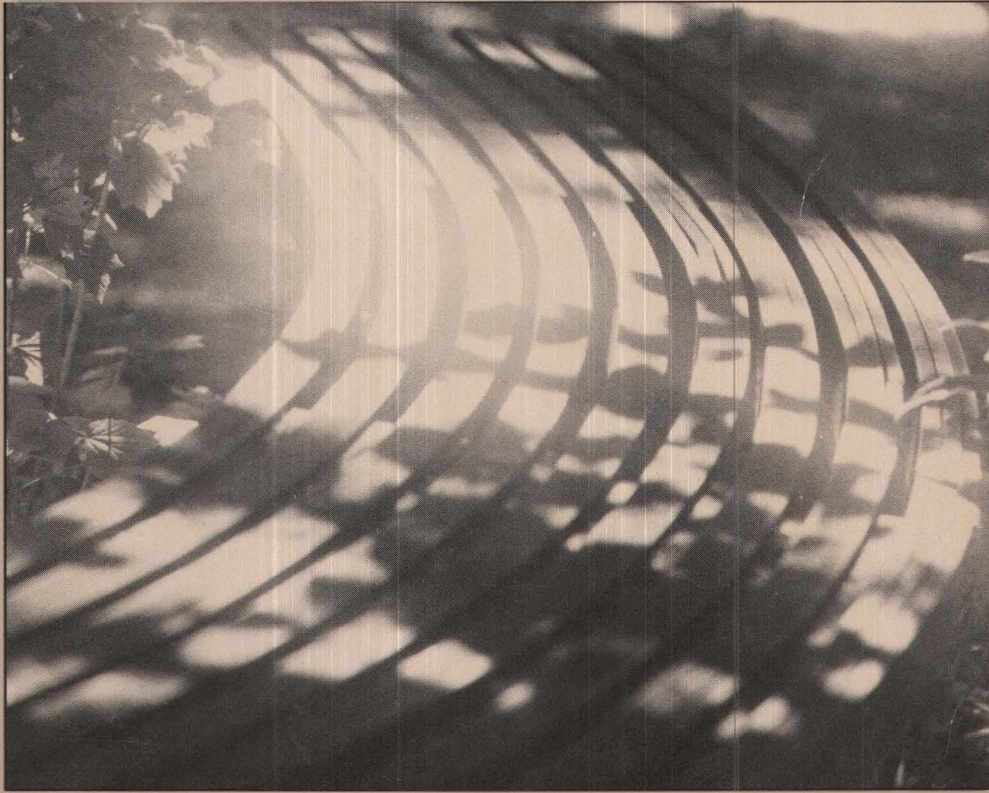



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# GRADUATE BULLETIN

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 **STONY  
BROOK**

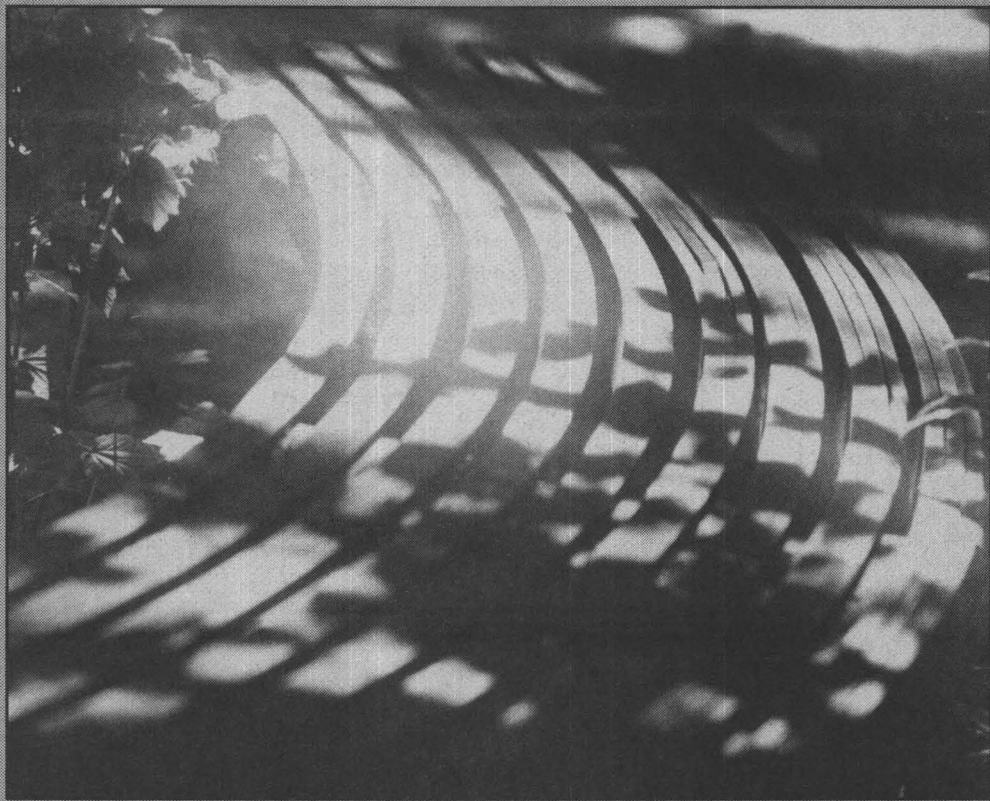
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**G R A D U A T E B U L L E T I N**

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 **STONY  
BROOK**

**Graduate Bulletin  
Volume XXI**

*Press Date:* August 1990

The university represents that the information in this publication is accurate as of the press date. Courses listed in the *Graduate Bulletin* are subject to change through normal academic channels. New courses and changes in existing coursework are initiated by the responsible departments or programs and approved by the appropriate curriculum committees, the appropriate academic dean, and the vice provost for graduate studies. Circumstances may require that a given course be withdrawn or that alternative offerings be made. Names of instructors of courses and days and times of class sessions are given in the class schedule, available to students at registration. All students are reminded that the University at Stony Brook is subject to the policies promulgated by the board of trustees of the State University of New York. Fees and charges are set forth in accordance with such policies and may well change in response to alterations in policy or actions of the legislature during the two-year period covered by this publication. The university reserves the right to change its policies without notice.

This document provides information intended primarily for students who have been admitted to the Graduate School. Detailed degree requirements, course listings, and academic rules, regulations, and procedures for students who are already admitted to the Graduate School may be found in this publication.

Additional bulletins are published and made available for undergraduate, continuing education (CED), and health sciences students.

*Additional Information*

For general information about graduate programs and/or application, please write or phone:

The Graduate School  
University at Stony Brook  
Stony Brook, New York 11794-4433  
(516) 632-7040

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### **Equal Opportunity and Affirmative Action**

The University at Stony Brook does not discriminate on the basis of race, religion, sex, sexual preference, color, national origin, age, disability, marital status, or status as a disabled or Vietnam-era veteran in its educational programs or employment. Also, the State of New York prohibits discrimination on the basis of sexual orientation.

Discrimination is unlawful. If you are a student or an employee of the University at Stony Brook and you consider yourself to be the victim of illegal discrimination, you may file a grievance in writing with the Affirmative Action Office within 45 calendar days of the alleged discriminatory act. If you choose to file a complaint within the university, you do not lose your right to file with an outside enforcement agency such as the State Division of Human Rights or Equal Employment Opportunity Commission.

Any questions concerning this policy or allegations of noncompliance should be directed to:

Monica Roth  
 Acting Affirmative Action Officer  
 Administration Building 474  
 University at Stony Brook  
 Stony Brook, New York 11794-0251  
 (516) 632-6280

## A Message from the Vice Provost for Graduate Studies

The *Graduate Bulletin* provides important information about Stony Brook's rules, regulations, and graduate degree requirements. It is intended to guide the study of students enrolled in our postbaccalaureate degree programs, but not to substitute for the advice that can be provided by the faculty. Graduate students should read and understand the introductory sections of this book and the section about their own program. They are expected to be familiar with, and of course comply with, these rules.

Additional general information about Stony Brook is available in the publication titled *Graduate Studies Opportunities*, which is intended primarily for those not familiar with the campus and who are considering graduate education. Other important information is in *Financial Information for Graduate Students*, which is revised annually. Departments and graduate programs provide more detailed information about their own rules and procedures, and each department has a complete compilation of Graduate School policies. Please be sure to consult all of these sources of information; your success here may depend upon it.

If you run into problems or difficulties during your studies, deal with them promptly and completely. If you cannot find the solution, contact the Graduate School; we can usually correct any problem that is brought to us in good time.

Work hard, and keep your eyes on the prize. Good luck!

Alexander H. King

Alexander H. King

# Campus Resources and Student Services



# Campus Resources

## University Libraries

The Stony Brook campus is endowed with a number of libraries to meet the information needs of students and faculty. The Frank Melville, Jr. Memorial Library, the main library building, provides both an intellectual and physical focal point for the campus and is among the largest academic libraries in the nation. Within the architecturally distinctive Melville building are collections serving the social sciences, humanities, fine arts, and music. These collections are particularly strong in English, Western European, and Latin American literature, as well as in modern Western and Latin American history. Special departments in the library provide ready access to current periodicals, government documents, maps, microforms, and legal materials. Other facilities of note are a music listening center, a student lounge, and a variety of individualized study carrels. The full range of library services, including open stack privileges and data base searches, are available to all students.

There are five branch science libraries. Four of these—chemistry, earth and space sciences, engineering, and mathematics/physics—are located in departmental buildings. The fifth, biology, is located in its own building. There is also a computer science annex to the Engineering Library as well as a Health Sciences Library in the Health Sciences Center. Collectively, the university libraries contain over 1.6 million bound volumes and 2.5 million publications in microformat.

Other library resources of note are the Senator Jacob K. Javits collection of papers and memorabilia and the William Butler Yeats Archives.

## Library Hours

During the academic year, the main library is generally open Monday through Thursday, 8:30 a.m. to midnight; Friday, 8:30 a.m. to 8 p.m.; Saturday, 10 a.m. to 6 p.m.; and Sunday, noon to midnight.

During intersession and other vacation periods, hours are generally 8:30 a.m. to 5 p.m., Monday through Friday, and closed weekends. The library is usually closed on those major holidays when classes are not held.

*Note:* Library hours are subject to change from year to year, and even within the year. Students are urged to check the posted hours of operation at the various branch libraries as well as at the main library.

## Computing Services

The university's computing environment is characterized by an ever-changing array of hardware, software, network connectivity, and consulting services. In addition to the services listed below, which are available to all students, individual departments offer a wide variety of mainframe, mini-, and microcomputing facilities for their own purposes.

Central mainframe computing is provided by an IBM 3090-180E and a VAX cluster comprising three VAXs: a 6400, an 8600, and an 8350. The IBM mainframe runs VM/XA and MVS/ESA operating systems and is equipped with a vector facility. The VAXs run the VMS operating system. The central computing facilities and the specialized departmental facilities are networked via fiber optics to 17 major academic buildings.

Languages available on the mainframes include FORTRAN, PASCAL, COBOL, LISP, APL, BASIC, C language, Assembler, and PL/I. Statistical software includes SAS, SPSSX, BMDP, PSTAT, and MINITAB. Graphics languages include DISSPLA, TELLEGRAF, EPIC, SAS GRAPH, and VAX GKs. Numerical libraries include IMSL, CERNLIB, LINPACK, MINPACK, and EISPACK. Available text formatting languages are SCRIPT, T<sub>E</sub>X, and L<sub>A</sub>T<sub>E</sub>X.

High-speed laser printing is provided by XEROX 8700 and 4650 printers and slower-speed printing by an LN03+ and a ScriptPrinter running POSTSCRIPT.

There is a networked distributed HP Unix system composed of multi-user computer servers, graphics workstations, and terminals at six locations on campus. It runs HP-UX, a System 5 derivative of Unix with Berkeley enhancements. Software includes PASCAL, FORTRAN, C, C++ compilers, Electrical Engineering Design Capture System, 2-D Mechanical Engineering CAD software, SQL, and X Windows.

Microcomputing facilities are available to students at seven sites and include IBM XTs, PS/2 model 50s and 60s, DEC Pro 350s, and Macintoshes. Printing capabilities include dot matrix and laser printers.

The university mainframe computers are nodes on both Internet and BITNET. Internet access is also available from the HP Unix networked system. The IBM 3090 is a smart node for the Cornell Super Computer.

The university computers are accessible from campus offices, dormitories, and student apartments through the ROLM telephone switch via a data control module that can be rented for a monthly fee. Public terminal sites are located in Light Engineering and the Frank Melville, Jr. Memorial Library.

Consulting is provided for all systems by the Office of User Services. Student consultants are available at the terminal sites

on campus. Documentation developed in house is available from the Office of User Services for all of the major systems and some of the more frequently used software products. The IBM mainframe, VAX cluster, and HP Unix systems all have extensive on-line help.

Discounts on IBM and Apple Macintosh personal computers are available to all full-time students of the university. Site licenses are also available on WordPerfect, Lotus, PC Write, Point 5, and others. Lotus products are available to students at a discount from the University Bookstore.

## Graduate Student Organization

The Graduate Student Organization (G.S.O.) is composed of all students enrolled in graduate programs at Stony Brook, including the School of Continuing Education and the Health Sciences Center. The G.S.O. operates a housing service and a part-time job service. Several active committees work on helping to solve problems facing graduate students. The Senate, representing all departments, oversees the spending of the mandatory student activity fee on campus social, cultural, athletic, and public service events.

All graduate students are welcome to help coordinate ongoing activities. The G.S.O. office is located in 206 Central Hall.

## Stony Brook Union

The Stony Brook Union is the campus center for hundreds of activities planned for and by students. Its nine meeting rooms, auditorium, ballroom, art gallery, spacious lounges, and courtyards provide space for all registered university groups.

The union is also a gathering place for students between classes. Some students gravitate to the bowling alley or the billiards room, while others prefer to relax, watch television, read, or mingle with friends and other members of the campus community in the lounges. The building houses many vital campus services—the post office, check cashing, locker rentals, and the University Information Center. Hungry students, whether looking for a quick snack or a complete meal, can satisfy their appetites in one of the union's eateries—a cafeteria, a delicatessen, a coffee house, a snack counter, and a restaurant. For information call the University Information Center at (516) 632-6830.

Weekends at Stony Brook are filled with concerts, plays, movies, speakers, sporting events, and parties. Past concerts have included the Hooters, Eddie Murphy, and George Benson, to name only a few. Craft fairs, club fairs, and special cross-cultural exhibits are popular weekend activities on campus.



The Student Union and Activities staff works with individuals and campus groups in planning programs. The staff also offers workshops in leadership development and in personal skills training that include assertiveness, time management, and an accredited course in theory and practice in leadership.

The Department of Student Union and Activities is located in Room 266 of the Stony Brook Union; call 632-6820 for further information.

### Hours of Operation

During the fall and spring semesters, the union is open Monday through Wednesday, 8 a.m. to 1 a.m.; Thursday and Friday, 8 a.m. to 2 a.m.; Saturday, 10 a.m. to 2 a.m.; and Sunday, 10 a.m. to 1 a.m. During recesses and intersession, it is open Monday through Friday 8:30 a.m. to 5 p.m. and is closed Saturday and Sunday.

Call for information concerning the union's summer session hours. The union is closed New Year's Day, Easter Sunday, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas Day.

*Note:* Union hours are subject to change from year to year and even within the year. For building hours information, call (516) 632-6830.

### Athletic Facilities

The indoor sports complex includes the new field house, which is expected to open in the fall of 1990, and the existing gymnasium.

The main arena of the complex will seat 4,100 for basketball and volleyball and 5,000 for special events such as lectures, concerts, and commencement ceremonies. The complex includes a four-lane, five-sprint lane track (177 meters); six glass back-walled squash courts; new locker room facilities including six new team rooms; and a new training room with capacity for hydrotherapy and electrotherapy. The building also contains two large, attractive lobbies suitable for receptions and large gatherings, and two fully equipped concession stands.

The complex also includes a gymnasium that seats 1800 for basketball or volleyball. When not in use for competition, the gymnasium contains three multipurpose courts suitable for basketball, volleyball, badminton, and indoor soccer. The facility also houses a six-lane, 25-yard pool, four racquetball and four squash courts, two Universal weight rooms, a free weight room, a dance studio, and an exercise room.

Other physical education and athletic facilities include 24 tennis courts, a 400-meter running track, four single-wall handball courts, two beach volleyball courts, two outdoor basketball courts, and separate fields for varsity soccer, baseball, softball, football/lacrosse, and intramural sports.

The complex is accessible to Stony Brook students, faculty, staff, alumni, and, for a modest fee, residents of the surrounding community. The complex is open seven days a week from 8 a.m. to 11 p.m., but is closed on all major holidays.

Most facilities may be used for recreational purposes when they are not scheduled for classes, intercollegiate or intramural events, or special events. Current schedules of recreation hours may be obtained in the Physical Education Office.

### Academic Journals

Academic publications edited or published at the university include *Advances in Learning and Behavioral Disabilities*; *Art Criticism*; *Biological Psychiatry*; *Circuits, Systems, and Signal Processing*; *Continental Philosophy*; *Developmental Review*; *Dow Jones Irwin Business and Investment Almanac*; *Eighteenth-Century Studies*; *Evolution*; *Forum Italicum*; *Gastrointestinal Radiology*; *Gradiva*; *Heat Transfer—Japanese Research*; *International Association of Philosophy and Literature*; *Journal of the American Statistical Association*; *Journal of College Science Teaching*; *Journal of Educational Technology Systems*; *Journal of Histotechnology*; *Journal of Urban Analysis and Public Management*; *Long Island Historical Journal*; *Materials Letters*; *Materials Science and Engineering*; *Medieval Prosopography*; *Mental Retardation and Developmental Disabilities*; *Minnesota Review*; *Philosopher Annual*; *Praxis International*; *Previews of Heat and Mass Transfer*; *Quarterly Review of Biology*; *Quintessence of Dental Technology*; *Slavic and East European Arts*; *Socio-Economic Planning Science*; *SUNY Series in Aesthetics*; and *Transplantation Proceedings*.

### Office of Research Services

The local administration and management of research and other sponsored activities depend on campus offices in both the academic and administrative areas. The Office of Research Services (ORS), under the auspices of the provost, has the responsibility for both the programmatic and fiscal aspects of sponsored projects. It provides information about opportunities for funding; reviews proposals to external sponsors for consistency with federal, state, campus, and sponsor regulations; provides reports on sponsored activities to administrative and departmental offices; and coordinates the activities of committees that deal with special features of research, such as ethical and safety considerations. ORS serves as the branch campus office of the Research Foundation of State University of New York, a private nonprofit corporation that is the grantee and contractor for external research sup-

port on behalf of the university. ORS also coordinates the technology transfer activities of the campus, including the filing of patents. Students are urged to discuss any agreements involving their research activities in which they are named, or which they may be asked to execute with external organizations, with this office.

All campus projects that involve human subjects, whether they are conducted as part of a research program or in conjunction with course activities (including graduate research), must receive prior review and approval by the campus-wide Committee on Research Involving Human Subjects (CORIHS). If such prior approval has not been obtained for degree-related work, delays may occur in the awarding of a graduate degree. (It is SUNY policy that the campus may not require the participation of students as subjects in human research.) Questions regarding human subjects should be addressed to the Staff Officer for Assurances in the Office of Research Services.

All projects requiring the use of animals, recombinant DNA, radioactive materials or ionizing radiation, or lasers require prior review and approval by the appropriate university committees. Questions relating to these areas should also be addressed to the Staff Officer for Assurances.

The campus offices that deal with research and scholarly effort recognize the importance of these activities to the university. They stand ready to help and advise on most aspects of these essential missions.

### Special Centers and Institutes

The university is home to a myriad of centers, laboratories, and institutes, many of them externally funded, which reflect the broad diversity of academic and research-oriented pursuits on campus. Many of these organizations are directed by Stony Brook faculty and staff. Students may benefit from these facilities by tapping them as resources for academic work. Among these organizations are the AIDS Education and Resource Center; Arms Control and Peace Studies Center; Bach Aria Festival and Institute; Center for the Analysis and Synthesis of Macromolecules; Center for Assessing Health Services; Center for Biotechnology; Center for Excellence and Innovation in Education; Center for Industrial Cooperation; Center for Italian Studies; Center for Photographic Images of Medicine and Health Care; Center for Regional Policy Studies; Center for Religious Studies; Center for Science, Mathematics, and Technology Education; Economic Research Bureau; Educational Communications Center; and Empire State College.

Other campus-based institutes and laboratories include the Howard Hughes Medical Institute in Neurobiology, Humanities

Institute, Institute for Advanced Studies of World Religions, Institute for Decision Sciences, Institute for Mathematical Sciences, Institute for Mental Health Research, Institute for Pattern Recognition, Institute for Planetary Atmospheres, Institute for Theoretical Physics, Institute for Urban Sciences Research, Institute of American Studies, International Art of Jazz, Laboratory for Arthritis and Related Diseases, Laboratory for Behavioral Research, Laboratory for Experimental Mechanics Research, Laboratory for Personal Computers in Education, and the Long Island Regional Advisory Council on Higher Education.

Stony Brook also houses the Lyme Disease Center, Research Center for Health Promotion/ Disease Prevention, Research Group for Human Development and Educational Policy, Sleep Disorders Center, Stony Brook Radiation Laboratory, Sudden Infant Death Syndrome Regional Center for Eastern New York State, Suffolk Child Development Center, Suffolk Partnership Program, and Taproot Workshops, Inc.

## Student Services

### Summer Institute in American Living

The Intensive English Center offers a special four-week session, the Summer Institute in American Living, which is a program of courses and activities in English language and American culture designed to meet the special needs of short-term visitors to the campus and students who wish an intensive pre-university course in English study before beginning their regular academic program in the fall. Participants in the institute attend English classes, visit American homes, and join excursions to places of cultural and historic interest. A three-day trip to Washington, D.C. affords students the opportunity to visit our nation's capital.

Admission is open to all foreign students and visitors who have completed the equivalent of a secondary school education. For additional information prospective students are invited to call or visit the Intensive English Center, 108 Central Hall, 632-7031.

### Career Development Office

The Career Development Office of the Student Affairs Department of Career and Developmental Services assists students and alumni with career planning and acts as a resource for information on full-time permanent employment. Individual and group consultation in which students are helped by career counselors to relate their academic abilities and interests to career opportunities is open to all.

An on-campus recruitment program permits interested seniors and graduate students to meet with prospective employers and graduate schools. A new computerized job-matching system allows students to identify job openings nationwide. A permanent credentials service is also provided to support students in their application for jobs or advanced study.

Students are encouraged to participate in the Student Volunteer Service Program (VITAL), in which experience in different career areas can be obtained by working with agencies and organizations that use student volunteers.

Group workshops assist students and alumni in writing resumes and in developing individual strategies for applying for employment. As part of the Career Development Office's Out-Reach Program, career counselors visit academic departments and residence halls in order to provide career-related information.

The Career Development Resource Library has information pertaining to opportunities in business, government, social service, and education. Materials are available on career planning, teaching certification, health careers, graduate and professional school admissions testing, graduate school and financial aid information, and recruitment options.

Other services available include two computerized systems for self-evaluation and career identifications: DISCOVER and SIGI Plus; information and applications for examinations required by various graduate and professional programs (i.e., the GRE, LSAT, GMAT, DAT, NTE, Actuarial Exam, MCAT, TOEFL, OAT, AHPAT, and Pharmacy Test); and a library of career information tapes recorded people who are actually doing the work discussed on the tapes.

It is suggested that students visit the Career Development Office and become familiar with the services it provides. The office, located in the Melville Library, Room W-0550, is open weekdays from 8:30 a.m. to 3 p.m.

### Child Care Services

The university provides day care for children ranging in age from two months to five years old. There are presently four on-campus facilities staffed with professionals in the early childhood field assisted by students engaged in coursework practice.

Two centers, Toscanini and Clark, are for children from 2 months to 3 years old, and the other two, Early Childhood Center and Benedict, are for children 3 to 5 years old. Benedict and Toscanini are open from 7:30 a.m. to 5:30 p.m. and ECC and Clark are open from 8 a.m. to 6 p.m. Fees are

charged on a sliding scale based on income. A low-income subsidy is available to families who qualify.

Because there are extensive waiting lists for these centers, it is wise to call for an application well before the service is needed. There is no guarantee that infant/toddler care will be available when needed; care for three- to five-year-olds is more readily available. Call Toscanini (632-6933), Benedict (632-6932), ECC (632-6931), Clark (632-9011), or the executive director's office (632-6930).

### Counseling Center

The University Counseling Center, located on the second floor of the Infirmary, provides individual, group, family, and marital counseling and psychotherapy for students experiencing psychological difficulties. The center also offers programs for personal growth and enrichment. For information, please call the center at (516)632-6725.

### Disabled Student Services

Disabled Student Services, operating within the Student Affairs Department of Career and Developmental Services, coordinates services to disabled students and assists them with housing, meals, registration, recreation, academic needs, special parking permits, transportation, and financial aid. The office can loan for short periods such special equipment as tape recorders, tapes, wheelchairs, crutches, and canes.

Disabled Student Services also has a Resource Center that offers the following kinds of support for learning-disabled students: placement testing, tutoring, vocational assessment, and psychological counseling.

A small Center for the Disabled, located in the Reference Room of the Melville Library, offers assistance to visually and physically disabled students. It includes equipment such as a Kurzweil Reading Machine, a braille, a Visual-Tek Machine, and an IBM computer with voice.

All disabled students are encouraged to contact Disabled Student Services, 133 Humanities Building, prior to the start of classes. The number to call is (516) 632-6748/9, TDD available. This notice is available on tape and in large print.

### The Intensive English Center

The Intensive English Center (IEC) offers classes in English as a second language for all residents of the Long Island community who wish to improve their command of the language. A full-time intensive program is available for those wishing to study for a semester or longer, and participants are eligible to receive a student

visa. Optional afternoon elective classes permit students to take courses in areas of special interest. Guidance in selecting a U.S. college or university assists students not planning to remain at Stony Brook. IEC participants are eligible for on-campus housing and use of all university facilities.

The IEC is located in 108 Central Hall and is open 9 a.m. to 5 p.m. The telephone number is 632-7031.

## Foreign Student Affairs

The Office of Foreign Student Affairs assists students from other countries with finances, housing, government regulations (including immigration and tax matters), and problems related to cross-cultural differences; questions relating to academics are usually handled by academic advisors within the individual's school or department. The staff also works with community groups and student organizations to provide access to a varied program of activities during the year, including tours and trips, discussion groups, home hospitality, speaking engagements, and other events. The director of the Office of Foreign Student Affairs reports to the dean for International Programs.

An F-1 or J-1 foreign student must take a full course of study, and must consult a foreign student advisor (1) upon arrival, (2) before accepting employment, (3) before leaving the United States either permanently or temporarily, (4) when transferring to another institution, (5) when withdrawing from the university, (6) when extending his or her entry permit, (7) before leaving the university, (8) before changing his or her address for any reason, (9) when anticipating a status change (for example, from "F" to "permanent resident"), or (10) to change his or her area of graduate studies or level of study.

## Health Services

The University Health Service, located in the Infirmary, concerns itself with student health needs. The Walk-in Clinic is staffed by physicians, physician assistants, and nurses. Specialty services for psychiatric and gynecological problems are also available. The University Health Service hours of operation are Monday through Friday, 8 a.m. to 6 p.m. At other times, students are requested to use the Emergency Department of University Hospital on a fee-for-services basis; therefore, adequate health insurance is important. Information on university-sponsored student health insurance is available at the Infirmary Building.

## Off-Campus Housing

The Off-Campus Housing Service provides information concerning rentals of rooms, apartments, and houses in the local area.

All landlords listing property with the university must sign a statement assuring non-discriminatory practices; listings do not become available until such assurance is received. The Off-Campus Housing Service and the university may not become party to landlord-tenant disputes.

The common price per month for a furnished room is \$240. Kitchen privileges are often included in this price. Rooms available in houses rented by other students are also listed. That is, arrangements can sometimes be made to share a complete house for \$200-400 per month plus a percentage of the utilities cost. Apartment listings cover those available in standard apartment building complexes and those available in private homes. The usual rental rate of a studio apartment (one large room, bathroom, closets, kitchenette) in a house is approximately \$375-\$500 per month. A studio apartment in one of the apartment complexes is usually \$400-\$600. Apartments in housing complexes usually provide more space and privacy. A conventional one-bedroom apartment, including living room, dining room, kitchenette, bathroom, and closet space, usually ranges in price from \$500-\$600 per month. Utility costs, except electricity, are often included in the price. There are also listings for house rentals in the area. These rentals range from \$600 to \$1200 per month, not including utilities. The price depends on the number of rooms in the house, the condition of the house, and its distance from the campus. For more specific information feel free to contact the Off-Campus Housing Service, located in 104 Administration Building, or phone 632-6770, Monday through Friday, 10 a.m. to 4 p.m.

## Veterans Affairs

The Office of Veterans Affairs, operating within the Department of Career and Developmental Services, offers counseling and advisement to veterans and eligible dependents of veterans. Students are provided with information and assistance in preparing applications for V.A. educational benefits and other financial aid programs for veterans and dependents of veterans.

As part of its outreach efforts, the office publishes a newsletter that includes information on legislation affecting veterans, changes in V.A. rules and regulations, new programs and services, and other issues of interest to veterans. In addition, a resource collection containing information on a wide variety of topics concerning veterans is available to interested individuals visiting the office.

Students seeking information and assistance are encouraged to contact the Office of Veterans Affairs as soon as possible. The

Office is located in 155 Central Hall. Office hours are Monday, Tuesday, and Friday, 1 to 5 p.m., and Wednesday and Thursday, 9 a.m. to noon.

## Writing Center

The English Department's Writing Center offers individual tutoring to all members of the Stony Brook community including undergraduate and graduate students and faculty. Tutors provide guidance in all stages of writing from getting started to revising, and for all types of projects from research papers to resumes. In addition, tutors provide general writing instruction for those interested in improving their skills apart from work on assigned writing tasks. Throughout the semester, tutors conduct workshops on various aspects of writing. The schedule of workshops is available in the Writing Center, 198 Humanities.

The Writing Center is open 9 a.m. to 5 p.m., Monday through Friday and selected evenings. Appointments are recommended (632-7405), since last-minute requests cannot always be accommodated.

## Policies and Procedures

### Telephone Directory

It is the policy of the University at Stony Brook to publish a campus telephone directory including student name, campus address, home address, and telephone number. If a student does not wish to be listed in the directory, or, in the case of a student who is a minor, if a parent does not wish such listing, he or she will be required to so indicate at the time of registration by filing SUSB Form #503-B at the Office of Records/Registrar.

### Parking and Traffic

Regulations have been established to govern vehicular and pedestrian traffic and parking on highways, streets, roads, and sidewalks owned, controlled, or maintained by the university. These regulations apply to students, faculty, employees, visitors, and all other persons upon such premises. The detailed regulations and appeal procedures are available in the Traffic Office, 192 Administration Building.

*Note:* At the present time, resident students, except freshmen and sophomores, are permitted to register their motor vehicles for parking in the resident student lots. Resident freshmen and sophomores *must* petition and be approved to have vehicles on campus. Applications may be obtained in the Traffic Office.

# Academic Regulations and Procedures



All programs, regulations, and schedules of dates are subject to change or withdrawal depending on the availability of funds and the approval of programs by appropriate state authorities.

It is the student's responsibility to stay abreast of university regulations and procedures as set forth in this Bulletin and in official campus publications and notices.

## Organization of Graduate Education at Stony Brook

Under the direction of the provost, Graduate School administration rests with the vice provost for graduate studies and the administrative staff of the Graduate School in conjunction with the Graduate Council, which is composed of faculty, students, and administrators.

### The Graduate Council

The membership of the council includes the provost, *ex officio*; the vice provost for graduate studies; two faculty members elected by the University Senate from each of the following groups: Arts and Humanities, Behavioral Sciences, Biological Sciences, Engineering Sciences, Mathematical Sciences, Social Sciences; two faculty members from the Health Sciences; a member from the School of Continuing Education; one faculty member of the library elected by the library faculty; one member elected by core campus nonteaching professionals; and a graduate student representative chosen by the Graduate Student Organization. Elected faculty members serve for three years with staggered terms. The chairperson and the secretary of the Graduate Council are elected by the council. Among other duties detailed in the "Faculty By-Laws," the council must approve all graduate programs before their submission to the SUNY Central Office and the State Department of Education.

### The Department

Each department exercises a large measure of responsibility for its graduate program. Under the general responsibility of the department chairperson, each department has a departmental committee on graduate students and a graduate studies director who administers departmental graduate activities. Each department also has an appeals and grievances committee comprising equal numbers of faculty and graduate student members. Individual departments select graduate applicants and recommend them for admission to the vice provost for graduate studies. The departments are responsible for the nomination of students and applicants for

fellowships, traineeships, and assistantships, as well as for the administration of graduate programs, including coursework, supervised research, teaching apprenticeships, and graduate examinations. It is the department that certifies to the Graduate School that the student has completed all degree requirements.

Some graduate programs are not housed in specific departments. Such interdepartmental programs are governed by faculty committees and are chaired by a graduate studies director. For purposes of graduate education they function as do departments in other disciplines.

## Registration

All students who are enrolled in the Graduate School in any program and who have not been granted a leave of absence by the vice provost must register each fall and spring for at least one credit until all degree requirements have been met. Students who hold graduate traineeships, research assistantships, or predoctoral fellowships must be registered as full-time students. Neither departments nor individual faculty members have authority to waive these rules.

A student is not considered to be registered until the appropriate forms have been filed with the Office of Records/Registrar and arrangements regarding tuition and fees have been made with the Bursar's Office. All graduate students, whether in residence or in absentia, must maintain matriculated status by completing their registration during the regular times designated by the Office of Records/Registrar for graduate student registration. Students failing to register during the advance registration or final registration period may still register during the first two weeks of the semester, but will be charged a *late registration fee* of \$20.00. Registration is ordinarily not permitted after the end of the second week of classes.

## Maintaining Matriculated Status

The requirement that all candidates for degrees register for at least one credit in thesis or dissertation research each semester (or summer term if they plan to graduate in August) applies even to those who are using the library, laboratories, or computer facilities; to those who are consulting with the faculty while working on their dissertations; and to those who are preparing for or taking qualifying or oral examinations at the master's or doctoral level.

To be eligible to receive a degree, a student must maintain matriculation for each semester prior to and including the semester in which the degree is awarded. Students on approved leaves of absence do

not register for those semesters for which a leave has been granted; however, **they must register for the semester in which the degree is awarded.**

Currently registered students who complete all degree requirements *after* the deadline for any degree date but before the first day of classes of the next semester or term are eligible for graduation the next time degrees are awarded, without additional registration. Students who complete all degree requirements during the summer term may graduate in December provided they were registered in the preceding spring semester and all requirements were completed before classes began in the fall semester. Students who wish an August degree and do not complete all requirements before the summer term begins must register for the summer term to be eligible for the August degree.

## Course Changes

During the first four weeks of classes (as noted in the academic calendar) graduate students may add or drop courses by completing the request form available from the Office of Records/Registrar, provided the proposed change does not alter the student's status as defined in the sections titled "Registration" and "Maintaining Matriculated Status." Courses dropped in the first two weeks of the term are deleted from the student's record. For courses dropped during the first four weeks, tuition is charged at the rates specified in the schedule of tuition liability in *Financial Information for Graduate Students*. After the fourth week of classes no course may be added or dropped. Should it become impossible for a student to complete a course for a reason such as illness or accident, he or she may petition the vice provost for graduate studies for a waiver of the deadline. Such petitions must be approved by both the chairperson and the graduate studies director of the department. If a petition is approved, a charge of \$10.00 is assessed, courses remain on a student's record, and a withdrawal grade of W is recorded.

## Leave of Absence

Leaves are granted for a maximum of one year at a time, renewable upon request for the second year. A student on academic probation may be granted a leave of absence only if he or she recognizes that reenrollment is subject to conditions imposed by the Graduate School and his or her department. These conditions will be specified in writing at the time the leave is approved. The semesters in which a student is on an *approved* leave of absence do not count in the calculation of the time limit for the degree. In order to request a

leave, the student must be currently registered or must have been registered for the preceding semester. Students who are admitted to graduate study but never register are not eligible for leaves. Requests for leaves of absence should be made on the Request for a Leave of Absence Form (SUSB 1341) and submitted to the graduate studies director of the individual department. If the graduate studies director and the chairperson of the department approve the request for leave, they recommend approval to the vice provost for graduate studies.

Students who have either preregistered or are currently registered must also submit a withdrawal card as described in the section below.

Military leave of absence will be granted for the duration of obligated service to students in good standing.

Students planning to return from leaves should inform their departments of their intention, preferably three months in advance of the term for which they wish to register. A current address should be given to the department. The academic department will then complete a Readmission Form and submit it to the Graduate School for approval.

## Withdrawal from the University

A student finding it necessary to withdraw from the university must obtain a withdrawal card from the Office of Records/Registrar. This card must be approved by the appropriate offices indicated on the card and by the Graduate School. The effective date of withdrawal is the date upon which the completed withdrawal card is returned to the Office of Records/Registrar. The process of withdrawing from the university is a formal procedure and the student has the responsibility for initiating it. Students may withdraw from the university up to the last day of classes; however, financial liability to the university still remains (see the schedule of tuition liability in *Financial Information for Graduate Students*).

Students are urged to discuss all withdrawals with the graduate studies director of their department and with their academic advisor before such an action is taken.

## Unauthorized Withdrawal

A student who leaves the university without obtaining an official withdrawal may forfeit the privilege of honorable withdrawal and endanger his or her prospects of readmission to the Graduate School. Such students will be reported as having failed all courses.

## Dissertation Research Away from Campus

It is expected that a graduate student's dissertation will normally be conducted at Stony Brook under the direct guidance of the faculty of the department or program in which the degree is sought and with the facilities available here or close by, such as, for example, at Brookhaven National or Cold Spring Harbor laboratories, the hospitals and institutions on Long Island, or the libraries of New York City. However, there may be circumstances in which the student's work would be facilitated at an off-campus location such as another institution or research facility. In such cases, the department must present to the vice provost for graduate studies a letter containing the following:

1. The reasons for the request.
2. The conditions under which the student's work away from campus is to be performed, supervised, and evaluated.
3. Confirmation that the student is registered as a graduate student at Stony Brook and has paid the necessary fees. If the student is supported by a stipend or grant from state funds or from university-monitored federal and private sources, he or she must be registered as a full-time student. If the student is employed elsewhere, in a position not under the university's jurisdiction, matriculation may be maintained by registering for at least one credit of research each semester providing all degree requirements have been fulfilled except for the writing of the thesis or dissertation.
4. For students with financial support, a statement by the chairperson of the department attesting that permission for the student to do work away from campus will not diminish the department's capability to fulfill its instructional commitments.
5. A statement from the institution where the student's work is to be performed in which responsibility for supervision is accepted by that institution. In the case of archival research or fieldwork, a statement of authorization for the student to use such resources must be submitted.
6. Approval of the graduate program committee and the chairperson of the department concerned.

## Advancement to Candidacy

A student may be advanced to candidacy after having completed Graduate School and departmental requirements other than the dissertation or its equivalent. Students on academic probation cannot be advanced to candidacy. Advancement to candidacy is granted by the vice provost for graduate studies upon recommendation of the graduate studies director.

## SUNY Exchange Program

When the special educational needs of a doctoral student at one SUNY institution or the graduate center of CUNY can be served best by taking courses at another unit of the SUNY system or at the graduate center of CUNY, he or she should obtain an application from the chairperson of his or her department to apply for admission to take the desired courses at the host institution. The recommendation from the department should state that the student has the prerequisites for the courses and that, if the courses are successfully completed, credit for them will be accepted toward the degree. The statement from the department chairperson should be approved by the vice provost for graduate studies. It should be sent to the dean of the graduate school of the host institution, who will clear it with the department concerned. When approval is obtained, the student will be admitted to take the courses requested. The student will pay appropriate tuition and fees at the host institution. If the student has a waiver of tuition at Stony Brook, that waiver will be recognized by the host institution. At the completion of the courses, the host institution will, on request, send a transcript to the University at Stony Brook.

## Transfer of Credit

### A. From Other Universities

1. A candidate for the master's degree may petition to transfer a maximum of 20 percent of the total graduate credit requirement for the degree toward his or her master's degree requirements.
2. These credits must be from an institution authorized to grant graduate degrees by recognized accrediting commissions.
3. **Credits must not have been used to fulfill the requirements for either a baccalaureate or another advanced degree.**
4. Credits must not have been earned more than *five years before* the time the student is admitted to graduate study at Stony Brook. Credits earned more than five years before admittance to Stony Brook will be accepted only in rare circumstances.
5. Credits must clearly be graduate level. A course listed as both graduate and undergraduate level will not be considered for transfer.
6. Credits must carry the grade of A or B. "Pass" or "Satisfactory" grades are not transferrable unless these grades can be substantiated as B or higher by the former institution. Grades earned in transferred courses are not counted as part of the overall grade point average at Stony Brook.

7. Work in one master's degree is not transferrable to a second master's degree.

8. A candidate for the doctoral degree may transfer graduate credits that are allowed by the appropriate departmental committee.

Students who wish to petition for transfer of credit should submit the Transfer Credit Request Form (SUSB 1343) along with an official copy of the transcript to their departmental committee for review. Departmental recommendation is needed before submission to the Graduate School for final approval.

## **B. Acceptance of Credits From the School of Continuing Education (CED) or Non-Matriculated Status (GSP)**

1. A maximum of 12 graduate credits from non-degree graduate status at Stony Brook can be applied toward degree requirements at the discretion of the academic department and with the approval of the Graduate School.

2. A maximum of six credits of CED courses not crosslisted with departmental offerings may be applied at the discretion of the academic department and with the approval of the Graduate School.

3. Certain degree programs offer courses that are crosslisted with those offered through CED. The number of such credits permitted toward those required for the program varies from program to program. The stipulation in paragraph 1 above also applies to credits earned in crosslisted courses. For more information see the descriptions of individual programs under the appropriate departmental heading or contact the appropriate graduate studies director.

## **The Grading System**

The following grading system will be used for graduate students in both graduate and undergraduate courses: A (4.0), A- (3.67), B+ (3.33), B (3.00), B- (2.67), C+ (2.33), C (2.00), C- (1.67), F (0.00). Pass/No Credit (P/NC) and grades of D are not approved grades for graduate students. Plus and minus grades are not applicable for courses taken before fall 1981.

In addition, the following marks may be awarded at the end of the semester:

*I (Incomplete):* This is an interim grade. It may be given at the discretion of the instructor but only at the student's request and upon evidence that good cause, such as serious, protracted illness, prevented the student's completion of course requirements. The grade of I must be resolved by March 15 for courses taken in the preceding fall semester and by November 1 for courses taken in the preceding spring

semester. However, the instructor may require that the work be completed at any time prior to the end of the Incomplete extension period. In granting a grade of I the instructor signifies a willingness to receive student work and prepare grades in accordance with these deadlines. If final grades are not reported to the Office of Records/Registrar by the specified dates, the grade of I will automatically be changed to I/F. Students should confer with their professors to establish how far in advance of the deadline work must be completed. Extension to the end of the succeeding term may be requested by written faculty petition to the Graduate School; any subsequent exception must be appealed by the student with a written letter of support or denial by the faculty member addressed to the Graduate School.

Each student's permanent academic record must reflect a final grade or a withdrawal grade for each course in which he or she was enrolled. If a final grade has not been reported by the scheduled deadline, or if the deadline has not been appropriately extended, the grade of F will be recorded.

*S (Satisfactory):* Indicates passing work (equivalent to the grade of C or higher) in those courses, so designated by the department and approved by the Graduate Council, where the normal mode of evaluation is impracticable.

*U (Unsatisfactory):* Indicates unsatisfactory work in those courses, so designated by the department and approved by the Graduate Council, where the normal mode of evaluation is impracticable.

Courses that are normally offered on a S/U basis are so indicated in the graduate class schedule published for each term.

*R (Registered):* Indicates attendance during the first semester in a yearlong course, the final grade for which will be assigned only after the completion of two semesters.

*NR (No Record):* An instructor may assign a temporary report of NR only for students who have never, to the instructor's knowledge, participated in the course in any way. An NR report is not to be interpreted as a grade but only as an indication of a temporary state of affairs that requires prompt resolution, leading either to removal of the course from a student's program (whenever it turns out to have appeared as a result of an error in recording the registration information submitted by the student), or to the assignment of a grade. If a final grade is not reported by the deadline in the academic calendar, the grade of N/F will be recorded. The entry of an I, NR, or no grade at all will automatically be calculated into the GPA as F until properly changed to a letter grade.

Graduate students may repeat for credit only those courses for which an F or U grade is recorded, or which are specifically designated for repetitive credit. No other courses may be repeated.

## **Change of Grade**

Grades appearing on a student's academic record **may not be changed after one calendar year from the end of the term in which the grade was incurred.** Final grades appearing on a student's academic transcript at the time of his or her graduation cannot be changed to any other grade subsequent to the graduation date. A final grade may not be changed on the basis of work completed after a term has ended.

## **Auditing**

Auditing is permitted by special arrangement between student and instructor. No record is kept of courses audited.

## **Academic Probation**

When a student's cumulative graduate grade point average falls below B (3.0) for grades earned in courses numbered 500 and above taken at Stony Brook, the student shall be placed on probation. If the student's overall graduate average has been raised to B (3.0) by the end of the next semester of enrollment after being first notified of probation, the student will be returned to regular status. A student on academic probation who fails to achieve a 3.0 cumulative GPA by the end of the second semester on probation will normally not be permitted to reenroll.

At the request of the new department, the record of a student who has changed his or her registered area of graduate studies may be treated as two separate records in considering possible waiver of academic probation. The G.P.A. for the new area of graduate studies may be calculated unofficially from the beginning of the semester in which the change became effective.

Similarly, at the discretion of the department, a passing grade earned for a course that was failed and retaken may be substituted unofficially for the F in considering a request for waiver of probation. This option may be exercised for one F grade only.

A student enrolled part time who has accumulated nine semester credits with a cumulative average below 3.0 will have two semesters or six credits (whichever is longer) to bring his or her cumulative GPA to 3.0.

If admitted on probation, a student must earn an overall graduate average of at least B (3.0) during the first semester of enrollment to be permitted to reenroll in the

subsequent semester. In this case, the student is considered to have achieved regular status. A student admitted on probation who fails to earn a B (3.0) average in the first semester will normally not be permitted to reenroll.

Departments or programs may have additional requirements, and failure to meet them can result in departmental academic probation. These are specified in departmental or program literature.

## Standards of Conduct

The university expects of all its students cooperation in developing and maintaining high standards of scholarship and conduct.

Students are expected to meet academic requirements outlined in this *Bulletin* and financial obligations as specified in *Financial Information for Graduate Students* in order to remain in good standing. Certain nonacademic rules and regulations must also be observed.

The university wishes to emphasize its policy that all students are subject to the rules and regulations of the university currently in effect or which, from time to time, are put into effect by the appropriate authorities of the university. Students, in accepting admission, indicate their willingness to subscribe to and be governed by these rules and regulations and acknowledge the right of the university to take such disciplinary action, including suspension and/or expulsion, as may be deemed appropriate. University authorities will take action in accordance with due process.

## Maintenance of Public Order

The university wishes to maintain public order appropriate for a university campus, without limiting or restricting the freedom of speech or peaceful assembly of the students, faculty, or administration. The university has, therefore, issued the *Rules for the Maintenance of Public Order* to ensure that the rights of others are protected and to set forth prohibited conduct. For a copy of the rules, contact the Office of the Student Judiciary, 347 Administration Building.

## Planned Assembly and Demonstrations

All groups using university buildings and grounds for planned assembly and demonstrations should submit a Facilities/Space Use Request Form to register their activities.

## Academic Dishonesty

Intellectual honesty is the cornerstone of all academic and scholarly work. Therefore, the university views any form of academic dishonesty as a serious matter. Detailed procedures for hearings and other func-

tions of the judiciary processes are available in the Graduate School.

## Grievance Procedures

Students encountering difficulties with departmental or Graduate School policy or procedure should discuss the problem first with their advisor and the graduate studies director of their department. If difficulties continue to be unresolved, the student should follow the guidelines for further appeal, available in the Graduate School.

## Student Educational Records

The Family Educational Rights and Privacy Act permits current or former students to inspect and review their educational records. Students are also accorded the right to a hearing in order to question the contents of their educational records. Written consent of students may be required before personally identifiable information about them will be released from their educational records as provided by law.

Specific guidelines and procedures are contained in T-507, "Family Educational Rights and Privacy Act," contained in the *Policy Manual* of the university. A copy of this manual is available in the Reference Room of the Melville Library.

After administrative remedies available at the university have been exhausted, inquiries or complaints may be filed with the Family Educational Rights and Privacy Act Office, Department of Health and Human Services, 330 Independence Avenue, S.W., Washington, DC 20201.

Applicants or students may waive their rights to inspect confidential letters or statements of recommendation.

## Transcripts

Students who wish to have transcripts of their academic records at Stony Brook forwarded to another institution or agency, or to themselves for their own use, must submit their requests in writing at least two weeks before the transcripts are needed, except at the end-of-semester peak period when additional time should be allowed. If making the request by mail, address a letter to P.O. Box 619, Stony Brook, NY 11790. Include 1) your full name; 2) your I.D. (social security) number; 3) your complete current address; 4) your dates of attendance at Stony Brook; 5) the exact name, office, institution, and complete address, including zip code, to which the transcript is to be sent; and 6) the required fee of \$3.00 for each transcript. Make checks payable to SUNY at Stony Brook.

If making the request in person, obtain a Transcript Request Form from the Office

of Records/Registrar in the Administration Building and follow the instructions on the form.

All financial obligations to the university must be satisfied before a transcript can be released. A request for a transcript must be made by the student himself or herself, and must be made in writing. Students who have both an undergraduate and a graduate transcript and wish only one of them sent should so specify in their request. Partial transcripts of either the undergraduate or graduate academic records are not issued. When satisfying financial obligations, cash, bank check, or money order is accepted. Personal checks will take two weeks to clear before release of transcripts.

## Equivalent Opportunity/Religious Absences

Some students may be unable to attend classes on certain days because of religious beliefs. Section 224-a of the Educational Law provides that:

1. No person shall be expelled from or be refused admission as a student to an institution of higher education for the reason that he or she is unable, because of religious beliefs, to attend classes or to participate in any examination, study, or work requirements on a particular day or days.

2. Any student in an institution of higher education who is unable, because of religious beliefs, to attend classes on a particular day or days shall, because of such absence on the particular day or days, be excused from any examination or any study or work requirements.

3. It shall be the responsibility of the faculty and of the administrative officials of each institution of higher education to make available to each student who is absent from school, because of religious beliefs, an equivalent opportunity to make up any examination, study, or work requirements that he or she may have missed because of such absence on any particular day or days. No fees of any kind shall be charged by the institution for making available to the said student such equivalent opportunity.

4. If classes, examinations, study, or work requirements are held on Friday after four o'clock post meridiem or on Saturday, similar or makeup classes, examinations, study, or work requirements shall be made available on other days, where it is possible and practicable to do so. No special fees shall be charged to the student for these classes, examinations, study, or work requirements held on other days.

5. In effectuating the provisions of this section, it shall be the duty of the faculty and of the administrative officials of each institution of higher education to exercise the fullest measure of good faith. No adverse or prejudicial effects shall result to



any students because of their availing themselves of the provisions of this section.

6. Any student who is aggrieved by the alleged failure of any faculty or administrative officials to comply in good faith with the provisions of this section shall be entitled to maintain an action or proceeding in the supreme court of the county in which such institution of higher education is located for the enforcement of his or her rights under this section.

7. As used in this section, the term "institution of higher education" shall mean schools under the control of the Board of Trustees of the State University of New York, the Board of Higher Education of the City of New York, or any community college.

### Areas of Graduate Studies, Codes

<i>Areas of Graduate Studies</i>	<i>Codes</i>
Anatomical Sciences	HBA
Anthropological Sciences	DPA
Anthropology	ANT
Applied Linguistics	LIN
Applied Mathematics and Statistics	AMS
Art Criticism	ARH
Astronomy/Planetary Sciences	AST
Biological Sciences, M.A.	BIO
Cellular and Developmental Biology	BCD

Cellular and Molecular Pathology	
Chemistry	
Chemistry 7-12	
Coastal Oceanography	
Comparative Literature	
Computer Science	
Foreign Languages, D.A.	
French	
German	
Italian	
Russian	
Spanish	
TESOL	
Dramaturgy	
Earth Sciences	
Earth Science 7-12	
Ecology and Evolution	
Economics	
Electrical Engineering	
English	
French	
Genetics	
Germanic Languages and Literatures	
Hispanic Languages and Literature	
History	
Italian	
Labor Management Studies, Advanced Certificate	
Management and Policy	
Marine Environmental Sciences	
Materials Science and Engineering	
Mathematics	
Mathematics 7-12 (pending)	
Mechanical Engineering	

HBP	Molecular and Cellular Pharmacology	HBH
CHE	Molecular Biology and Biochemistry	BMO
TCH	Molecular Microbiology	HBM
OCN	Music	MUS
CLG	Neurobiology and Behavior	BNB
CSE	Oral Biology and Pathology	HBO
	Philosophy	PHI
DLF	Physics	PHY
DLG	Physics 7-12	TPH
DLI	Physiology and Biophysics	HBY
DLR	Political Science	POL
DLS	Psychology	PSY
DLT	Slavic Languages and Literatures	SLV
DRM	Social Studies 7-12	
GEO	Sociology	SOC
TES	Studio Art	ARS
BEE	Technological Systems Management	EST
ECO	TESOL	ESL
ESE	Theatre Arts	THR
EGL	Women's Studies, Certificate	
FRN		
BGE		
GER		
SPN		
HIS		
ITL		
PAM		
MAR		
ESM		
MAT		
ESC		

### Academic Calendar

A detailed academic calendar is prepared each year by the Office of Records, and is made available to students along with the class schedules and various other publications.

# Degree Requirements



It is possible to learn without being educated. Learning merely implies the amassing of knowledge. An educated person is much more than a receptacle for facts. He or she is able to present those facts to others with grace and clarity, and to manipulate and juxtapose them with a broader base of knowledge in order to gain new insights. Finally, an educated person never ceases to test his or her knowledge against the highest standards of scholarship and to develop new ways of thinking about the facts that he or she encounters or uncovers in the course of a lifetime.

Education at the graduate level clearly implies the amassing of knowledge beyond that gained in an undergraduate degree, but the nature of the knowledge and the ways in which it is gained and used are significantly different too. We naturally expect that graduate students will gain detailed knowledge about a more specialized field than at the undergraduate level. The process of acquiring that knowledge is also much more independent and more reliant upon the initiative of the student. In spite of the necessarily specialized nature of the new knowledge, we at the University at Stony Brook expect graduate students to maintain a broad perspective on their studies, such that they are able to take part in scholarly discourses in the broadest possible range of disciplines. Graduate students are therefore responsible for extra-curricular self-education within and beyond their own fields of study; the mere satisfaction of the technical requirements for a degree is not sufficient to make one an educated person.

With education comes responsibility. We demand the highest level of scholarly ethics from all members of our academic community. Graduate students must make themselves aware of the ethical issues of academia in general, and of their own fields in particular. No degree candidate can be considered fully educated if he or she lacks an appreciation of these values and a dedication to upholding them.

*The degree requirements listed in this bulletin are correct as of the press date, and apply to graduate students first matriculating in the academic years 1990-91 and 1991-92. The requirements in this section are the minimal ones mandated by the Graduate School; additional requirements may be set by the individual departments or graduate programs. Any changes in requirements will apply only to students who first matriculate in their particular program after the change is approved and communicated to students at the time of admission. The university reserves the right to alter these regulations without notice.*

## The Degrees of Master of Arts, Master of Fine Arts, Master of Music, and Master of Science

The degrees of Master of Arts, Master of Science, Master of Fine Arts, and Master of Music are advanced degrees implying the acquisition of knowledge and skills beyond those required for a baccalaureate. Some of these degrees may be taken en route to a doctoral degree, while others are considered to be strictly terminal. All master's degrees imply the recognition of their holders as skilled practitioners of their disciplines.

In order to be awarded a master's degree, it is necessary to demonstrate a grasp of advanced knowledge through coursework and the ability to learn independently and communicate effectively with one's peers. As with all graduate degrees, appreciation of the ethical questions and adherence to the highest ethical standards of the discipline are required. The student's skills as a practitioner may be demonstrated by a variety of means, such as a comprehensive examination, a thesis, a colloquium, or a recital.

The granting of the master's degree is based upon the completion of any special departmental requirements in addition to the items listed below:

### A. Courses and Grade Point Average

A student must achieve a 3.0 overall grade point average for a minimum of 30 credits of graduate work to receive a master's degree.

At the request of the new department, the record of a student who has changed his or her registered area of graduate studies may be treated as two separate records for the purposes of meeting degree requirements. The G.P.A. for the new area of graduate studies may be calculated unofficially from the beginning of the semester in which the change became effective.

Similarly, at the discretion of the department, a passing grade earned for a course that was failed and retaken may be substituted unofficially for the F in calculating the G.P.A. This option may be exercised for one F grade only.

### B. Language Proficiency

Although the Graduate School itself does not require proficiency in a foreign language for the master's degree, departments have responsibility for their own foreign language requirements and the evaluation of proficiency. Students must comply with departmental requirements.

### C. Teaching

At least one semester of supervised teaching experience is required, except for those programs in which teaching is not germane to the degree objectives.

### D. Thesis and Comprehensive Examination

The requirement for thesis and comprehensive examination varies from department to department. Some departments require a thesis and others require a comprehensive examination, while some require only a master's paper. For specific requirements, refer to each departmental section of this *Bulletin*. If a thesis is to be filed with the Graduate School, it must be prepared in accordance with the guidelines presented in the Guide to the Preparation of Theses and Dissertations in this *Bulletin*. The University at Stony Brook does not allow multiple authorship of a thesis or dissertation.

### E. Degree Application

Students must submit a signed degree card to the Office of Records in accordance with published deadlines. If degree requirements are not met, students must reapply for any subsequent awarding periods.

### F. Registration

Degree candidates must be registered in the program granting their degree for at least one credit in the semester in which the diploma is awarded. There is one exception. If a student is registered in any given semester but fails to complete the degree requirements by the deadline, he or she may reapply to graduate in the next semester or term without registering again *provided* all requirements are met *before* the first day of classes of the next semester or term.

### G. Departmental Recommendation

When all departmental requirements are completed, the graduate studies director may recommend to the vice provost for graduate studies that the master's degree be granted.

### H. Time Limit

Depending on the student's first-time, matriculated enrollment in the Graduate School, full-time students must complete all degree requirements within three years, part-time students in five years. If enrollment status changes at a later time, this policy is determined by the student's initial entrance status. In rare instances, the vice provost for graduate studies will entertain a petition bearing the endorsement of the graduate studies director of the department for an extension of this time limit. In such instances, the student may be required to repeat certain examinations or present evidence that he or she is still prepared for the thesis or the final examination.

## The Master of Arts in Liberal Studies Degree

This is a terminal, non-research degree offered by the School of Continuing Education (CED). Additional information is available in the CED Office.

## The Ph.D. Degree

The degree of Doctor of Philosophy was historically the first degree to be conferred by universities. It is granted in recognition of a candidate's high level of scholarly competence and demonstrated ability to conduct and report significant research independently and effectively.

"Doctor" is the Latin word for "teacher." "Philosophy" in its broadest definition means "all knowledge." The modern sense of the title "Doctor of Philosophy" is one who comprehends all knowledge within his or her chosen field and has mastered an area of specialization, has added in a significant way to that body of knowledge, and has transmitted the new knowledge, thus teaching the world something new. An appreciation of the ethical questions and adherence to the highest ethical standards of the discipline are required. It is further expected that the future work of the candidate for the Ph.D. will maintain and uphold the same standards of scholarship demanded for the degree, so the title and its meaning continue to apply.

The three requirements for the Ph.D. are assessed in the final defense of a dissertation. The dissertation should demonstrate significant original work, and it should be presented with a clarity of thought and excellence of exposition that make it suitable for publication as a book or a series of papers in learned journals. The breadth and depth of the candidate's knowledge beyond the confines of his or her own research are also critically assessed, both in the defense and at various examinations during the student's studies.

Admission to the Graduate School does not automatically qualify a student as a candidate for the Ph.D. degree. Formal recommendation of advancement to candidacy for the Ph.D. degree must be made to the Graduate School by the department after a review of the student's performance in courses, independent study, and departmental examinations. A candidate for the Ph.D. degree engages in research leading to a dissertation. Listed below are the minimal requirements mandated by the Graduate School. Additional requirements may be set by the individual departments or graduate programs.

### A. Courses and Grade Point Average

The student will follow an approved program of courses determined to meet his or her needs and to satisfy departmental requirements. A student must achieve a

minimum 3.0 overall grade point average in graduate courses taken at Stony Brook in order to receive a doctoral degree.

At the request of the new department, the record of a student who has changed his or her registered area of graduate studies may be treated as two separate records for the purposes of meeting degree requirements. The G.P.A. for the new area of graduate studies may be calculated unofficially from the beginning of the semester in which the change became effective.

Similarly, at the discretion of the department, a passing grade earned for a course that was failed and retaken may be substituted unofficially for the F in calculating the G.P.A. This option may be exercised for one F grade only.

### B. Language Proficiency

Although the Graduate School itself does not require proficiency in a foreign language for the Ph.D. degree, departments have responsibility for their own foreign language requirement and the evaluation of proficiency. Students must comply with departmental requirements. The proficiency examination must normally be passed before permission is given to take the preliminary examination.

### C. Preliminary Examination

The purpose of the preliminary examination is to ascertain the breadth and depth of the student's preparation and to appraise readiness to undertake significant original investigation. At the discretion of the department, the preliminary examination may be oral or written or both, and may consist of a series of examinations. The examining committee is appointed by the vice provost for graduate studies on recommendation of the graduate studies director. It must include at least two faculty members from the program and may include one or more members from outside the program. Results of the preliminary examination will be communicated to the student as soon as possible and to the Graduate School within one week of the completion of the examination. A repetition of the preliminary examination, upon failure, may be scheduled at the discretion of the department. A second repeat must be approved by the vice provost for graduate studies.

### D. Advancement to Candidacy

The student may be advanced to candidacy when all Graduate School and departmental requirements for the degree other than the dissertation have been completed. Students on academic probation cannot be advanced to candidacy. Advancement to candidacy is granted by the

vice provost for graduate studies upon recommendation of the graduate studies director.

### E. Dissertation

A dissertation is required for the Ph.D. degree. It must convey in a clear and convincing manner the results of an original and significant scholarly investigation. Depending upon the character of the student's research, the graduate studies director will appoint an appropriate supervisor or supervisory committee, in consultation with whom the student will conduct an investigation and write a dissertation. *The dissertation must be prepared in accordance with the guidelines presented in the Guide to the Preparation of Theses and Dissertations in this Bulletin.* The University at Stony Brook does not allow multiple authorship of a dissertation.

### F. Dissertation Examining Committee

The dissertation must be approved by a dissertation examining committee of at least three members of the faculty, appointed by the vice provost for graduate studies. This committee includes a dissertation supervisor, defense chairperson, at least two faculty members from the department or program, and at least one person outside the department or university. The outside member should have expertise in the student's research field so as to be able to understand, criticize, and contribute to the dissertation, as well as to judge the quality and significance of the research. The dissertation supervisor cannot serve as chairperson of the examining committee.

### G. Dissertation Defense

At the discretion of the department, approval of the dissertation may or may not involve a formal oral defense. If a formal defense is required, it will be conducted by the dissertation committee and will not be chaired by the supervisor of the dissertation. The formal defense is open to all interested faculty members and graduate students.

In the absence of a formal defense, the student will present the results of the dissertation research at an informal dissertation colloquium convened for that purpose by the department and open to interested faculty and graduate students.

Approval of the dissertation defense will be indicated by the dissertation committee signatures on a committee approval form, which appears on page ii of the dissertation manuscript.

### H. Teaching

At least a semester of practicum in teaching under supervision is required.

### I. Residence Requirement

At least two consecutive semesters of full-time graduate study in the program grant-

ing the degree are required. The purpose of the residence requirement is to ensure that the graduate student participates in the professional life of the department beyond class attendance. Owing to the difference in the means by which this requirement can be satisfactorily met, departmental residence requirements may vary from the Graduate School norm and are described in the individual departmental requirements for the degree; the Graduate School regulation pertains unless otherwise specified.

#### **J. Degree Application**

The student must submit a signed degree card to the Office of Records in accordance with published deadlines. If degree requirements are not met, students must reapply for any subsequent awarding periods.

#### **K. Departmental Recommendation**

When all departmental requirements are completed, the graduate studies director may recommend to the vice provost for graduate studies that the Ph.D. degree be granted.

#### **L. Registration**

Degree candidates must be registered for at least one credit in the semester in which the diploma is awarded. There is one exception. If a student is registered in any given semester but fails to complete the degree requirements by the deadline, he or she may reapply to graduate in the next semester or term without registering again, provided all requirements are met before the first day of classes of the next semester or term.

#### **M. Time Limit**

The candidate must satisfy all requirements for the Ph.D. degree within seven years after completing 24 credit hours of graduate courses in the University of Stony Brook department or program in which he or she is to receive the degree. In rare instances, the vice provost for graduate studies will entertain a petition to extend this time limit, provided it bears the endorsement of the chairperson of the department or graduate program. The vice provost or the department may require evidence that the student is still properly prepared for the completion of work. In particular, the student may be required to pass the preliminary examination again before being permitted to continue work.

### **The Doctor of Arts and the Doctor of Musical Arts**

The degrees of Doctor of Arts and Doctor of Musical Arts are the only nonclinical doctoral degrees offered at Stony Brook other than the Ph.D. The fundamental require-

ments for the D.A. and the D.M.A. are essentially those for the Ph.D. with the exception that the scope of the original work and the scale of the research are somewhat reduced. The requirements for expertise within the subject area and for clear exposition are equal to those for the Ph.D. In the case of the D.A. a dissertation is required, but for the D.M.A. clarity of exposition is demonstrated through the medium of a recital.

### **The Doctor of Arts Degree in Foreign Language Instruction**

Admission to the Graduate School does not automatically qualify a student as a candidate for the D.A. degree. Formal recommendation of advancement to candidacy for the D.A. degree must be made to the Graduate School by the department after a review of the student's performance in courses, independent study, and departmental examinations. A candidate for the D.A. degree engages in a creative research project leading to a dissertation. The requirements listed below are the minimal ones mandated by the Graduate School. Additional requirements may be set by the individual departments or graduate programs.

#### **A. Courses and Grade Point Average**

The student will follow an approved program of courses determined to meet his or her needs and to satisfy departmental requirements. A student must achieve a minimum 3.0 overall grade point average in graduate courses taken at Stony Brook in order to receive a doctoral degree.

At the request of the new department, the record of a student who has changed his or her registered area of graduate studies may be treated as two separate records for the purposes of meeting degree requirements. The G.P.A. for the new area of graduate studies may be calculated unofficially from the beginning of the semester in which the change became effective.

Similarly, at the discretion of the department, a passing grade earned for a course that was failed and retaken may be substituted unofficially for the F in calculating the G.P.A. This option may be exercised for one F grade only.

#### **B. Language Proficiency**

The student must have a master's degree or its equivalent with specialization in one of the following languages: French, German, Italian, Russian, Spanish, or TESOL.

#### **C. Practicum**

Successfully teaching an elementary or intermediate course in the area of graduate studies is required.

#### **D. Internship**

Team teaching a course of literature, advanced language, or culture for one semester is required.

#### **E. Externship**

Full-time teaching for one semester (three courses) at the secondary or college level is required.

#### **F. Comprehensive Examination**

The final evaluation is to include both a written and an oral comprehensive examination and will include topics from all areas covered in the program. The comprehensive examination will be administered only after the candidate has demonstrated verbal fluency in the target language and competence in language instruction and methodology. A doctoral committee will test the verbal fluency of all candidates.

It will be the responsibility of the candidate to prepare, with his or her major and minor advisors, a reading list to cover his or her individual specialties. This list must be submitted and approved one semester prior to taking the comprehensive examination.

#### **G. Advancement to Candidacy**

A student may be advanced to candidacy when Graduate School and departmental requirements other than the dissertation or its equivalent have been completed. Students on academic probation cannot be advanced to candidacy. Advancement to candidacy is granted by the vice provost for graduate studies upon recommendation of the graduate studies director.

#### **H. Dissertation**

All doctoral candidates must complete a creative research project. The subject of the research project will be determined by the candidate's professional interest and training. The dissertation will be undertaken after the student has completed all coursework and has been reviewed by the doctoral committee, which will make the final determination for recommendation for conferral of the degree of Doctor of Arts in foreign language instruction. The dissertation must be prepared in accordance with the guidelines presented in the Guide to the Preparation of Theses and Dissertations in this *Bulletin*. The University at Stony Brook does not allow multiple authorship of a dissertation.

#### **I. Dissertation Examining Committee**

The dissertation must be approved by a dissertation examining committee of at least three members of the faculty, appointed by the vice provost for graduate studies. This committee includes a dissertation supervisor, defense chairperson, at least two faculty members from the department or program, and at least one person outside the department or university. The

outside member should have expertise in the student's research field so as to be able to understand, criticize, and contribute to the dissertation, as well as to judge the quality and significance of the research. The dissertation supervisor cannot serve as chairperson of the examining committee.

Approval of the dissertation will be indicated by the doctoral committee signatures on a committee approval form, which appears on page ii of the dissertation manuscript.

#### **J. Residence Requirement**

At least two consecutive semesters of full-time graduate study in the program granting the degree are required. The purpose of the residence requirement is to ensure that the graduate student participates in the professional life of the department beyond class attendance. Owing to the difference in the means by which this requirement can be satisfactorily met, departmental residence requirements may vary from the Graduate School norm and are described in the individual departmental requirements for the degree; the Graduate School regulation pertains unless otherwise specified.

#### **K. Degree Application**

Students must submit a signed degree card to the Office of Records in accordance with published deadlines. If degree requirements are not met, students must reapply for any subsequent awarding periods.

#### **L. Departmental Recommendation**

When all departmental requirements are completed, the graduate studies director may recommend to the vice provost for graduate studies that the D.A. degree be granted.

#### **M. Registration**

Degree candidates must be registered for at least one credit in the semester in which the diploma is awarded. There is one exception. If a student is registered in any given semester but fails to complete the degree requirements by the deadline, he or she may reapply to graduate in the next semester or term without registering again, provided all requirements are met before the first day of classes of the next semester or term.

#### **N. Time Limit**

The candidate must satisfy all requirements for the D.A. degree within seven years after completing 24 credit hours of graduate courses in the University at Stony Brook department or program in which he or she is to receive the degree. In rare instances, the vice provost for graduate studies will entertain a petition to extend this time limit, provided it bears the endorsement of the chairperson of the department or graduate program. The vice provost or the depart-

ment may require evidence that the student is still properly prepared for the completion of work. In particular, the student may be required to pass the comprehensive examination again before being permitted to continue work.

### **The Doctor of Musical Arts Degree**

Admission to the Graduate School does not automatically qualify a student as a candidate for the D.M.A. degree. Formal recommendation of advancement to candidacy for the D.M.A. degree must be made to the Graduate School by the department after a review of the student's performance in courses, independent study, and departmental examinations. The requirements listed below are the minimal ones mandated by the Graduate School. Additional requirements may be set by the individual departments or graduate programs.

#### **A. Courses and Grade Point Average**

The student will follow a program of courses determined to meet his or her needs and to satisfy the departmental requirements. A student must achieve a minimum 3.0 overall grade point average in graduate courses taken at Stony Brook in order to receive the D.M.A. degree.

At the request of the new department, the record of a student who has changed his or her registered area of graduate studies may be treated as two separate records for the purposes of meeting degree requirements. The G.P.A. for the new area of graduate studies may be calculated unofficially from the beginning of the semester in which the change became effective.

Similarly, at the discretion of the department, a passing grade earned for a course that was failed and retaken may be substituted unofficially for the F in calculating the G.P.A. This option may be exercised for one F grade only.

#### **B. Contract Toward Candidacy**

The student must fulfill the specific requirements of an approved contract toward candidacy.

#### **C. Language Proficiency**

Although the Graduate School itself does not require proficiency in a foreign language, the departments have responsibility for their own foreign language requirements and the evaluation of proficiency. Students must comply with their departmental requirements.

#### **D. Advancement to Candidacy**

The student may be advanced to candidacy when all Graduate School and departmental requirements for the degree

other than the doctoral recital have been completed. Students on academic probation cannot be advanced to candidacy. Advancement to candidacy is granted by the vice provost for graduate studies upon recommendation of the graduate studies director.

#### **E. Doctoral Recital**

The student must demonstrate a distinguished level of performance in the doctoral recital. A cassette recording of the recital is to be kept permanently in the university library. In addition, an official copy of the program and the doctoral examination prospectus must be submitted to the Graduate School.

#### **F. Teaching**

A practicum in teaching under supervision is required.

#### **G. Residence Requirement**

At least two consecutive semesters of full-time graduate study beyond the baccalaureate are required as a student registered in the program granting the degree. The purpose of the residence requirement is to ensure that the graduate student participates in the professional life of the department beyond class attendance. Owing to the difference in the means by which this requirement can be satisfactorily met, departmental residence requirements may vary from the Graduate School norm and are described in the individual departmental requirements for the degree; the Graduate School regulation pertains unless otherwise specified.

#### **H. Degree Application**

The student must submit a signed degree card to the Office of Records in accordance with published deadlines. If degree requirements are not met, students must reapply for any subsequent awarding periods.

#### **I. Departmental Recommendation**

When all departmental requirements are completed, the chairperson or graduate studies director may recommend to the vice provost for graduate studies that the D.M.A. degree be granted.

#### **J. Registration**

Degree candidates must be registered for at least one credit in the semester in which the diploma is awarded. There is one exception. If a student is registered in any given semester but fails to complete the degree requirements by the deadline, he or she may reapply to graduate in the next semester or term without registering again provided all requirements are met before the first day of classes of the next semester or term.

### ***K. Time Limit***

The candidate must satisfy all requirements for the D.M.A. degree within seven years after completing 24 credit hours of graduate courses in the University at Stony Brook department or program in which he or she is to receive the degree. In rare instances, the vice provost for graduate studies will entertain a petition to extend this time limit provided it bears the endorsement of the chairperson of the department or graduate program. The vice provost or the department may require evidence that the student is still properly prepared for the completion of work.

### **Award of Degree**

When all requirements have been completed, the department chairperson will so certify to the vice provost for graduate studies and recommend that the degree be awarded. Degrees are awarded three times a year: May, August, and December. Formal investiture, however, takes place only at the spring commencement. To be eligible for a degree a student must have completed all university requirements, satisfied any provisional admission requirements, submitted the appropriate manuscripts, obtained all university clearances, and have maintained matriculation according to the regulations outlined under the section titled Maintaining Matriculated Status, elsewhere in this *Bulletin*.

### **Waiver of Regulations**

Specified requirements may be waived by the vice provost for graduate studies in individual instances. A petition for such a waiver must be endorsed by the chairperson of the department and the graduate studies director, who shall append their reasons for believing that the requested waiver would not result in a breach of the spirit of the regulations.

# College of Arts and Sciences

The College of Arts and Sciences consists of four divisions: Biological Sciences, Humanities and Fine Arts, Physical Sciences and Mathematics, and Social and Behavioral Sciences.

The Division of Biological Sciences, which consists of the departments of Biochemistry, Ecology and Evolution, and Neurobiology and Behavior, offers the Ph.D. degree in Cellular and Developmental Biology, Ecology and Evolution, Genetics, Molecular Biology and Biochemistry, and Neurobiology and Behavior, and a program leading to an M.A. degree in Biological Sciences. The dean of the Division of Biological Sciences is Eugene Katz, Life Sciences 130, (516) 632-8520.

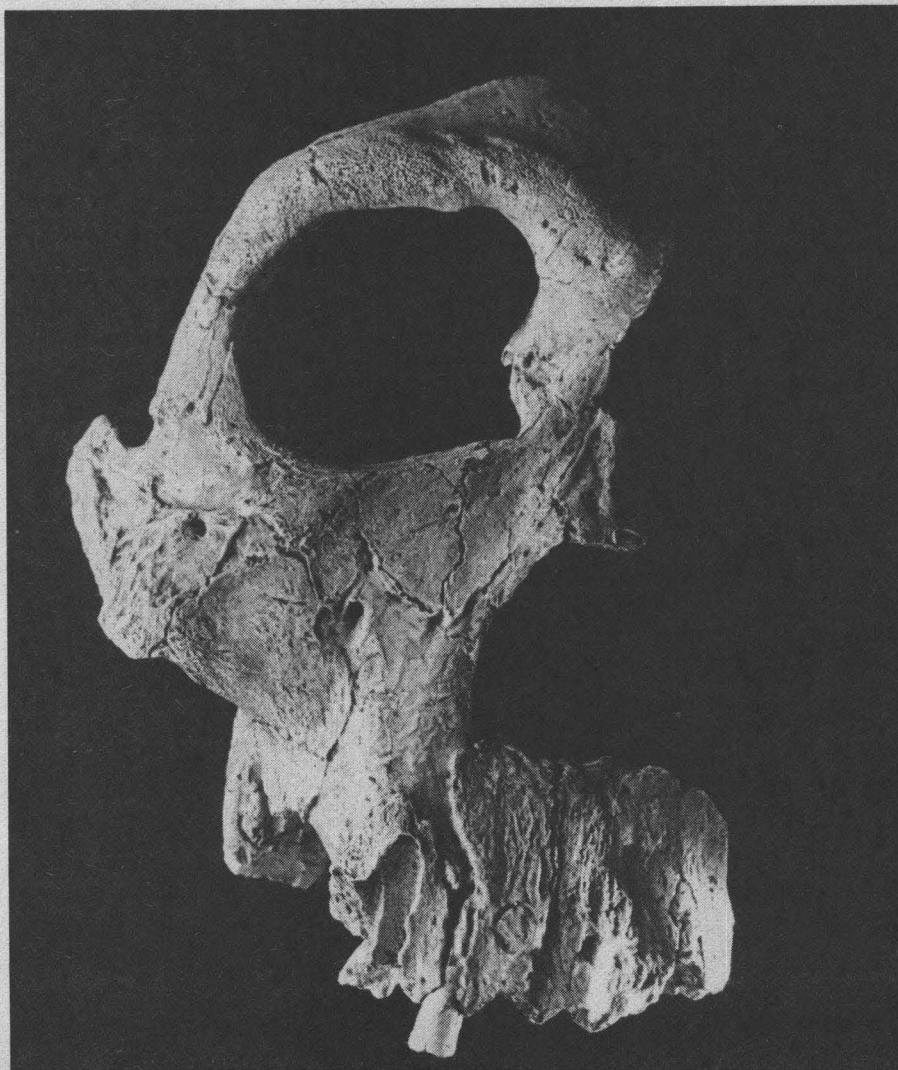
The Division of Humanities and Fine Arts comprises the departments of Art, English, Comparative Studies, French and Italian, Germanic and Slavic Languages and Literatures, Hispanic Languages and Literature, Music, Philosophy, and Theatre Arts. English, Hispanic Languages and Literature, Music, and Philosophy offer the Ph.D., as does Comparative Literature within the Department of English. Courses are also offered in the classics, humanities, Judaic studies, Korean studies, and religious studies. The Doctor of Arts is offered through the language departments, and all language departments offer the M.A. The departments of Art and Theatre Arts have programs leading to the M.A. and M.F.A., and Music offers, in addition to the Ph.D. and M.A., the Doctor of Musical Arts and the Master of Music. The Philosophy Department offers the Ph.D., the M.A., and the Master of Arts in Philosophical Perspectives. The acting dean is Patrick Heelan, Melville Library E2345, (516) 632-6992.

The Departments of Chemistry, Earth and Space Sciences, Physics, and Mathematics constitute the Division of Physical Sciences and Mathematics. With a faculty of about 140, postdoctoral research asso-

ciates numbering about 60, numerous visiting scientists, and external research fund expenditures of more than \$13 million per year, the division conducts a wide range of vigorous research programs. Dean Ronald Douglas is in Melville Library 2340, (516) 632-6993.

The Division of Social and Behavioral Sciences includes the departments of Anthropology, Economics, History, Linguistics, Political Science, Psychology, and Sociology, and also offers courses in Africana Studies and Social Sciences Interdisciplinary (with programs in Women's Studies and Secondary Education). Six of the departments offer Ph.D. programs, and Linguistics, which offers a D.A. program, is scheduled to soon offer the Ph.D. In the near future Women's Studies will offer a graduate certificate; proposals for graduate certificates in Africana Studies and Child and Family Studies are now being prepared. Dean Andrew Policano, Melville Library E2345, (516) 632-6992.

The above is only a broad outline of the courses of study available in the College of Arts and Sciences. For detailed descriptions of the programs consult the individual department listings.





# Anthropology

## (ANT)

**Chairperson: William Arens**  
**Ward Melville Social and Behavioral Sciences Building S-511**  
**(516) 632-7620**

### Degree Requirements

#### Requirements for the M.A. in Anthropology and M.A. in Anthropology with Concentration in Applied Anthropology

In addition to the requirements of the Graduate School, the following are required:

A. Completion of a minimum of 30 graduate credits, maintaining a 3.0 average.

B. A course of study planned and carried out with the approval of the student's M.A. guidance committee. This may require examinations, library research, laboratory study, and/or fieldwork as the basis of the M.A. thesis, which must be accepted by a committee appointed by the department. No final defense is required.

C. Minimum residence of one year.

### Courses

#### ANT 500 Social and Cultural Anthropology

Study of the forms of social organizations: family, kinship, economic, political, and religious, as found among simple and complex societies. A basic graduate-level course designed for students whose previous background is in other fields. Crosslisted with CES 502.

*Variable and repetitive credit*

#### ANT 501 Development of Anthropological Theory

Survey of the development of anthropological theory from the 19th century to the present.

*4 credits*

#### ANT 503 Evolution of the State

The theories of a number of seminal thinkers in social history, political theory, economics, sociology, and anthropology are tested against the empirical results of contemporary anthropological research, both archaeological and ethnographic. Emphasis is Asia and Africa, but New World materials are also introduced for purposes of comparison.

*3 credits*

#### ANT 505 Anthropological Methods

A course for advanced graduate students that examines the scientific foundations of anthropology, explanation, methods of research, analysis of data, and preparation of research proposals. Fieldwork techniques include observation, recording, interviewing, texts, life histories, genealogies, and census.

*Prerequisite: One year of graduate study*  
*3 credits*

#### ANT 509 Seminar in European Ethnography

Investigation and discussion of selected topics and problems concerning European societies and cultures. The perspectives of culture history and current fieldwork are employed.

*3 credits, repetitive*

#### ANT 512 Comparative Civilizations

A comparative study of the processes of socio-cultural evolution from the beginnings of sedentary life to the achievement of early civilization in the Near East, Egypt, the Indus Valley, China, Mesoamerica, and the Andean area. The seminar will focus upon theories of the formation of complex societies and will cover such topics as urbanization, demography, irrigation, craft specialization, militarism, and trade and exchange.

*Prerequisite: Graduate standing or permission of instructor*  
*3 credits*

#### ANT 513 Origins of Agriculture

This course will trace the history of anthropological thought on the origins of agriculture and will assess the evidence from the Old and New worlds for this economic revolution. The course will not only explore areas where early agriculture is evidenced, but will also contrast these areas with those where agriculture was a later development. Emphasis will be on the environmental, technological, biological, social, and cultural processes associated with the "Neolithic Revolution."

*3 credits*

#### ANT 514 The Stone Age of Africa

This course provides a detailed examination of the evidence for the evolution of human behavior and biology on the African continent. The focus is on the way both early and modern hominids adapted to different habitats, and looks carefully at modern African environments and ecology as well as modern hunter-gatherer peoples.

*3 credits*

#### ANT 515 Theory and Method in Archaeology

Theoretical and methodological approaches employed in archaeology. The goals of the course are to provide an historical perspective on the growth of theory and method in archaeology and to examine in detail some of the pertinent research topics being studied today.

*4 credits*

#### ANT 519 Archaeozoology

An introduction to the study of animal bones from archaeological sites. Special emphasis is on identification of fragmented bone, identification of bone surface modification, calculation of indexes of abundance, and measurement and metrical analysis of mammal bone. Computer analysis is stressed, and the class seeks to synthesize traditional archaeozoology and actualistic studies.

*3 credits*

#### ANT 520 Principles of Social and Cultural Anthropology

Concepts and principles of social and cultural anthropology; historical background, structure, function, social processes, transactions, culture, communication, continuity, change, and other topics and problems of contemporary interest. Some ethnographic monographs are discussed in terms of their relevance to the general concepts and principles treated in the seminar.

*4 credits*

#### ANT 527 Field Methods and Techniques in Archaeology

The course will be held during the summer only. It will consist of field and laboratory work on an aspect of Long Island's archaeological heritage. Students' time will be divided between surveying and excavation in the field and artifact analysis in the laboratory. Such techniques as map and air photo reading, survey instruments, stratigraphy, conservation, typology construction, etc. will be taught. Students will be exposed to the full range of excavation, survey, and laboratory methods and techniques.

*Prerequisite: Graduate standing or permission of instructor*  
*3-9 credits*

#### ANT 540 Readings in Ethnography and Ethnology

A survey of the more important and better documented cultures and societies of selected world ethnographic areas.

*3 credits, repetitive*

#### ANT 561 Peasant Societies and Cultures

The concept of peasantry is examined from political, religious, and social class viewpoints as well as from the more traditional economic view. These agricultural peoples, who are essentially preliterate and preindustrial, are described and analyzed especially in relation to the national societies of which they form a part.

*3 credits*

#### ANT 602 Research Seminar in Anthropological Theory

*Variable and repetitive credit*

#### ANT 610 Individual Research

Research supervised by faculty. Students must have permission of instructor and enroll in appropriate section.

*Variable and repetitive credit*

#### ANT 611 Research Seminar in Old World Archaeology

This course will present an in-depth analysis of some of the major problems that face archaeologists in the Old World. Emphasis will be on the various theoretical models currently in use to explain these events by archaeologists. Topics might include the food-producing revolution in

the Near East and Southeast Asia; the elaboration of the Neolithic way of life that led to the development of civilization; the nature of civilization in the Near East, the Indus Valley, etc.; or a discussion of the non-civilized Bronze Age cultures of Europe, Africa, and Asia. The specific topics may vary from year to year.

*3 credits, repetitive*

**ANT 614 Research Seminar in New World Archaeology**

The seminar will emphasize problems in research methods, culture history, technology, economy, ecology, and interpretation in the indigenous, pre-European New World. The comparative analysis of institutions within a developmental context will be among the goals of the seminar.

*Prerequisites:* Graduate status; permission of instructor  
*3 credits*

**ANT 620 Research Seminar in Topical Problems**

*Variable and repetitive credit*

**ANT 630 Research Seminar in Physical Anthropology**

*Variable and repetitive credit*

**ANT 640 Research Seminar in Ethnography and Ethnology**

*Variable and repetitive credit*

**ANT 650 Research Seminar in Cultural History**

*Variable and repetitive credit*

**ANT 680 Special Seminar**

Selected topics in cultural and social anthropology. Topics covered will reflect current interests of faculty and graduate students.

*1-3 credits*

**ANT 699 Research Seminar in Fieldwork Problems**

*Variable and repetitive credit*

# Anthropological Sciences (DPA)

**Director: Randall L. Susman**

**Health Sciences Center, Level 8, Room 040 (516) 444-3125**

**Codirector: David W. Krause**

**Health Sciences Center, Level 8, Room 020 (516) 444-3117**

## Degree Requirements Requirements for the Ph.D. Degree in Anthropological Sciences

For a full description of DPAS requirements, please request "DPAS Rules, Regulations, Requirements, and Procedures" from the program secretary.

A. Completion of a minimum of 48 graduate credits, maintaining a minimum of 3.0 average.

B. The qualifying examination taken after one year of study and passed at an appropriate level.

C. A course of study planned and carried out under the direction of a guidance committee. This may require courses in methods and other subjects, library research, essays, fieldwork, and laboratory study.

D. Meeting current foreign language, statistics, and computer skills requirements.

E. Teaching requirement for all students.

F. Preparation of dissertation research proposal.

G. Passing the preliminary examination and advancement to candidacy. (The M.A. may be awarded at this point.)

H. Fieldwork or other dissertation research.

I. Written dissertation and defense.

J. Time limit: The candidate must satisfy all requirements for the Ph.D. degree within seven years after completing 24 credit hours of graduate courses at the University at Stony Brook department or program in which the candidate is to receive his or her degree.

## First-Year Program

Every year the following introductory courses are offered:

### Fall

DPA 515: Theory/Method Archaeology

DPA 530: Physical Anthropology

### Spring

DPA 520: Principles of Social/Cultural Anthropology

When a student has completed this first-year program a qualifying examination is given by a faculty committee. After successfully completing the exam, a student begins an individual course of study under the direction of a guidance committee. This includes completion of elective courses, participation in seminars and independent study courses, specialization in one or more subdisciplines, and preparation for dissertation research. The second-year program includes studies in methods and techniques appropriate to the student's field of interest. In consultation with the faculty, the student plans a course of study that may include computer competence, statistics, research methods, languages, and other fields as appropriate. Under guidance committee direction, students prepare essays in two or more subjects relevant to their proposed research and prepare a dissertation research proposal. An oral dissertation proposal defense, open to the public, is required for advancement to candidacy. Upon successful defense of the dissertation proposal, the student may be awarded an M.A. degree, advance to candidacy, and commence dissertation research. The writing and defense of the dissertation are supervised by a faculty committee that includes one member outside of the DPAS faculty.

## Courses

### DPA 501 Development of Anthropological Theory

Survey of the development of anthropological theory from the 19th century to the present.

4 credits

### DPA 503 Evolution of the State

The theories of a number of seminal thinkers in social history, political theory, economics, sociology, and anthropology are tested against the empirical results of contemporary anthropological research, both archaeological and ethnographic. Emphasis is Asia and Africa, but New World materials are also introduced for purposes of comparison.

3 credits

### DPA 505 Anthropological Method

A course for advanced graduate students that examines the scientific foundations of anthropology, explanation, methods of research, analysis of data, and the preparation of research proposals. Fieldwork techniques include observation, recording, interviewing, texts, life histories, genealogies, census.

*Prerequisite:* One year of graduate study  
3 credits

### DPA 509 Seminar in European Ethnography

Investigation and discussion of selected topics and problems concerning European societies and cultures. The perspectives of culture history and current fieldwork are employed.

3 credits, repetitive

### DPA 512 Comparative Civilizations

A comparative study of the processes of socio-cultural evolution from the beginnings of sedentary life to the achievement of early civilization in the Near East, Egypt, the Indus Valley, China, Mesoamerica, and the Andean area. The seminar will focus upon theories of the formation of complex societies and will cover such topics as urbanization, demography, irrigation, craft specialization, militarism, and trade and exchange.

*Prerequisite:* Graduate standing or permission of instructor

3 credits

### DPA 513 Origins of Agriculture

This course will trace the history of anthropological thought on the origins of agriculture and will assess the evidence from the Old and New worlds for this economic revolution. The course will not only explore areas where early agriculture is evidenced, but will also contrast these areas with those where agriculture was a later development. Emphasis will be on the environmental, technological, biological, social, and cultural processes associated with the "Neolithic Revolution."

3 credits

### DPA 514 The Stone Age of Africa

This course provides a detailed examination of the evidence for the evolution of human behavior and biology on the African continent. The focus is on the way both early and modern hominids adapted to different habitats, and looks carefully at modern African environments and ecology as well as modern hunter-gatherer peoples.

3 credits

### DPA 515 Theory and Method in Archaeology

Theoretical and methodological approaches employed in archaeology. The goals of the course are to provide an historical perspective on the growth of theory and method in archaeology and to examine in detail some of the pertinent research topics being studied today.

4 credits

**DPA 519 Archaeozoology**

An introduction to the study of animal bones from archaeological sites. Special emphasis is on identification of fragmented bone, identification of bone surface modification, calculation of indexes of abundance, and measurement and metrical analysis of mammal bone. Computer analysis is stressed, and the class seeks to synthesize traditional archaeozoology and actualistic studies.

3 credits

**DPA 520 Principles of Social and Cultural Anthropology**

Concepts and principles of social and cultural anthropology; historical background, structure and function, social processes, transactions, culture, communication, continuity, and other change; topics and problems of contemporary interest. Some ethnographic monographs are discussed in terms of their relevance to the general concepts and principles treated in the seminar.

4 credits

**DPA 527 Field Methods and Techniques in Archaeology**

The course will be held during the summer only. It will consist of field and laboratory work on an aspect of Long Island's archaeological heritage. Students' time will be divided between surveying and excavation in the field and artifact analysis in the laboratory. Such techniques as map and air photo reading, survey, instruments, stratigraphy, conservation, typology construction, etc. will be taught. Students will be exposed to the full range of excavation, survey, and laboratory methods and techniques.

*Prerequisite:* Graduate standing or permission of instructor

3-9 credits

**DPA 530 Physical Anthropology**

A course in the fundamentals of physical anthropology that will be an introduction to the subject and a basis for advanced and specialized work.

4 credits

**DPA 531 Gross Anatomy of the Human Body**

A course comprising (1) laboratories in which detailed dissection of the human body is undertaken and (2) lectures covering topics in gross anatomy including embryology, functional and topographic anatomy, clinical correlations, and introduction to radiology. Crosslisted with HBA 531.

*Prerequisite:* Permission of instructor

Fall modules, 4-7 credits

**DPA 540 Readings in Ethnography and Ethnology**

A survey of the more important and better documented cultures and societies of selected world ethnographic areas and the implications of data from these for current approaches and problems in ethnology.

3 credits, repetitive

**DPA 560 Advanced Regional Anatomy**

A course in advanced human gross anatomy for graduate students or advanced undergraduates in biology, anthropology, and other life sciences. Crosslisted with HBA 560.

*Prerequisite:* Permission of instructor

Fall and spring, 3-8 credits

**DPA 561 Peasant Societies and Cultures**

The concept of peasantry is examined from political, religious, and social class viewpoints as well as from the more traditional economic view. These agricultural peoples, who are essentially preliterate and preindustrial, are described and analyzed especially in relation to the national societies of which they form a part.

3 credits

**DPA 563 Aspects of Animal Mechanics**

An introduction to biomechanics. Covers freebody mechanics and kinetics as applied to vertebrate locomotion. Considers the structure and physiology of muscle as it relates to adaptations of the musculoskeletal system. Crosslisted with HBA 563.

*Prerequisites:* Introductory physics and biology or permission of instructor

Fall, even years, 2 credits

**DPA 564 Primate Evolution**

The taxonomic relationships and evolutionary history of primates as documented by their fossil record and structural and chemical evidence. Emphasis on primates prior to the origin of the human lineage. Crosslisted with HBA 564.

4 credits

**DPA 565 Human Evolution**

A survey of the fossil record of hominid evolution through the Pliocene and Pleistocene with emphasis on the morphological structure and function of locomotor, masticatory, and neural systems. Includes utilization of comparative anatomical material and extensive cast and slide collections.

4 credits

**DPA 566 Studies in Functional Morphology**

Introduction to the theory and methods of functional morphology. Various methods of analysis and the application of experimental techniques such as electromyography or bone strain analysis are discussed as they pertain to the understanding of the interaction between form and function. Special emphasis is placed on the analysis of human and nonhuman primate morphology, and the application of this analysis to interpretation of the fossil evidence for human and nonhuman primate evolution. Crosslisted with HBA 566.

*Prerequisite:* Permission of instructor.

Fall, alternate years, 2 credits

**DPA 580 Comparative Anatomy and Evolution of Mammals**

The comparative anatomy, evolutionary history, and radiation of fossil and living mammals. A course requiring a major research project on any aspect of mammalian comparative anatomy. Supplemented by lectures and seminars on the evolutionary history and radiation of mammals. Comparative osteological and fossil cast collections will be utilized. Crosslisted with HBA 580. Lecture/seminar series can be taken separately as HBA 581.

*Prerequisites:* Previous course in human or vertebrate anatomy and permission of instructor

Fall, alternate years, 4 credits

**DPA 581 Evolution of Mammals**

A course on the evolutionary history and radiation of mammals from the Mesozoic to the present from paleontological and anatomical perspectives. Particular emphasis will be placed on the origin of mammals and the origin, evolution, and anatomical diversity of modern and extinct orders of mammals. Crosslisted with HBA 581.

*Prerequisites:* Previous course in human or vertebrate anatomy and permission of instructor

Fall, alternate years, 2 credits

**DPA 582 Comparative Anatomy of Primates**

The comparative anatomy of living primates. Laboratory dissection with emphasis on relating structural diversity to behavior and biomechanics. Crosslisted with HBA 582.

*Prerequisites:* HBA 364 and previous course in human or vertebrate anatomy and permission of instructor

Fall, 4 credits

**DPA 600 Practicum in Teaching**

Variable and repetitive credit

**DPA 610 Individual Research**

Research supervised by faculty. Students must have permission of instructor and enroll in appropriate section.

Variable and repetitive credit

**DPA 611 Research Seminar in Old World Archaeology**

This course will present an in-depth analysis of some of the major problems that face archaeologists in the Old World. Emphasis will be on the various theoretical models currently in use to explain these events by archaeologists. Topics might include the food-producing revolution in the Near East and Southeast Asia; the elaboration of the Neolithic way of life that led to the development of civilization; the nature of civilization in the Near East, the Indus Valley, etc.; or a discussion of the non-civilized Bronze Age cultures of Europe, Africa, and Asia. The specific topics may vary from year to year.

3 credits, repetitive

**DPA 614 Research Seminar in New World Archaeology**

The seminar will stress problems in research methods, culture history, technology, economy, ecology, and interpretation in the indigenous, pre-European New World. Depending upon the professor, either Mesoamerica or the Andean area will be used as the organizing example. The comparative analysis of institutions within a developmental context will be among the goals of the seminar. The seminar format will require full student participation, including the formal presentation of a research paper.

*Prerequisites:* Graduate status; permission of instructor

3 credits

**DPA 620 Research Seminar in Topical Problems**

Variable and repetitive credit

**DPA 630 Research Seminar in Physical Anthropology**

Variable and repetitive credit

**DPA 640 Research Seminar in Ethnography and Ethnology**

Variable and repetitive credit

**DPA 650 Research Seminar in Cultural History**

Variable and repetitive credit

**ANT 680 Special Seminar**

Selected topics in cultural and social anthropology. Topics covered will reflect current interests of faculty and graduate students.

1-3 credits

**ANT 699 Research Seminar in Fieldwork Problems**

Variable and repetitive credit

# Art

## (ARH, ARS)

**Chairperson: James H. Rubin**  
Staller Center 2221 (516) 632-7260

**Graduate Studies Director: Anita Moskowitz**  
Staller Center 4213 (516) 632-7270

### **Degree Requirements Requirements for the M.A. Degree in Art History and Criticism**

#### **A. Course Requirements**

The student will be required to complete successfully 36 credits of graduate work, as outlined in the list of courses below:

1. ARH 502 History of 19th-Century Art Criticism and Theory (3 credits)
2. ARH 503 History of 20th-Century Art Criticism and Theory (3 credits)
3. ARH 546 Topics in 20th-Century Art (3 credits)
4. ARH 540 Methodologies of Art History (3 credits), normally to be taken in the first semester of matriculation
5. Two or three of the following, one of which must be a criticism course (6-9 credits):
  - ARH 501 History of Renaissance and Baroque Art Criticism and Theory (3 credits)
  - ARH 591 Practicum in the Writing of Art Criticism (3 credits)
  - ARH 541 Topics in Ancient Art (3 credits)
  - ARH 542 Topics in Medieval Art (3 credits)
  - ARH 543 Topics in Renaissance Art (3 credits)
  - ARH 544 Topics in Baroque Art (3 credits)
  - ARH 545 Topics in 19th-Century Art (3 credits)
  - ARH 547 Topics in Primitive Art (3 credits)
6. Two or three electives in the humanities and/or social sciences (6-9 credits), to be chosen in consultation with a faculty advisor and with the approval of the graduate studies director. One of these should be in philosophy; others might be on relevant aspects of literary studies or criticism, history, musicology, sociology, anthropology, etc.
7. ARH 598 Thesis (up to 6 credits).

Note: A student who takes only two courses from group 5 must take three from group 6, and vice versa. Total credits from groups 5 and 6 must be 15.

#### **B. Comprehensive Examination**

This test of basic competency will include questions examining the student's knowledge of particular periods in the history of art and individual artists and works of art, as well as essay questions designed to test the student's knowledge of the theoretical and critical issues at stake in a particular art. The student must take this examination during the third semester of study in order to continue in the program. An extension will be allowed to part-time students.

#### **C. Foreign Language**

A reading knowledge of French or German must be acquired before graduation. Students planning to advance to doctoral work will be encouraged to master both of these languages.

#### **D. Teaching Requirement**

All graduate students will be expected to assist in teaching a minimum of one semester. The course in which the student will assist shall ordinarily be an introductory-level undergraduate course. Competency in teaching will be judged through teacher evaluation questionnaires and classroom visits by the course's faculty supervisor.

#### **E. Thesis**

At the beginning of the third semester, the student, together with his or her directing committee, which shall consist of the student's advisor and one or two other faculty members, will jointly agree on a thesis topic. The student must at that time submit a prospectus outlining the nature and aims of the thesis. The thesis shall be a significant original work in the form of one or more essays relevant to the examination of art history, criticism, and theory.

### **Requirements for the M.F.A. in Studio Art**

#### **A. Areas of Concentration**

The candidate for the M.F.A. degree will choose from one of the three areas of concentration in studio art offered by the Department of Art: Painting and Drawing

(which are *not* separated), Sculpture, and Printmaking. Courses are also available in photography, 2- and 3-dimensional design, ceramics, and ceramic sculpture, but these are not areas of concentration.

#### **B. Demonstrations of Studio Proficiency**

All M.F.A. candidates should demonstrate proficiency in the disciplines of their chosen area of concentration. In addition, M.F.A. candidates in sculpture should demonstrate proficiency in drawing, modeling, carving, and welding. Proficiency is determined by a board of review through an interview and an evaluation of the candidate's progress prior to admission to the final year of studies toward the M.F.A. This review will take place no later than the end of the spring semester before the final year of full-time residency. At this time, the department will notify the candidate in writing as to whether he or she has been accepted for completion of the program, has been found inadequate to the professional standards of the program and has been dropped, or is deficient in some area that must be made up before continuing or completing his or her studies.

#### **C. Final-Year Residency and One-Person Exhibition**

The final year of study must be taken in full-time residency. During this period, in addition to regular coursework, the student will prepare a final one-person exhibition of work. As part of this requirement, the student will submit to the department for its files a 35mm color slide record of the exhibition and a written commentary. This written commentary should be an articulation of the candidate's thoughts and objectives regarding the work, and might also include discussion of arts and ideas generally, as they relate to the work and thought of the candidate. (Together, these are commonly known as the M.F.A. thesis.)

#### **D. Recommended Foreign Language**

The department recommends, but does not require, proficiency in a foreign language, preferably French, German, or Italian.

### E. Teaching Requirement

All graduate students are required to assist in teaching a minimum of one semester. All students will receive three credits under ARS 531 for a preliminary semester of observing in the course that they will teach under faculty supervision in a subsequent semester. Students not receiving a teaching assistant stipend will teach under the teaching practicum ARS 531 for three credits. Teaching assistants will teach classes as part of their obligation under the stipend.

### F. Course Requirements

The student will be required to complete successfully 60 credits of graduate work, as outlined in the list of courses below. No graduate studio course may be taken for more than three credits per semester.

1. One semester of Graduate Drawing Studio (ARS 550) to be taken during the first year. This course may be counted toward either item 2 or 4 below, but not both.
2. Six graduate studio courses in the major area of concentration (3 credits per course, total 18 credits).
3. Four semesters of ARS 580 Visual Arts Seminar (3 credits per semester, total 12 credits).
4. Three graduate studio courses outside the major area of concentration (3 credits per course, total 9 credits).
5. Four courses in graduate liberal arts, e.g., art history, languages, literature, philosophy, computer graphics, etc. (3 credits each course, total 12 credits).
6. Graduate Teaching Experience (see Item E., above).
7. ARS 532 Thesis Project (up to 6 credits).

## Art History and Criticism Courses

### ARH 501 History of Renaissance and Baroque Art Criticism and Theory

An examination of theoretical treatises and other writings on art during the Renaissance and Baroque periods. The influence of theory on practice—and vice versa—will be explored through close examination of selected monuments. Changing concepts of the artist's place in society will also be studied as reflected in contemporary critical and expository writing. *Fall, 3 credits*

### ARH 502 History of 19th-Century Art Criticism and Theory

A study of European art criticism and theory of the 19th century stressing relationships between art and the history of ideas. Readings will concentrate on primary sources, including reviews of art exhibitions (Diderot, Stendhal, Zola), artists' letters (Constable, Delacroix, the Impressionists), and treatises relating to art (Winckelmann, Proudhon, Ruskin). Special emphasis will be given to Baudelaire. Comparisons will be made between ways of seeing art as well as between critical and theoretical attitudes to artists' intentions. *Fall, 3 credits*

### ARH 503 History of 20th-Century Art Criticism and Theory

The literature of art has expanded enormously in the 20th century—far beyond attempts to organize it developmentally or conceptually. An attempt will be made to define types of criticism both in relation to the critics and their relation to the support system for the arts of which they are part.

*Spring, 3 credits*

### ARH 540 Methodologies of Art History

This course will focus primarily on three approaches to the history of art: (1) style and connoisseurship; (2) structuralism, semiology, and related symbolic theories; and (3) social history. Under (1), various methods of stylistic analysis—such as cyclical schema and period and regional schema—will be examined both in relation to general theory and to particular kinds of art. Connoisseurship will be considered as another aspect of the methodology of style. Under (2), there will be a discussion of a variety of methods for investigating the nature of signs and symbols in art. In addition to structural-semiotic approaches, iconography and psychoanalytic methods will be included in this section. Under (3), there will be discussion of methods that treat the work of art and the artist as part of a larger social and political context. Consideration will be given to both Marxist critiques of establishment history and practice, and to other non-Marxist approaches. *Annually, 3 credits*

### ARH 541 Topics in Ancient Art

This course will deal with a variety of topics relating to ancient art and its influence on later European art and artistic theory. Areas to be explored will include ancient art history, aesthetics, and comparative criticism; Roman uses of Greek art; pagan imagery in early Christian and medieval art; antique art and the Renaissance (use of prototypes); collecting antiquities (from the Medici to Getty); archaeological exploration and publication in the 18th and 19th centuries; French neoclassicism; and the calligraphy of Greek vases (Hamilton, Blake, Flaxman, Ingres, Picasso). *Alternate years, 3 credits*

### ARH 542 Topics in Medieval Art

A topic in medieval art or architecture, such as early medieval manuscript illumination, ornament and design, or the Gothic cathedral, is selected and explored during the semester in lectures, discussions, and student reports or papers. *Alternate years, 3 credits*

### ARH 543 Topics in Renaissance Art

This course, usually a seminar, will deal with one or several of the following aspects of Renaissance art: iconographic problems, style and connoisseurship (including the study of individual works at the Metropolitan Museum or the Frick), patronage and its effect on the form and content of a work, the exchange of artistic ideas between northern and southern Europe, and Renaissance sources in antiquity and the Middle Ages. *Alternate years, 3 credits*

### ARH 544 Topics in Baroque Art

Specific areas within 17th-century art will be studied through lectures and seminar reports. Possible topics are manners and mores in 17th-century Dutch painting—the evolution of genre painting from its roots in the religious and moralizing images of the 16th century to scenes of Dutch social life, often didactic or satirical, in the 17th century; the iconography of 17th-century religious art—a study of the direct impact of the Council of Trent on religious art in the 17th century, and of transformations in Christian iconography after the Counter-Reformation. *Alternate years, 3 credits*

### ARH 545 Topics in 19th-Century Art

Selected topics in 19th-century art with an emphasis on interdisciplinary approaches to interpretation. Possible topics include politics and art during the French Revolution; English landscape painting and the theory of the picturesque; and French realism and mid-19th-century social thought.

*Alternate years, 3 credits*

### ARH 546 Topics in 20th-Century Art

Twentieth-century art considered as an international movement, European and American, although national groups may be studied. Emphasis will vary with topics ranging over stylistic analysis, iconographical interpretations, and theoretical studies. Students are expected to undertake original research and interpretation. *Alternate years, 3 credits*

### ARH 547 Topics in Primitive Art

Study of the various theoretical approaches to the interpretation of primitive art. Topics will include structural analysis of art, socioeconomic structure and art, and symbolism and art. *Alternate years, 3 credits*

### ARH 550 Inquiries into Art Criticism and Theory

This course will deal with the theoretical approaches to the study of art that cross historical boundaries. Topics will vary from semester to semester. They may be an expansion of one of the areas generally covered in ARH 540, such as psychology of art or the iconography of architecture. Other investigations may focus on subjects requiring a special methodological approach, such as the theory and history of ornament and design or the role of public art. *Alternate years, 3 credits*

### ARH 591 Practicum in the Writing of Art Criticism

This course is designed as a practicum in the writing of art criticism under the supervision of the faculty.

*Fall and spring, 3 credits*

### ARH 592 Practicum in Teaching

Instruction in the department under the supervision of the faculty. (This course may not be included more than once in the courses taken in fulfillment of the 36 credit hour requirement.) *Fall and spring, 3 credits*

### ARH 595 Directed Readings in Art History, Criticism, and Theory

An independent reading course to be arranged with a particular faculty member. Normally this course is reserved for advanced students who have fulfilled most of their course requirements and for whom the proposed program of study cannot be organized within other existing course structures.

*Fall and spring, 1-3 credits, variable and repetitive*

### ARH 598 Thesis

*Prerequisite:* Completion of all degree requirements

*Fall and spring, 1-12 credits, variable and repetitive*

## Studio Art Courses

### ARS 520 Special Projects for M.F.A. Candidates

Advanced projects in areas that may not be included in the M.F.A. curriculum, utilizing the unique talents of regular and visiting faculty, the facilities of the Art Department or other aspects of the university environment, and possibly facilities at other locations or institutions.

*Prerequisites:* Faculty sponsor, permission of graduate studies director

*Fall, spring, and summer, 1-3 credits*

**ARS 530 Professional Experience Internship**

Internship in the professional art world of New York City and its environs, required of all M.F.A. candidates, in lieu of or in addition to the teaching practicum. Depending on the professional objectives of the M.F.A. candidate, the student may choose to intern at a foundry, printmaking atelier, art gallery or museum, known artist's studio, or related facility or institution.

*Prerequisite:* Accepted candidate for M.F.A.  
*Fall, spring, and summer, 1-3 credits*

**ARS 531 Graduate Teaching Practicum**

Supervised teaching practicum in undergraduate studio or studio/theory course.

*Prerequisite:* Accepted candidate for M.F.A.  
*Fall and spring, 1-3 credits*

**ARS 532 Thesis Project**

Preparation of thesis under departmental advisor.

*Prerequisites:* Accepted candidate for M.F.A., review board passed  
*Fall, spring, and summer, 1-3 credits (may be repeated once)*

**ARS 540 Graduate Photo Studio**

Photographic studio, theory, and laboratory emphasizing individual development as a photographer. Color and black-and-white studios and darkrooms. Fine arts, reportage, illustration, commercial, industrial.

*Prerequisites:* Demonstration of appropriate level of proficiency, permission of instructor  
*Fall and spring, 3 credits*

**ARS 541 Photographing Works of Art**

Graduate-level course for art history and criticism students, studio art students, and others examining in detail the techniques of photographing works of art and architecture and of photo reproduction; black-and-white and color work for portfolio, publication, teaching, cataloging slide and photograph collections, etc. No laboratory work.

*Prerequisite:* Graduate standing in Art History and Criticism or Studio Art or permission of department

*Once every three semesters, 1½ credits*

**ARS 550 Graduate Drawing Studio**

Graduate theory and practice of drawing; investigations of historical and contemporary concepts of drawing, with concentration on individual development as an artist. Models, space for conceptual and environmental works, and other wide-ranging facilities available.

*Prerequisite:* Accepted candidate for M.F.A. or permission of department  
*Fall or spring, 3 credits*

**ARS 551 Graduate Painting Studio**

Studio and theory in painting and related visual forms, with instruction and facilities available in all media and techniques; emphasis on individual development as an artist. Models and space for environmental and conceptual works available.

*Prerequisites:* Permission of instructor; accepted candidate for M.F.A. or permission of department  
*Fall and spring, 3 credits*

**ARS 560 Graduate Sculpture Studio**

Theory and practice of sculpture for the graduate student, with instruction and facilities available in all media and techniques; emphasis on individual development as an artist. Studio facilities include air, electric, and hydraulic power equipment; TIG, MIG, Arc, and flame welding; forging; woodworking; modeling, molding, and casting facilities for clay, wax, plaster, and plastics; and metal casting capabilities in investment, shell, sand, and centrifugal.

*Prerequisites:* Permission of instructor; accepted candidate for M.F.A. or permission of department  
*Fall and spring, 3 credits*

**ARS 561 Graduate Ceramics and/or Ceramic Sculpture Studio**

Theory and practice of ceramics and ceramic sculpture for the graduate student. Advanced studio instruction in handbuilding: coil, slab, pinch; wheelthrowing; casting, inclusive of multi-piece plaster pour-molds; various firing techniques; reduction; oxidation; high-and-low fire overglaze techniques.

*Prerequisites:* Permission of instructor; accepted candidate for M.F.A. or permission of department

*Fall and spring, 3 credits*

**ARS 570 Graduate Printmaking Studio**

Graduate studio in the theory and practice of printmaking. Color, black-and-white, and photographic processes in plate and stone lithography, serigraphy, relief, and intaglio, emphasizing the student's individual development as an artist.

*Prerequisites:* Permission of instructor; accepted candidate for M.F.A. or permission of department

*Fall and spring, 3 credits*

**ARS 580 Visual Arts Seminar**

Required seminar and critique throughout the M.F.A. curriculum. Guest speakers, artists, and critics; demonstrations and lectures; seminars; individual and group critiques. The M.F.A. candidate will, as part of this seminar, regularly participate in critiques in which his or her work is analyzed by guest faculty and art history/criticism faculty and graduate students, as well as by his or her peers. The Visual Arts Seminar will, where applicable, include field trips and assignments of special lectures, panels, seminars, and other events of the professional art world.

*Fall and spring, 3 credits*

**ARS 591 Graduate Design Studio**

Graduate theory and practice of two- and three-dimensional design; projections; perspective; maquettes; various techniques, including air-brush and experimental; and conceptual development of ideas, leading to completion of a design idea or design research project.

*Prerequisite:* Permission of instructor

*Fall and spring, 3 credits*

# Biological Sciences (BIO)

Life Sciences Building 130 (516) 632-8530

## Degree Requirements Requirements for the M.A. Degree in Biological Sciences

In addition to the requirements of the Graduate School, the following are required:

### A. Course Requirements

The M.A. in Biological Sciences requires completion of an approved course of study, a project, and a minimum of 30 graduate credits (a maximum of six approved transfer credits may be applied to this requirement). The overall grade point average in graduate courses must be at least 3.0.

The program of study must include at least one course in Area I—Research and Educational Techniques, and at least one course in three of the other five areas: II—Molecular Biology, III—Cellular and Developmental Biology and Genetics, IV—Neurobiology and Behavior, V—Animal and Plant Biology, and VI—Ecology and Evolution. Additional courses may be taken from the offerings of the other graduate programs, with permission of the instructor. At least six (but no more than 15) credits must be taken as individual study under the headings of directed readings, laboratory research, and master's project (the last for at least three credits). Faculty sponsors must be obtained for this part of the program.

**Note:** The M.A. in Biological Sciences is currently being revised. Please contact the Department of Biological Sciences, Life Sciences Building 130, 632-8530 for further information regarding the revised program.

### B. Master's Project

The master's project may be a thesis presenting the results of a laboratory and/or field study. Alternatively, it may be a paper providing either a critical assessment of a topic, based largely on the primary literature, or a curriculum in biology for secondary schools or community colleges, developed by the student. In all cases, the results must be accepted by a project committee appointed by the program.

### C. Residence Requirement

Graduate Studies in Biological Sciences has no full-time residence requirement, but all part-time students must work continuously by taking at least one course each semester. Deviations from such a minimum schedule require the consent of the graduate studies director.

## Courses

### BIO 500 Natural History of Intertidal Organisms

Adaptations, reproductive strategies, classification, evolution, and ecology of selected intertidal organisms. Emphasis on local invertebrate fauna. Visits to course exhibits required.

*Prerequisite:* 1 year of general biology, zoology, or zoology-botany  
*Summer, 3 credits*

### BIO 561 Human Genetics

This course assumes a knowledge of the fundamentals of general genetics. It focuses upon the study of genes in human kindreds and populations, giving attention to human cytogenetics and to the importance of genetic factors in human development, disease, society, and evolution.

*Fall, 3 credits*

### BIO 593-598 Special Seminars

Topics to be arranged.

*Fall, spring, and summer, 1-3 credits, repetitive*

### BIO 599 Research

Under the supervision of a member of the graduate staff the student does an independent laboratory, field, or theoretical research project.

*Fall, spring, and summer, credit to be arranged*

### BIO 600 Practicum in Teaching

Participation in the presentation of a biology course, under supervision of the course director.

*Fall, spring, no credit, repetitive*

### BIO 601 Practicum in Teaching

Participation in the presentation of a biology course, under supervision of the course director.

*Fall, spring, 1-3 credits, repetitive*

*Note: Additional courses are available from the offerings of other graduate programs.*



# Cellular and Developmental Biology (BCD)

*Graduate Studies Director: Harvard Lyman  
Department of Anatomical Sciences  
Life Sciences Building 310 (516) 632-8534*

## Degree Requirements Requirements for the M.A. Degree

Graduate Studies in Cellular and Developmental Biology normally does not accept a student whose goal is a master's degree. In exceptional instances, a student already enrolled may be awarded an M.A. degree upon completing an approved course of study, including a minimum of 30 graduate credit hours, passing a comprehensive examination, presenting and defending a research thesis, and fulfilling the minimum requirements of the Graduate School.

## Requirements for the Ph.D. Degree

### A. Course Requirements

1. Cell Biology at the graduate level (BCD 656).
2. Developmental Biology at the graduate level (BCD 657).
3. Molecular Genetics (HBM 503).
4. Biochemistry (BMO 520).
5. Student seminar for at least four semesters (BCD 531, 532). One acceptable seminar is to be given each semester until advancement to candidacy, and attendance at all research seminars (BCD 621, 622) is required.
6. Two semesters of research (BCD 530) in staff laboratories. The students generally must work in four different laboratories during the two semesters. The particular laboratories involved will be decided in consultation with the student and with approval of the executive committee.
7. At least three approved elective graduate courses.

8. Students who have not had an undergraduate course in physical chemistry or physical biochemistry may take HBH 545 and HBH 560, which will fulfill the requirement as well as count toward the three required graduate elective courses. (See requirement 7 above.)

Students must achieve a B or better in all required courses and must maintain a B average in undergraduate and graduate elective courses.

### B. Comprehensive Examination

At the beginning of the fourth semester, the student will take a written comprehensive examination covering the areas of cell and developmental biology.

### C. Teaching Requirement

It is expected that each graduate student completing a doctoral degree will have functioned as a teaching assistant during at least two semesters of his or her graduate career (BIO 600/601).

### D. Residence Requirement

The university requires at least two consecutive semesters of full-time graduate study. The demands of the program necessitate a longer period of residence.

## Courses

### BCD 500 Directed Readings in Genetics and Developmental Biology

Directed readings in topics of current interest, under supervision of a faculty sponsor, culminating in one or more critical review papers.  
*Prerequisite:* Sponsor and approval of master's programs executive committee.  
*Yearly, 1-3 credits, repetitive*

### BCD 527 Photoperiodic Control of Plant and Animal Development

Examination of seasonally correlated developmental processes that are modulated and controlled by light, the physiological and biochemical

pathways whereby the control is mediated, and the nature of the biological timing mechanism involved. Topics will include flowering and phytochrome system, insect development, annual reproductive cycles in birds and mammals, the Bunning hypothesis, and circannual rhythms.  
*Fall, alternate years, 3 credits*

### BCD 529 Organelle Development

This course is concerned primarily with the development of the mitochondrion and the chloroplast. Subjects will include the biogenesis of these organelles and their relation to the interaction with the nucleus. Emphasis will be on genetical and biochemical analysis.  
*Fall, 3 credits*

### BCD 530 Projects in Developmental Biology

Individual laboratory projects, closely supervised by staff members, to be carried out in staff research laboratories on a rotation basis.  
*Fall and spring, 2 credits*

### BCD 531, 532 Graduate Seminar in Developmental Biology

Seminars are given by graduate students on current literature in the field of developmental biology.  
*Fall and spring, 1 credit*

### BCD 535 Physiology and Development of Higher Plants

Survey of selected topics in plant physiology with emphasis on developmental aspects. Areas from which specific problems will be selected include photomorphogenesis, hormonal control of plant growth and plant tissue culture.  
*Fall, alternate years, 2 credits*

### BCD 536 Biological Clocks

An in-depth consideration of the temporal dimension of biological organization and of the cellular and molecular timekeeping mechanisms characteristic of living systems. Topics include a survey of circadian rhythms and their properties in eukaryotic systems, cell cycle clocks, the quest for anatomical loci, dissection of clocks by chemicals and molecular genetic techniques, entrainment and coupling pathways, biochemical and molecular models of circadian oscillators, pacemaker dysfunction, cellular aspects of chronopharmacology and chronotherapy, and cellular clocks in development and aging. Crosslisted with HBA 536.  
*Spring, 3 credits*

**BCD 537 Physiology and Biochemistry of the Cell Cycle**

An integrated view of the cell development cycle in prokaryotes and eukaryotes. Topics considered will include cell cycle anatomy, cell population dynamics, general patterns of nucleic acid synthesis, regulation of enzyme activity during the cell cycle, temporal control of gene expression, development and function of cellular organelles during the cell cycle, and the control of cell division. Crosslisted with HBA 537.

*Fall, 3 credits*

**BCD 599 Research**

Original investigation under the supervision of a member of the staff.

*Fall and spring, credit to be arranged.*

**BCD 621, 622 Developmental Biology Seminar**

A weekly series of seminars by members of the staff, postdoctoral students, advanced graduate students, and visiting scientists on current research in developmental biology.

*Fall and spring, 1 credit*

**BCD 656 Comparative Cell and Tissue Biology**

Introduction to the structural and functional organization of cells and tissues and to the way structure relates to function. Particular emphasis placed on cell organelle structure and function in specialized cells in tissues. The organization and interaction of cells in tissues will also be covered. The course will be comparative and will include examples of tissues from vertebrates, invertebrates, and plant prokaryotic systems. Crosslisted with HBA 656.

*Spring, 3 credits*

**BCD 657 Principles of Development**

This course will deal with developing systems at all levels from the morphological to the molecular. Illustrative material from both animal and plant kingdoms will be used. Special attention will be given to gametogenesis, genetic control of early development, transcriptional and translational control of protein synthesis, the role of cell division and cell movements, and cell-to-cell interactions in defining developing systems. Crosslisted with HBA 657.

*Prerequisite: BCD 656*

*Fall, 3 credits*

**BCD 682-684 Advanced Seminars**

Topics to be arranged.

*Fall and spring, variable and repetitive credit*

**BCD 699 Dissertation Research**

Original investigations undertaken as part of the Ph.D. program under supervision of research committee.

*Fall and spring, credit to be arranged*

# Chemistry

## (CHE)

**Chairperson: D.M. Hanson**  
**Chemistry Building 104 (516) 632-7884**

**Graduate Studies Director: Scott L. Anderson**  
**Chemistry Building 104 (516) 632-7915**

### Degree Requirements

#### Requirements for the M.S. Degree in Chemistry

A. Successful completion of an approved course of study comprising at least 30 credits of graduate coursework.

B. Successful completion of the CHE 532 seminar and six courses made up from any of the following groups: CHE 501 through 530, 557 through 589, 601 through 604, 623 through 683, and courses offered through other departments or through the School of Continuing Education (CED).

C. Successful completion of the CHE 590 term paper or research, thesis, and thesis defense.

#### Requirements for the M.A. Degree in Teaching Chemistry

The curriculum for a Master of Arts in Teaching Chemistry consists of 36 credits distributed among graduate-level course offerings in chemistry, other sciences and mathematics, teaching methods in both science and general education, and practice teaching in secondary schools. Individual programs are tailored to the background and interests of the student in consultation with an advisor.

#### Requirements for the Ph.D. Degree in Chemistry

##### A. Courses

Successful completion of an approved course of study comprising at least six formal graduate courses, of which four are selected from CHE 501 through 530, in addition to CHE 531, 532 and two semesters of Teaching Practicum (CHE 610, 611) or the equivalent is required. Continuation in the Ph.D. program is based, in part, on achievement in four 500-level chemistry courses to be taken during the student's first year. In consultation with faculty advisors each student selects a course of study to acquire a good background for research in the area of chemistry chosen.

##### B. Advancement-to-Candidacy (Preliminary) Examination

A student is advanced to candidacy for the Ph.D. degree when all degree requirements except the dissertation have been completed. A special committee is designated for each student to aid in progress toward this step. The committee is charged with advising the student and administering the advancement-to-candidacy (preliminary) examination. This examination, normally completed within one year following qualification to the Ph.D. degree, consists of a written proposition and oral defense, a discussion of the student's research, and discussion or evaluation of the recent literature.

##### C. Presentation of a Department Seminar

##### D. Research, Dissertation, Dissertation Defense, and Departmental Colloquium

Each student selects a faculty research advisor at some time after the middle of the first semester and usually before the middle of the second semester. The research advisor also serves on the advancement-to-candidacy committee.

Specific inquiries from prospective graduate students regarding research opportunities are welcomed and should be addressed to the chairperson. The Graduate Programs in Chemistry brochure states in some detail the varied research interests of the chemistry faculty and is available from the department.

##### E. Residence

A one-year residence is required.

#### Requirements for the Ph.D. Degree, Concentration in Chemical Physics

A field of concentration in chemical physics is provided for students whose interests lie in both chemistry and physics. A graduate student who is admitted to either the chemistry or physics department may elect this course of study with the consent of the department chairperson. A chemistry student elects this course of study to obtain

more extensive training in physics than is normally required by chemistry departments. A physics student elects this concentration to obtain more extensive exposure to chemical systems than is normally obtained in physics departments. A student in the chemical physics concentration may select a research advisor from either department subject to the approval of the chairpersons.

For a chemistry student the requirements are the same as for the Ph.D. in chemistry described above, with the following exceptions:

##### A. Courses

CHE 531, 532, two semesters of CHE 610, 611, and six formal graduate courses are required, including the following:

1. CHE 523 Chemical Thermodynamics
2. Either CHE 521 Quantum Chemistry I or PHY 511 Quantum Mechanics I
3. One course from among CHE 501, 502, 504, 511, 514, 515 (Organic/Inorganic Chemistry)
4. Three courses from among CHE 522, 524, 525, 526, 527, 528, 529, and 530 and PHY 501, 503, 505, 540, 551, 555, and 565. Other graduate courses can be substituted only with prior permission of the graduate advisement committee.

A prerequisite for the Chemical Physics Program is undergraduate training in classical mechanics and electromagnetic theory at or above the level of PHY 301 Electromagnetic Theory and PHY 303 Mechanics. Students in the Chemical Physics Program must take these courses unless they receive waivers from the graduate advisement committee.

##### B. Advancement-to-Candidacy (Preliminary) Examination

In some cases a hybrid of the chemistry and physics requirements may be used.

## Requirements for the Ph.D. Degree, Concentration in Chemical Biology

The field of concentration in chemical biology is a course option for students whose interests lie in both chemistry and biology. A graduate student who is admitted to the Chemistry Department or another appropriate department may elect this field of concentration with the consent of the chairperson. The course of study can provide more extensive training in biology than is normally required for a chemistry graduate degree and more extensive exposure to fundamental chemical studies for students in other departments. In addition, a student may select a research advisor in any appropriate department, subject to the approval of the chairpersons involved.

Each student will have an advisory committee consisting of members from more than one department. When research is initiated, the research advisor will join this advisory committee. The committee advises the graduate student to prepare for a research career in some area of chemical biology.

Qualification for candidacy in this course of study requires, in addition to the general requirements in chemistry, a satisfactory background in undergraduate biology as judged by the student's advisory committee or as demonstrated by satisfactory performance in coursework. The requirements are the same as for the Ph.D. program in chemistry described above with the exception that in addition to CHE 532 and two semesters of Teaching Practicum, a minimum of seven formal graduate courses is required as specified by the student's advisory committee.

## Courses

### CHE 501 Spectroscopy in Organic Chemistry

Modern spectroscopic techniques ( $^1\text{H}$  and  $^{13}\text{C}$ -NMR, IR, MS, UV, and CD-ORD) applied to organic compounds. Structural effects on spectroscopic properties are surveyed with dual emphasis on fundamental aspects and problem solving. The student learns how to use spectroscopic methods both to solve complex structural problems and to investigate bonding features in organic molecules.  
*Spring, 3 credits*

### CHE 502 Mechanistic Organic Chemistry

Important reaction mechanisms and the methods by which they are studied. Substituent and medium effects on reactions proceeding through concerted mechanisms and unstable intermediates are discussed.  
*Spring, 3 credits*

### CHE 503 Synthetic Organic Chemistry

A survey of the most important organic reactions from the viewpoint of synthetic utility, including many recent innovations in this field. Throughout the discussion of these methods, emphasis will be placed upon their use in the synthesis of complex organic structures.  
*Spring, 3 credits*

### CHE 504 Structure and Reactivity in Organic Chemistry

Electronic and stereochemical theories relating to organic structure and reactions. Topics such as bonding, strain, aromaticity, MO theory, molecular rearrangements, pericyclic reactions, and photochemistry will be covered. This course is intended to provide a foundation of knowledge at the beginning graduate level as preparation for advanced subjects in CHE 502 and CHE 503, and is complementary to CHE 501.  
*Fall, 3 credits*

### CHE 507 Biomolecular Structure and Reactivity

The reactivity and physiological function of biological macromolecules and their monomeric constituents will be described at the chemical level. The emphasis of this course will reflect the most recent advances at the interface of organic chemistry and biochemistry. Specific topics will include catalysis, biomimicry, protein and DNA modification, binding and target recognition, and correlation between three-dimensional structure and reactivity.  
*Spring, 3 credits*

### CHE 511 Structural Inorganic Chemistry

Properties and reactions of inorganic compounds are considered from the viewpoint of molecular and electronic structure. The modern bonding theories used in inorganic chemistry including molecular orbital, valence bond, and ligand field theories are developed using symmetry and group theory. Selected main group, transition metal, and organometallic compounds are discussed. An introduction to crystallography and solid-state structure is included.  
*Fall, 3 credits*

### CHE 514 Transition Metal Chemistry

A survey course with an emphasis on the transition metals. Reaction mechanisms, synthesis, and structure will be covered. Specific areas of concern will include coordination chemistry, organometallic chemistry, bioinorganic chemistry, and selected topics from solid-state and non-transition metal chemistry.  
*Spring, 3 credits*

### CHE 515 Advanced Inorganic Chemistry

A topical course with an emphasis on the current literature. Subject matter will vary and will be announced in advance. Possible subjects include reaction mechanisms, organometallic chemistry, bioinorganic chemistry, and physical inorganic chemistry. May be repeated as the subject matter varies.  
*Spring, 3 credits*

### CHE 521 Quantum Chemistry I

Quantum theoretical concepts are discussed. Schrodinger wave mechanics and related mathematical techniques are illustrated by treatment of systems of chemical interest. Designed to form the theoretical basis for the study of chemical bonding, molecular structure, spectroscopy, and molecular collision phenomena.  
*Fall, 3 credits*

### CHE 522 Quantum Chemistry II

Problems in time-dependent quantum mechanics with the derivation of both approximate and exact solutions. The elements of group theory with applications to atomic, molecular, and solid-state systems.  
*Spring, 3 credits*

### CHE 523 Chemical Thermodynamics

A rigorous development of the fundamentals of thermodynamics and its application to a number of systems of interest to chemists, such as electrochemical cells, gases, and homogeneous and heterogeneous equilibrium. An introduction to statistical mechanics will also be included.  
*Fall, 3 credits*

### CHE 524 Magnetic Resonance

This course provides an introduction to the fundamental quantum mechanics of the magnetism of spin- $1/2$  (and higher) particles. It includes a study of the Bloch equations (the responses of the magnetism to continuous-wave and pulsed irradiation) and a discussion of the experimental hardware and techniques commonly employed. Topics covered include the basics of the spin Hamiltonian (chemical shifts, J, dipolar, and quadrupolar couplings), dynamics and relaxation 1-D spectroscopy (spin and chemical exchange, lineshapes, spin echos, etc.), 2-D spectroscopy (homonuclear and heteronuclear correlation), techniques for studies of solids and liquid crystals (magic angle spinning, cross polarization, quadrupolar echo), and the principles of magnetic resonance imaging. Applications to the biological and material sciences, as well as chemical problems, will be discussed.  
*3 credits*

### CHE 525 Theoretical Chemistry

This course stresses the physical theory underlying chemical phenomena. Special emphasis is given to advanced topics in electronic structure theory, molecular dynamics, condensed matter and surfaces, many-body and quantum ensemble theory, and the interaction of light and molecules.  
*Prerequisite: CHE 521*  
*3 credits*

### CHE 526 Chemical Kinetics

An intensive study of rates of chemical reactions and, in particular, the relationship of kinetic studies to the determination of reaction mechanisms. Experimental methods will be discussed with emphasis on the determination of rate laws. The theoretical treatment will include discussions of the kinetic theory and the transition-state theory approaches to chemical kinetics.  
*3 credits*

### CHE 527 Chemical Dynamics

Experimental and theoretical aspects of reaction dynamics. Emphasis on the link between experimental observations and reaction mechanisms. Topics will include kinematics; potential scattering; differential and integral cross sections; elastic, inelastic, and reactive collision; angular momentum, and angular distributions.  
*3 credits*

### CHE 528 Statistical Mechanics

Statistical theory of equilibrium systems and rate processes. Ensemble theory, spatial and time correlation functions. Model systems and methods of estimating their properties. Designed to enable the student to use the current literature dealing with application of statistical mechanics to problems in chemistry.  
*3 credits*

### CHE 529 Nuclear Chemistry

Topics include the properties of radioactive substances and their use in the study of chemical problems; nuclear structure; nuclear reactions; radioactive decay and growth; interactions of radiation with matter; detection and measurement of radiation; application of radioactivity to chemical problems such as kinetics, structure, and analysis; artificially produced elements.  
*3 credits*

### CHE 530 Physical Chemistry of Macromolecules

An investigation of the gross and fine structures of macromolecules and molecular aggregates in solution as revealed by hydrodynamic behavior (e.g., ultracentrifugation, viscosity), light scattering, spectroscopic properties (e.g., ultraviolet hypochromism, circular dichromism, Raman, fluorescence, magnetic resonance spectra), and the thermodynamics and kinetics of interaction with small molecules and ions. Theory of conformation changes and phases transitions.  
*3 credits*

**CHE 531 Departmental Research Seminar**

Meetings in which first-year graduate students learn about the research activities of the departmental faculty.  
*Fall, no credit*

**CHE 532 Literature Seminar**

Students select and discuss topics from the current literature.  
*Spring, no credit*

**CHE 542 Physical Methods in Chemistry**

Subject matter and prerequisites will vary and will be announced in advance. Possible subjects include nuclear magnetic resonance (NMR), molecular spectroscopy, and X-ray crystallography. May be repeated as the subject matter varies.

*Fall or spring, 3 credits*

**CHE 551 Glass Blowing**

Basic scientific glass blowing: basic sealing techniques, Vac Line lay out, set up, and repairs. T-seals, ring seals, use of cutting machine, hard torch, and bench torch. Safety with glass. Open to graduate students in the sciences.

*Fall, 1-2 credits*

**CHE 589 Directed Study**

Subject matter varies according to needs of student.

*Variable and repetitive credit*

**CHE 590 M.S. Term Paper**

Independent study leading to a term paper on a selected topic in chemistry, chemical applications, or chemical pedagogy.

*Summer, fall, or spring, 3 credits*

**CHE 591 Chemistry in Society**

Will include current trends in chemical research and the influence of chemistry in areas such as the environment and technology. Topics of local interest and the conflicting demands placed on technology will be integrated into the course.

*3 credits*

**CHE 592 Instrumental Methods**

An introduction to the principles underlying the operation of modern instruments in chemical research and technology. The lecture material will be supported by experiments performed using instruments available in the Department of Chemistry.

*3 credits*

**CHE 593 Chemical Demonstrations**

The design and implementation of demonstrations to illustrate modern concepts of chemistry.  
*3 credits*

**CHE 601 Special Topics in Synthetic Organic Chemistry**

The subject matter varies depending on interests of students and faculty. Possible topics include asymmetric synthesis and natural product syntheses. A sound background in organic synthetic methods (e.g., CHE 503) is a prerequisite.

*Variable and repetitive credit*

**CHE 602 Special Topics in Physical Organic Chemistry**

The subject matter varies depending on interests of students and staff. It may cover such areas as photochemistry, theoretical organic chemistry, and the chemistry of unstable intermediates; the emphasis is on fundamental considerations and recent developments.

*Variable and repetitive credit*

**CHE 603 Special Topics in Bioorganic Chemistry**

The subject matter varies depending on interests of students and faculty. Possible topics include asymmetric synthesis and natural product synthesis.

*3 credits, repetitive*

**CHE 610, 611 Practicum in Teaching**

Practice instruction in chemistry at the undergraduate level, carried out under faculty orientation and supervision. A minimum of two semesters of CHE 610 or 611 is required of all candidates for graduate research degrees in chemistry, unless explicitly waived by the chairperson.

*610: variable and repetitive credit*

*611: no credit, repetitive*

**CHE 619 Critical Readings of Current Topics in Chemistry**

Recent research papers from the literature will be analyzed in depth. These papers may originate from the inorganic, organic, physical, and/or biochemical literature. The exact topic of the course will be announced in advance.

*Variable and repetitive credit*

**CHE 623 Molecular Spectroscopy**

A detailed description of the theory and practice of molecular spectroscopy. Topics include the interaction of molecules with electromagnetic radiation and the time evolution of molecular energy states.

*Prerequisite: CHE 521*

*3 credits*

**CHE 625 Molecular Structure and Crystallography**

Experimental methods in the determination of molecular structure. The emphasis will be on the determination of structure in the solid state, particularly by X-ray crystallography. Students will complete a single-crystal molecular structure determination using modern diffractometer techniques.

*3 credits*

**CHE 641 Organometallic Chemistry**

A systematic presentation of the chemistry of organometallic compounds, particularly those of the transition metals. Topics will include structure, bonding, reaction mechanisms, synthesis, and applications in catalysis and organic synthesis.

*3 credits*

**CHE 682 Special Topics in Inorganic Chemistry**

Subject matter varies, depending on interests of students and staff, but will cover recent developments in inorganic chemistry.

*Variable and repetitive credit*

**CHE 683 Special Topics in Physical Chemistry**

Subject matter varies, depending on interests of students and staff, but will cover recent developments and advanced topics in physical chemistry.

*Variable and repetitive credit*

**CHE 693 Physical Chemistry Seminar**

*1 credit, repetitive*

**CHE 694 Biological Chemistry Seminar**

*1 credit, repetitive*

**CHE 695 Inorganic Chemistry Seminar**

Discussions of current issues in inorganic chemistry.

*1 credit, repetitive*

**CHE 696 Organic Chemistry Seminar**

*1 credit, repetitive*

**CHE 698 Colloquium**

*Variable credit*

**CHE 699 Research**

*Variable and repetitive credit*

# Comparative Literature (CLG)

*Chairperson: Román De la Campa*

*Frank Melville, Jr. Memorial Library E4339 (516) 632-7460*

*Graduate Studies Director: Louise O. Vasvari*

*Frank Melville, Jr. Memorial Library E4309 (516) 632-7460*

## **Degree Requirements Requirements for the M.A. Degree, Graduate Studies in Comparative Literature**

In addition to the minimum requirements of the Graduate School, the following are required:

### **A. Course Requirements**

The minimum course requirement for the M.A. degree is 30 graduate credit hours. An M.A. candidate is expected to take CLT 500 and CLT 501 History of Literary Theory I and II, CLT 502 Theory and Practice of Translation, CLT 510 Comparative Literature Methodology, and CLT 602. The remaining courses may be distributed among graduate courses in comparative literature, English, foreign languages, philosophy, history, art criticism, theatre, music, and other appropriate fields.

### **B. Minor Options: Korean Studies and Religious Studies**

Graduate students in Comparative Literature may declare an official minor as part of their course of study. This minor will indicate a concentration within the larger fields of comparative literature and literary theory, and will be of value to students who wish to find employment in a relatively specialized field and want official recognition of their competence in that field.

To qualify for a minor, students must satisfy a specific set of course and examination requirements; these are supplementary to the general requirements of Graduate Studies in Comparative Literature, none of which is waived or in any way altered when a minor is selected.

At the time of publication, minor programs existed in the fields of religious studies and Korean studies. Students matriculating in the fall 1990 semester or thereafter are encouraged to inquire whether additional options have been created.

### **C. Diagnostic Test**

All incoming graduate students will be asked to take a short test early in their first semester. They will be given two and a half hours to write an essay on a subject related to one of the required courses. The purpose of the test is to evaluate writing skills.

### **D. First-Year Evaluation**

At the end of the student's first semester of graduate work the graduate studies director prepares a file for the student's first-year evaluation. It consists of (1) the student's grades, (2) letters from the professor in all of these student's classes, and, if the student is a teaching assistant, (3) a letter of evaluation from appropriate faculty and (4) student evaluations. Students may submit any other relevant material such as a seminar paper or original essay. The graduate studies committee will evaluate the dossier and decide whether the student should be encouraged to continue in the program.

### **E. Satisfactory Progress Towards the M.A.**

Because so many factors depend on satisfactory progress toward the degree, it is important for students to be aware of and monitor their own progress. The following define the minimum limits for satisfactory progress for full-time students:

1. Maintain an A- average, with no course below B-, in each semester of graduate study, as well as complete all Incomplete grades by the first deadline. Students who fail to fulfill these requirements in any semester will be automatically placed on probation during the following semester and will be subject to possible dismissal.

2. Receive a passing grade on the Diagnostic Test of Writing Skills in the first fall semester of graduate study.

3. Receive an acceptable first-year evaluation in the spring semester of the first year of study.

4. Satisfy at least one language requirement in each year until all language requirements are met. All language requirements must be completed at least three months before the master's examination.

### **F. Foreign Language Requirements**

Entering students are expected to have a good command of one and preferably two foreign languages. Students must ultimately be competent in one major and one minor language (nonnative speakers of English may offer English as one of the two languages). All students must have passed the language requirements before they are allowed to take the M.A. examination. To demonstrate competence in the major language, students must take for credit, and earn a grade of B or better in, at least one graduate or advanced undergraduate literature course conducted in the language (final papers may be written in English). Competence in the minor language can be demonstrated by (1) earning a grade of B or better in a graduate translation or language course such as CLT 520 or a graduate translation course in a foreign language department or (2) passing a CLT examination to be taken with a dictionary. (For details see the department handbook.)

### **G. M.A. Examination**

The student will take a written master's examination, based on the M.A. Reading List available in the department, in the first or second year of graduate study. The exam measures the student's knowledge and mastery of literary theory and its history, familiarity with the major texts of world literature, and ability to write a competent *explication de texte*.

## **Requirements for the Ph.D. Degree, Graduate Studies in Comparative Literature**

In addition to the minimum requirements of the Graduate School, the following are required:

#### A. Course Requirements

1. CLT 500 and CLT 501 Literary Theory I and II
2. CLT 502 Theory and Practice of Translation
3. CLT 510 Comparative Literature Methodology
4. At least seven seminars on the 500 or 600 level, including one interdisciplinary seminar (CLT 602). For students without an accepted M.A. degree in comparative literature or a related discipline, the course requirement is 51 credits.

#### B. Minor Options: Korean Studies and Religious Studies

See requirements for the M.A. degree.

#### C. Diagnostic Test

See requirements for the M.A. degree.

#### D. First-Year Evaluation

See requirements for the M.A. degree.

#### E. Satisfactory Progress Towards the Ph.D.

In addition to requirements A through D, Ph.D. students must fulfill the following requirements:

1. Complete all core courses in the first two years of full-time study and all 51 credits for the Ph.D. in three years.
2. Take the comprehensive examination no later than one year after completion of coursework.
3. Submit a dissertation prospectus three months after the satisfactory completion of the comprehensive examination.
4. Advancement to candidacy should normally occur no later than the fourth year of full-time study.
5. Students must satisfy all requirements for the Ph.D. within seven years after completing 24 credits of graduate work at Stony Brook.

#### F. Foreign Language Requirements

Ph.D. students may choose to demonstrate competence in either two major foreign languages or one major and two minor languages. For ways to demonstrate competence, see Foreign Language Requirements in the requirements for the master's degree and consult the department handbook.

#### G. Comprehensive Examination

Full-time students who are candidates for the Ph.D. will normally take an oral comprehensive examination no more than one year after completing their coursework. All language requirements must be completed at least three months before the comprehensive examination. Each student will have a committee of five faculty members who can examine the candidate in one or more areas of the comprehensive examination, and who will assist the candidate in

preparing a reading list for the examination. The examination consists of four parts: literary theory and its history, a literary genre, a period of literary history, and a special area of comparative nature related to the student's plan for the dissertation. (For more details see the department handbook).

#### H. Dissertation

The dissertation represents the culmination of the student's degree program and should be a serious contribution to scholarship. Candidates choose their dissertation director and the dissertation committee in consultation with the chairperson and the graduate studies director. A Ph.D. dissertation proposal should be presented to the dissertation director within three months after completion of the comprehensive examination. Early involvement of all members of the committee in the ongoing research and writing is strongly recommended. The student's formal defense of the dissertation is open to all members of the university community.

#### I. Teaching Assistantships

All students are asked to acquire some experience in teaching. Guidelines permit a graduate student to be supported as a teaching assistant (T.A.) for a maximum of four years. However, in exceptional cases the Graduate School may grant permission for accomplished T.A.s who work in areas of department need to be considered for support after four years in the department. Graduate students in comparative literature have the opportunity to teach a wide variety of courses: traditionally they have taught foreign language courses, English composition, interdisciplinary courses offered in the undergraduate humanities program, and entry-level comparative literature courses.

#### J. Additional Information

*A Handbook for Graduate Studies in Comparative Literature* includes more extensive information on comparative literature at Stony Brook. A copy is available at the Comparative Literature Office or can be requested by mail.

### Courses

#### CLT 500 History of Literary Theory I: Before 1800

An introduction to basic texts in literary criticism before 1800. Stress is placed on the ethical and mimetic approach of classical theory, its transformation in the Renaissance and neoclassical periods, and its reformulation in subsequent theory. Attention is paid where appropriate to materials drawn from non-Western traditions.  
*Fall, 3 credits*

#### CLT 501 History of Literary Theory:

##### Since 1800

An introduction to important developments in literary theory in the 19th and 20th centuries. Attention is given to the influence of other disciplines such as psychology and linguistics.  
*Spring, 3 credits*

#### CLT 502 Translation Theory

After an overview of the history of translation theory and practice, students gain familiarity with current theories of translation and analyze significant representative translations in a variety of languages in the light of theoretical developments.  
*Fall or spring, 3 credits*

#### CLT 510 Comparative Literature Methodology

An introduction to the discipline of comparative literature and its history, methods, and problems. Stress is given to the interrelations of literature with other disciplines as well as to questions involving subjects such as canon formation, genre, periodization, and reception theory.  
*Fall or spring, 3 credits*

#### CLT 520 Problems in Translation

After studying translation theory and critically evaluating representative translations of literary works in their language and field of specialization, students translate a literary text.  
*Prerequisite: CLT 500*  
*Fall and spring, 3 credits*

#### CLT 530 Religious Studies Methodology

A survey of major approaches to religious studies. The course looks at how *Religionswissenschaft* came into existence in the 19th century, and investigates the various directions in which it has developed, keeping in view parallel developments in fields such as literary theory, philosophy, psychology, and theology.  
*Fall or spring, 3 credits*

#### CLT 597 Directed Readings for M.A. Students

*Fall and spring, variable and repetitive credit*

#### CLT 599 Independent Study

*Fall and spring, variable and repetitive credit*

#### CLT 600 Seminar in Stylistics

Changing topics in the study of stylistic and structural elements of the literary text.  
*Fall and spring, 3 credits each semester, repetitive*

#### CLT 601 Seminar in Literary Theory

Changing topics in the specialized examinations of recent or historical trends such as semiotics, Marxism, reader-response, psychoanalysis, hermeneutics, deconstruction, etc.  
*Fall and spring, 3 credits each semester, repetitive*

#### CLT 602 Interdisciplinary Seminar

Specific problems in the relations between literature and other disciplines.  
*Fall and spring, 3 credits each semester, repetitive*

#### CLT 603 Comparative Studies in Literary History

Changing topics in the study of literary periods and styles.  
*Fall and spring, 3 credits each semester, repetitive*

#### CLT 604 Comparative Studies in Genre

Changing topics in the study of the history and theory of literary genres.  
*Fall and spring, 3 credits each semester, repetitive*

**CLT 607 Major Authors in Comparative Context**

Critical and comparative examination of two or more major figures from different literary traditions. Recent topics have included "Proust, Mann, Conrad" and "Eliot and Rilke."  
*Fall and spring, 3 credits each semester, repetitive*

**CLT 630 Seminar in Comparative Religion**  
Critical and comparative investigation of texts, figures, ideas, or themes from two or more religious traditions.

*Fall and spring, 3 credits each semester, repetitive*

**CLT 631 Textual Studies in Religion**

An in-depth investigation of texts from one or more of the religious traditions, such as the *Divine Comedy*, the *Rig Veda*, one of the *Upanishads*, Confucius' *Analects*, Augustine's *City of God*, the *Diamond Sutra*, Rum's *Mathnawi*, and the *Tao Te Ching*.

*Fall and spring, 3 credits*

**CLT 632 Comparative Studies in Religion**

An investigation of selected themes from one or more of the religious traditions, with emphasis on tracing the significance of these themes within the tradition and the problems of interreligious comparisons.

*Fall and spring, 3 credits*

**CLT 650 Seminar in Korean Literature**

A seminar on special topics in Korean literature, investigating an author, period, genre, or movement.

*3 credits*

**CLT 652 Seminar in Korean Religious and Philosophical Thought**

An examination of the major schools of thought that have influenced the flow of Korean philosophical and religious traditions. The major Buddhist leaders, such as Wonhyo, Uisang, and Chinul, are examined along with the distinctive neo-Confucianism of Toegye and his successors. Korean Christianity, Korean Shamanism, and other Korean religious systems are also discussed.

*3 credits*

**CLT 690 Dissertation Research**

*Fall and spring, variable and repetitive credit*

**CLT 698 Practicum in Teaching**

The course is divided into two parts: one half is normally given in the fall, one in the spring. The first part deals primarily with matters of pedagogy. The second part is designed to help students plan their own undergraduate courses. The practicum is required of all teaching assistants during their first year of teaching comparative literature. May be repeated, but students may receive credit toward degree requirements only once.

*Fall and spring, 3 credits total*

**CLT 699 Directed Readings for Doctoral Candidates**

*Fall and spring, variable and repetitive credit*



# Earth and Space Sciences (AST, GEO)

*Chairperson: Gilbert N. Hanson*  
*Earth and Space Sciences Building 255 (516) 632-8200*

*Graduate Studies Director: Gilbert N. Hanson*  
*(516) 632-8200*

## **Degree Requirements (AST) Requirements for the M.S. Degree—Astronomy**

### **A. Formal Coursework**

For the M.S. degree, it is necessary to successfully complete, with a B average, an approved course of study consisting of 24 graduate credits with no more than six credits of Practicum in Teaching and no more than three credits of Research.

### **B. Qualifying Examination**

Astronomy students must pass a written qualifying exam at the M.S. level.

### **C. Language**

There is no language requirement for the M.S. degree.

### **D. Departmental Recommendation**

When all departmental requirements are completed, the chairperson may recommend to the vice provost for graduate studies that the M.S. degree be granted.

### **E. Residence**

There is no residence requirement.

### **F. Time limit**

All requirements for the M.S. degree must be completed within two years of the student's first registration at Stony Brook as a graduate student. For part-time students, this time limit may be waived by the graduate committee.

## **Requirements for the Ph.D. Degree—Astronomy**

In addition to the minimum Graduate School requirements, the following are required:

### **A. Formal Coursework**

Successful completion of an approved course of study is required. A student normally takes nine credit hours per semester, not counting AST 600 Practicum in Teaching.

### **B. Qualifying Examination**

Acceptable performance on the written Ph.D. qualifying examination is required. This exam is normally given at the end of the fourth semester, but may be attempted at the end of the second semester. Successful completion of qualifying examinations in the Department of Physics also satisfies this requirement.

### **C. Preliminary Examination**

Successful defense of a thesis proposal is required. The student, in conjunction with a faculty advisor, prepares a written thesis proposal and submits it to a committee of the faculty two weeks in advance of the preliminary examination. The student is expected to complete the proposal by the end of the fifth semester or earlier. The committee will review the written proposal for its suitability as a thesis topic within a week. The preliminary examination consists of an oral presentation of the proposal and an oral examination on the proposal and related topics.

The chairperson of the preliminary examination committee will inform the student of the committee's decision and submit a written report of the examination (signed by all committee members) to the graduate committee. If the student does not pass the examination, the preliminary examination committee will recommend further action to the graduate committee. This recommendation will be implemented by the graduate committee, in consultation with the faculty.

### **D. Language**

There is no language requirement for the Ph.D. degree.

### **E. Advancement to Candidacy**

Upon successful completion of the preliminary examination, including any associate qualifications and requirements of the course of study, the student will be considered for advancement to candidacy. This recommendation is made by the graduate committee, through the department chairperson, to the vice provost for graduate studies. Candidacy signifies that the student has successfully completed all Graduate School and departmental requirements for the Ph.D. degree except the thesis.

## **Degree Requirements (GEO) Requirements for the M.S. Degree—Geological Sciences**

### **A. Residence**

There is no residence requirement.

### **B. Language**

There is no language requirement.

### **C. Formal Coursework**

Successful completion with a B average of an approved course of study consisting of 30 graduate credits with a minimum of 18 academic credits and a thesis. Courses that satisfy the academic credit requirements must be in the approved course of study, must be at the graduate level, and cannot be teaching or research courses.

### **D. M.S. Thesis Proposal**

An M.S. thesis proposal of two to three pages in length is to be submitted to the graduate committee and the advising committee before the last day of final examinations at the end of the first year. This proposal will be evaluated by the three-member faculty committee (two advisors

and one additional faculty member) before the graduate student evaluation, but need not bear faculty signature. Final acceptance of the M.S. thesis proposal will be by faculty signature(s) after the end-of-semester graduate student evaluation.

#### **E. Evaluation of Thesis**

The thesis must be approved by an examining committee and defended in an oral defense, part of which includes a public presentation of the results of the M.S. thesis research.

The faculty advisor must certify satisfactory completion of the research before the graduate committee will establish an examining committee. Copies of the thesis shall be submitted to the M.S. examining committee at least one week before a planned M.S. examination. The committee must respond to the student within one week after receipt of the thesis. Only if the committee attests that the thesis is well written, that it shows competent collection and interpretation of data, that it adequately references the pertinent literature, and that it is concise, can a date for the M.S. examination be set. The student is responsible for meeting all requirements of the Graduate School regarding the M.S. thesis.

A final oral thesis defense, required of all M.S. candidates, shall be given after completion of the thesis. The examining committee shall consist of at least three experts in the field who hold Ph.D.s. These generally will be faculty members, but may include research associates or visiting experts. The defense may cover any topic in the student's approved course of study, but generally focuses on the thesis.

The thesis defense must be administered at least two weeks before the end of classes in the semester during which the degree is to be conferred, and the final thesis must be submitted to the Graduate School no later than six months after the thesis defense.

#### **F. M.S. Degree Without a Thesis**

Under unusual circumstances and in consultation with faculty advisors, the M.S. degree may be awarded after 30 graduate academic credits without a thesis. The M.S. degree with concentration in hydrogeology requires 21 course credits and nine research credits, but does not require a thesis.

#### **G. Departmental Recommendation**

When all departmental requirements are completed, the chairperson may recommend to the vice provost for graduate studies that the M.S. degree be granted.

#### **H. Time Limit**

All requirements for the M.S. degree must be completed within three years of the student's first registration at Stony Brook as a graduate student. For part-time students, this time limit may be waived by the graduate committee.

### **Requirements for the Ph.D. Degree—Geological Sciences**

#### **A. General Statement**

The Ph.D. preliminary examination is the primary examination before embarking on a Ph.D. thesis. Its main purposes are to identify the research potential of the student and to assess whether this potential is sufficient to obtain a Ph.D. degree. The preliminary examination is a major examination, but it is only part of the evaluative process that recognizes all of the student's accomplishments from the time that he or she arrives at Stony Brook.

The following elements are important for a Ph.D.:

1. Creativity, originality, and independence in development of research projects and in problem solving
2. Flexibility of thought processes
3. Knowledge of and critical evaluation of the forefront of the science
4. Ability to obtain the skills and specific knowledge to solve particular problems
5. Basic knowledge to support items 1-4
6. Ability to complete research projects and to present results in written papers and oral presentations to the scientific community.

One Ph.D. research proposal will be used to evaluate the student with regard to these criteria.

#### **B. Residence**

Two consecutive semesters of full-time graduate study are required.

#### **C. Language**

There is no language requirement.

#### **D. Formal Coursework**

Successful completion of an approved course of study is necessary. The number of credit hours required is unspecified and will be set according to the student's background and interests.

For a student entering the Ph.D. track without an M.S. degree, the approved course of study must include research projects under two different faculty members. These independent research projects must result in papers to be evaluated by a three-member faculty committee prior to scheduling the preliminary examination.

For a student entering the Ph.D. track with an M.S. degree, the course of study must include at least one research project resulting in a paper; the M.S. may serve as a second paper. The research paper and M.S. thesis are to be evaluated by a three-member faculty committee prior to scheduling the preliminary examination.

#### **E. Preliminary Examination Procedures**

Successful defense of one research proposal is required. Geological Sciences graduate students may decide on their own initiative to take the Ph.D. preliminary examination. Such a decision will generally be an outgrowth of consultations with advisors, who in turn will monitor the student's research progress. Typically, the Ph.D. preliminary examination process will begin late in the first year for students entering with a M.S., late in the second year for students entering with a B.S./B.A. and who are bypassing a M.S., and late in the third year for students receiving a M.S. at Stony Brook.

**Abstract:** The student will submit an abstract of a research proposal to the graduate committee for approval. A single abstract must be endorsed in writing by three Geological Sciences faculty members. Endorsement signifies that the student's preparation of a written proposal based on the stated topic is acceptable. One or more of the signatories must be identified as a potential sponsor, a designation that signifies a willingness, but not a binding commitment, to supervise the proposed research. This procedure does not commit a student to work with the indicated sponsor(s), but provides the student with an early indication that a potential thesis advisor is available for the proposed research topic.

**Preliminary Examination Committee:** Upon approval of the abstract, the department chairperson, in consultation with the graduate committee, will nominate the preliminary examination committee and a chairperson for appointment by the vice provost for graduate studies. The committee will consist of five members, one of whom may be from outside the department. The student will be informed of the membership of the committee.

**Research Proposal:** Following the approval of the abstract, the student will be instructed to prepare the proposal in depth—a process that normally takes about six weeks. The proposal shall state an idea

for research, indicate why it was selected, and outline the procedures to be used to explore and develop it. A proposal must include a list of the principal references used in its preparation. The prepared proposal will be submitted to the members of the examination committee, graduate committee, and other interested faculty members. The examination committee will judge the proposal for soundness of idea, suitability as a Ph.D. topic, and quality of development. Within one week after receiving the proposal, the examination committee must either (a) approve the proposal and set the time and place for a preliminary examination to be held within one week; (b) inform the student that the proposal is unacceptable as written and request that it be resubmitted within a given time, not greater than four weeks; or (c) reject the proposal, in which case there is no preliminary examination and the student is terminated. If the proposal is accepted, the student will circulate and post a notice of the time and place of the examination and the title of the proposal as soon as possible after acceptance of the proposal by the examination committee.

**Preliminary Examination:** The student will be given time at the examination to set forth briefly the research proposal, after which, in closed session, there will be questions from the committee and other faculty members. The questioning may be extended beyond the specific topics of the proposal to include related subjects. At the end of the defense, the student and all faculty members other than the committee will be excused, unless the committee requests specific information from a faculty member not on the committee. The committee will evaluate the proposal with regard to the quality of development and defense and the adequacy of the student's background knowledge. In summary, it will judge whether the student has demonstrated the ability to conceive, plan, and carry out original and significant research. A grade of "pass" from at least three members of the committee shall constitute a successful defense. A student may pass with qualifications that must subsequently be met for a successful defense. The chairperson of the preliminary examination committee will inform the student of the committee's decision and submit a written report of the examination (signed by all committee members) to the graduate committee. If the student does not pass the examination, the examination committee will recommend further action to the graduate committee. This recommendation will be implemented by the graduate committee in consultation with the faculty.

#### **F. Advancement to Candidacy**

Upon successful completion of the preliminary examination, including any associated qualifications and the requirements of the department and the course of study, the student will be considered for advancement to candidacy. This recommendation is made by the graduate committee through the department chairperson to the vice provost for graduate studies. Candidacy signifies that the student has successfully completed all Graduate School and departmental requirements for the Ph.D. degree except the dissertation.

#### **G. Dissertation Research**

If the subject of the dissertation research differs from that in the research proposal defended at the preliminary examination, a dissertation statement must be endorsed by two faculty members in addition to the thesis advisor and submitted to the graduate committee. Thereafter, a brief oral report on the dissertation research will be presented yearly to the department until the dissertation is completed, and a brief progress report will be presented to the student's advising committee each semester, as explained in the advising procedures.

#### **H. Dissertation**

The finished dissertation must be approved by a dissertation examining committee that shall consist of five members of faculty rank, at least one of whom must be from outside the department. The committee and its chairperson shall be appointed by the vice provost for graduate studies on the recommendation of the department chairperson in consultation with the graduate committee. The committee chairperson must not be the supervisor of the dissertation. The committee must receive the dissertation at least two weeks before the oral defense of the dissertation. Before the oral defense can be held, the majority of the examining committee must certify in writing that the dissertation is ready to be defended. The committee will conduct the oral defense of the dissertation. The presentation will be open to all faculty members and to others by invitation of the student.

#### **I. Time Limit**

All requirements for the Ph.D. degree must be met within three years of advancement to candidacy. Extension beyond this limit will be at the discretion of the graduate committee in consultation with the student's thesis advisor.

### **Requirements for the M.A.T. Degree—Earth Science**

The Master of Arts in Teaching Earth Science leads to New York State provisional certification for teaching earth science in

secondary schools. It also prepares the student for the examinations for permanent certification.

#### **A. Residence**

There is no residence requirement.

#### **B. Language**

There is no language requirement for the M.A.T. degree.

#### **C. Formal Coursework**

Successful completion with a B average of 36 credits distributed among graduate course offerings in geology, other sciences and mathematics, teaching methods in both science and general education, and practice teaching in secondary schools. Individual programs are tailored to the background and interests of the student, in consultation with an advisor.

#### **D. Departmental Recommendations**

When all the departmental requirements are completed, the chairperson will consult with the director of the Center for Science, Mathematics, and Technology Education to determine whether all state-mandated education courses have been successfully completed. If both science and general education courses have been completed, the associate dean of the School of Continuing Education will receive the recommendation that provisional certification requirements have been fulfilled, and the vice provost for graduate studies will be informed that the M.A.T. degree should be granted.

#### **E. Time Limit**

Although full-time students can complete all degree requirements for the M.A.T. degree within three semesters, it is recognized by the graduate committee that part-time students will require additional time to complete the degree requirements.

### **Responsibility**

The student should become thoroughly familiar with these departmental requirements, with the advising and study plan procedures of each concentration, with the graduate degree program, and with the degree requirements of the Graduate School. In addition, the student should make a point of learning the function of the graduate committee and his or her relationship to it. Final responsibility for deadlines and procedures rests *solely* with the individual student.

## Courses in Astronomy

### AST 501/502 The Planetary System

An introduction to our current understanding of the solar system, excluding the sun. Topics will include orbits and bulk properties of the planets, moons, asteroids, and comets; physics and chemistry of comets; bombardment histories; composition, dynamics, structure, and evolution of planetary and satellite atmospheres; dynamics of satellites and rings, including resonance and tidal heating. The latter part of the course will focus on cosmogonic theories, including planetary and satellite accretion; the formation of planetary atmospheres; and the probability that other planetary systems exist.

*Prerequisite:* Permission of the instructor  
*Fall, alternate years (501), 3 credits*  
*Spring, alternate years (502), 3 credits*

### AST 543 Laboratory Course in Astronomical Techniques

A course designed to introduce the theory, design, and operation of modern astronomical instrumentation and to familiarize the student with the use of telescopes. Current astronomical techniques will be discussed with emphasis on methods of observational measurements and reduction of data. Will emphasize optical techniques appropriate for wavelengths shorter than one micron. Extensive laboratory and observing exercises may be expected.

*Spring, alternate years, 4 credits*

### AST 553 Stellar Interiors and Evolution

The study of the structure and evolution of stars. Topics will include the formulation of the equations describing hydrostatic equilibrium and energy transport, the equations of state, nuclear energy generation, sources of opacity. Model calculations are compared with observation of individual stars and clusters of stars. The stages of evolution covered will include main sequence and pre-main sequence evolution. Post-main sequence evolution through white dwarfs and neutron stars will be described in detail.

*Spring, alternate years, 3 credits*

### AST 554 Stellar Atmospheres

The study of the structure of stellar atmospheres and chemical abundance determinations. Topics will include radiative transfer, thermodynamics in the presence of a radiation field, spectral line formation, and temperature, gravity, and composition determination. Departures from hydrostatic equilibrium and plane-parallel symmetry will be discussed including such topics as mass loss in spherically symmetric systems and radiation transport in the presence of magnetic fields.

*Fall, alternate years, 3 credits*

### AST 583 Interstellar Medium

A study of the interstellar medium with emphasis on physical processes. Topics include kinetic theory, equation of transfer, spectral lines, non-thermal emission, ionization, effects of dust, and formation and spectroscopy of molecular clouds. The components of the interstellar medium and the interactions between them are discussed in detail, as well as the process of star formation.

*Fall, alternate years, 3 credits*

### AST 584 Galaxies

A basic course on the observational and theoretical aspects of the content, dynamics, and evolution of galaxies: potential theory; stellar orbits; equilibria and stability of collisionless stellar systems; spiral structure, bars, and warps; collisions of stellar systems; galactic evolution; clusters of galaxies; dark matter. Approximately one-half of the course is spent on the Milky Way and the other half on other galaxies.

*Fall, alternate years, 3 credits*

### AST 585 Cosmology and High-Energy Astrophysics

A basic course on cosmology and primarily extragalactic high-energy astrophysics: Hubble expansion, Friedman universes, age of the universe, microwave background radiation, big-bang nucleosynthesis, inflation growth of gravitational instabilities, correlation functions, local density and velocity perturbations, dark matter, synchrotron radiation, inverse Compton scattering, pulsars, extragalactic radio sources, quasars and active galactic nuclei, black holes.

*Fall, alternate years, 3 credits*

### AST 597 Methods of Astronomical Research

This course is designed to acquaint beginning graduate students with current research in the department and to develop basic techniques of research in astronomy. Students work directly with one or more faculty members on short research projects that may involve using the astronomical literature, computer programming, or instrumentation in one of the laboratories.

*Fall and spring, 1-3 credits*

### AST 599 Research

*Fall and spring, variable and repetitive credit*

### AST 600 Practicum in Teaching

*0-3 credits, repetitive*

### AST 601 Advanced Topics in Astronomy-Astrophysics

*Fall and spring, 3 credits per semester, repetitive*

### AST 611 Planetary Atmospheres

A survey of current knowledge about the composition, structures, and dynamics of the atmospheres of planets in the solar system. Models for the upper and lower regions and probable evolutionary histories will be discussed. Emphasis will be placed on the most recent results obtained from space craft and ground-based observations. Student participation is encouraged. This course is identical to ESC 681.

*Fall, alternate years, 3 credits*

### AST 612 Seminar in Astronomy-Astrophysics

Designed to treat specific subject areas in depth, either extending material introduced at the 500 level or covering topics not presented there. Topics recently offered or anticipated in the near future include observational cosmology, atomic and molecular processes, planetary atmospheres, interstellar molecules, advanced topics in radiative transfer, interstellar gains, quasars, and galactic nuclei. Two one-and-a-half-hour lectures per week.

*3 credits, repetitive, topics to be announced*

### AST 696 Astronomy Colloquium

A weekly series of research seminars presented by visiting scientists as well as by the faculty. Required every semester of all astronomy graduate students.

*Fall and spring, no credit*

### AST 697 Astronomy Seminar

Presentation of preliminary research results and current research problems by students and faculty. Required every semester of all astronomy graduate students.

*Fall and spring, no credit*

### AST 698 Astronomy Special Seminar

A weekly series of specialized seminars in which graduate students and faculty discuss specific topics within the astronomy subgroups. Research is reviewed, and these are discussed.

*Fall and spring, no credit*

### AST 699 Dissertation Research

Independent research for Ph.D. degree. Open only to candidates for the Ph.D. who have passed the preliminary examination.

*Fall and spring, variable and repetitive credit*

## Courses in Geological Sciences

### GEO 501 Recent Developments in Evolutionary Paleontology and Paleocology

Study of case histories from the fossil record with extensive examination of fossil specimens. Assignments emphasize the development of individual field and laboratory projects. Stresses changes in the history of life throughout the Phanerozoic, but especially how these changes are being analyzed at present. Relevant graphical and statistical techniques for data analysis are emphasized in the lab.

*Spring, 3 credits*

### GEO 503 Mineral Equilibria

Covers the basics of the application of the principles of chemical thermodynamics to the resolution of geochemical and petrological problems. Begins with the first law and continues through phase transitions, properties of fluids, definitions of fugacity and activity of major and trace elements in fluids and molten solutions; configurational entropies; models quantifying non-ideal mixing in solid solutions. Additional topics include interpretation of calorimetric studies and/or solubilities of minerals in aqueous solutions.

*Prerequisites:* Physical chemistry; thermodynamics; or permission of instructor  
*Fall, 3 credits*

### GEO 505 Experimental Petrology Laboratory

The course is designed to give the student experience in some or all of the following techniques of experimental petrology: evacuated silica-glass tube experiments, one-atmosphere quenching experiments (with and without controlled atmospheres), 1- to 5-kbar hydrothermal systems (using oxygen buffers where necessary), gas-media experiments up to 7 kbar, and solid-media, piston-cylinder experiments.

*Requirements:* Completion of a project involving several of the above techniques; written report.

*Prerequisite:* Permission of instructor  
*Fall, 1 credit*

### GEO 506 Theoretical Petrology

Theory of phase diagrams, Schreinemaker's rules, heterogeneous equilibria, experimental systems of petrologic interest, properties of solutions.

*Prerequisites:* Metamorphic and igneous petrology and physical chemistry or thermodynamics; or permission of instructor  
*Spring, 3 credits*

### GEO 507 Petrogenesis

Discussion of the origin and evolutionary history of selected types of igneous and metamorphic rocks by integrating the principles of heterogeneous phase equilibria, trace-element and isotopic geochemistry, crystal chemistry, and geologic occurrence.

*Fall, 3 credits*

### GEO 508 The Rock-Forming Minerals

Study of the crystal chemistry, intracrystalline cation distribution (homogeneous equilibria) stability, and paragenesis of the rock-forming minerals. Special emphasis will be placed on amphiboles, feldspars, micas, and pyroxenes.

*Fall, 3 credits*

### GEO 511 Advanced Paleontology

An introductory graduate-level course that stresses an integration of practical field and laboratory study of fossil assemblages with quantitative statistical analyses of data. The actual content of the course varies from year to year; field collecting will normally be carried out in the lower or middle Paleozoic of the central Appalachians.

*Fall, 3 credits*

**GEO 515 Geohydrology**

Physics of hydraulic transport in porous media. Chemical principles of groundwater hydrology. Fundamentals of groundwater geology. Analytic and numerical models of regional fluid flow and groundwater contamination. Environmental and geological applications of hydrology.  
*Spring, alternate years, 3 credits*

**GEO 518 Carbonate Sediments**

An intensive study of the formation, deposition, lithification, and diagenesis of carbonate sediments. Lectures and seminars will emphasize principles of carbonate deposition, facies relationships, and chemistry. Laboratories will emphasize binocular and petrographic analysis of recent and ancient carbonates.  
*Spring, alternate years, 4 credits*

**GEO 519 Geochemistry of Natural Waters**

A comprehensive quantitative treatment of the processes controlling the chemistry of polluted and unpolluted surface and ground waters. Topics covered include thermodynamics and kinetics of water-rock interaction; mineral solubility; chemical speciation; redox reactions; adsorptions; carbonate chemistry; and speciation, mobility, and toxicity of metal ions. Based on a knowledge of these processes, the chemical composition of a wide variety of surface and ground waters is interpreted. Water-quality criteria and their application are also discussed.  
*Spring, 3 credits*

**GEO 521 Isotope Geology**

Consideration and evaluation of the various decay radiation schemes useful for determining the age of rocks and minerals. Development of the theoretical background necessary for the application of trace elements and radiogenic isotopes to the study of geologic processes in igneous, metamorphic, and sedimentary systems.  
*Fall, 3 credits*

**GEO 522 Planetary Sciences**

The chemical, physical, and petrologic properties of meteorites are reviewed. These data and data for the moon and the terrestrial planets are used to form a picture of the origin, chemical evolution, and accretion of planetary material.  
*Fall, 3 credits*

**GEO 526 Principles of Chemical Sedimentology**

A chemical approach to the study of sediments. Fundamental principles of chemical thermodynamics and kinetics, including isotope effects as they pertain to low-temperature geochemical processes, are presented and utilized in the discussion of sedimentological processes.  
*Spring, alternate years, 3 credits*

**GEO 528 Carbonate Geochemistry**

Examination of the mineralogical and chemical characteristics of the rock-forming carbonates with emphasis on stabilities in the geological environments. Includes study of phase relations; trace and minor element chemistries; and mechanisms of growth, dissolution, and replacement. Use of current research techniques as applied to carbonate minerals.  
*Fall, alternate years, 3 credits*

**GEO 530 Organic Geochemistry**

Introduction to organic chemistry of the earth, oceans, and atmosphere. Topics include production, transformation, and fate of organic matter; use of organic biomarkers as source and environmental indicators; use of stable and radioisotopes in organic geochemistry; diagenesis in recent sediments; petroleum and coal production and composition; dissolved and particulate organic matter in seawater. This course is crosslisted with MAR 530.  
*Prerequisite:* Permission of instructor  
*Fall, 3 credits*

**GEO 531 Crystalline Solids**

Principles of symmetry, single-crystal, and powder X-ray diffraction techniques and elements of crystal structure determination are considered. Use of crystallographic data in the study of mineral systems. Laboratory in diffraction techniques includes extensive use of digital computers.  
*Fall, alternate years, 3 credits*

**GEO 532 Solid-State Geochemistry**

The application of crystallographic techniques to problems in mineral chemistry. Concepts of the crystalline state, order-disorder, atom radii, chemical bonding, atom coordination, solid solutions, and physical properties of minerals. Emphasis on silicate and sulfide crystal structures.  
*Fall, alternate years, 3 credits*

**GEO 535 Regional Structure and Tectonics**

Formation and development of continental crust in Phanerozoic mountain belts. The structure and origin of ocean crust, magmatic arcs, and continental margin sequences are studied using geophysical, geochemical, and geologic data from ancient and modern examples.  
*Fall, alternate years, 3 credits*

**GEO 542 Inverse Theory**

Introduction to the basic concepts of inverse theory and its application to the study of the internal structure of the Earth and related problems.  
*Fall, alternate years, 3 credits*

**GEO 544 Restricted Marine Environments: Ancient and Modern**

An intensive and interdisciplinary study of restricted marine environments, including anoxic basins and evaporative basins, as they occur in the modern world and as they are represented in the geologic record. The chemical, sedimentologic, and paleoecologic import of these unusual circulation systems will be examined. This course is crosslisted with MAR 544.  
*Prerequisite:* Previous coursework in stratigraphy  
*Spring, 3 credits*

**GEO 545 Coastal Sedimentary Environments**

Survey of depositional environments from the nearshore continental shelf through the back barrier estuarine complex. Emphasis will be placed on depositional processes and products within such varied environments as tidal deltas, barrier islands, tidal flats and salt marshes, point bars and river deltas. This course is crosslisted with MAR 545.  
*Prerequisite:* Introductory course in stratigraphy and sedimentation or geological oceanography, or permission of the instructor  
*Fall, 3 credits*

**GEO 550 Global Tectonics**

Geological, geochemical, and geophysical evidence related to the concepts of plate tectonics and mantle convection. Kinematics and dynamics of plate motions. Origin of first-order crustal structures of continents and ocean basins. Geochemical and thermal evolution of the Earth.  
*Spring, 3 credits*

**GEO 551 Physics of the Earth I**

Study of the internal structure and properties of the Earth as revealed by field and laboratory investigations. Topics to be discussed include the rotation and figure of the Earth, gravity anomalies, solid-earth tides, geomagnetism and paleomagnetism, electromagnetic induction, and heat flow and the Earth's present and past thermal states. May be taken independently of GEO 552.  
*Fall, 3 credits*

**GEO 552 Physics of the Earth II**

Study of the Earth's structure and properties based on evidence from seismology and high-pressure geophysics. Topics to be discussed include fundamental principles of elastic wave

theory, body and surface wave propagation in layered media, earthquake source mechanisms, free oscillations of the Earth, and rheological properties of the Earth's interior. May be taken independently of GEO 551.  
*Spring, 3 credits*

**GEO 556 Solid-State Geophysics**

Application of lattice dynamics and equations of state of solids to studies in high-pressure, high-temperature geophysics. Reviews experimental data from physical acoustics, static and shock wave compression, and theoretical results from finite strain and atomistic models.  
*Prerequisites:* GEO 551 and 552, or permission of instructor  
*Spring, 3 credits*

**GEO 562 Early Diagenesis of Marine Sediments**

The course treats qualitative and quantitative aspects of the early diagenesis of sediments. Topics include diffusion and adsorption of dissolved species; organic matter decomposition and storage; and diagenesis of clay materials, sulfur compounds, and calcium carbonates. The effects of bioturbation on sediment diagenesis are also discussed. This course is crosslisted with MAR 562.  
*Prerequisite:* Permission of instructor  
*Fall, alternate years, 3 credits*

**GEO 564 Numerical Hydrology**

Numerical solution methods for the equations of incompressible flow in porous media with special emphasis on groundwater flow. Finite-difference and finite-element methods for steady-state and transient flows: boundary conditions, range of validity and stability of the numerical schemes, numerical artifacts. The approach will be hands on with example problems being computed. This course is crosslisted with AMS 564.  
*Prerequisite:* AMS 526 or permission of instructor  
*Fall, alternate years, 3 credits*

**GEO 567 Sedimentary Rocks and Crustal Evolution**

An examination of major and trace elements and isotopic composition of terrigenous sedimentary rocks within a framework of tracing the composition and evolution of the continental crust. Emphasis will be placed on interpreting sedimentary compositions in terms of provenance and sedimentary history (e.g., weathering, diagenesis, recycling). Relationships between sediment composition and tectonic setting will also be examined.  
*Spring, 3 credits*

**GEO 570 Earthquake Mechanics**

A survey of fundamental mechanics aspects of earthquake rupture; reviews concepts of fracture mechanics, elastodynamics, and experimental rock mechanics. Topics include state of stress in the lithosphere, theoretical models of earthquake instability, energetics of faulting, representation of dynamic elastic field generated by earthquakes, and relation of seismic signals to the kinematics and dynamics of seismic source.  
*Prerequisites:* GEO 552 or permission of instructor  
*Spring, alternate years, 3 credits*

**GEO 571 Mechanics of Geologic Materials**

Elastic, thermal, and anelastic properties of geological materials. The course emphasizes a thermodynamic characterization of these properties including irreversible thermodynamics and nonhydrostatic thermodynamics. Specific applications to the Earth's environment are discussed.  
*Prerequisites:* GEO 551, 552, or permission of instructor  
*Fall, alternate years, 3 credits*

**GEO 572 Advanced Seismology**

Course is intended to expose the student to topics that are at the forefront of current seismological research. Examples include wave propagation in heterogeneous media, earthquake source studies, tsunami generation, and seismic network data analysis.

*Prerequisite:* GEO 552

*Fall, alternate years, 3 credits*

**GEO 585 Directed Studies**

Special studies directed by various faculty members to be taken for variable and repetitive credit.

*Fall, spring, and summer, 1-3 credits*

**GEO 599 Research**

*Fall and spring, variable and repetitive credit*

**GEO 600 Practicum in Teaching**

*0-3 credits, repetitive*

**GEO 603 Topics in Petrology**

*1-3 credits*

**GEO 605 Topics in Sedimentary**

**Geology-Paleontology**

*1-3 credits*

**GEO 609 Topics in Mineralogy and Crystallography**

*1-3 credits*

**GEO 696 Geoscience Colloquium**

A weekly series of research seminars presented by visiting scientists as well as by the faculty. Required every semester of all geoscience graduate students.

*Fall and spring, no credit*

**GEO 697 Geoscience Seminar**

Presentation of preliminary research results and current research problems by students and faculty. Required every semester of all geoscience graduate students.

*Fall and spring, no credit*

**GEO 698 Geoscience Special Seminar**

A weekly series of specialized seminars in which graduate students and faculty discuss specific topics within the subgroups of geology. Research is reviewed, and theses are discussed.

*Fall and spring, no credit*

**GEO 699 Dissertation Research**

Independent research for Ph.D. degree. Open only to candidates for the Ph.D. who have passed the preliminary examination.

*Fall and spring, variable and repetitive credit*

**Course in Earth and Space Sciences****ESS 546 Middle Atmosphere Dynamics**

This course is concerned with the dynamics of the Earth's neutral atmosphere above the troposphere; that is, the stratosphere, mesosphere, and lower thermosphere. Observational information of the dynamics of the middle atmosphere are discussed, and theories of middle atmospheric motions are developed.

*Prerequisite:* ESC 545 or permission of instructor

*Spring, alternate years, 3 credits*

# Ecology and Evolution (BEE)

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**Chairperson: Jeffrey S. Levinton**  
*Life Sciences Building 650 (516) 632-8600*

**Graduate Studies Director: James D. Thomson**  
*Life Sciences Building 650 (516) 632-8603*

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## Degree Requirements Requirements for the M.A. Degree

Graduate Studies in Ecology and Evolution usually does not accept a student whose goal is an M.A. degree. However, a student already in graduate studies may be awarded an M.A. degree upon satisfaction of the following requirements in addition to the minimum Graduate School requirements:

- A. Completion of an approved course of study including 30 graduate credit hours.
- B. Preparation of a research thesis.

## Requirements for the Ph.D. Degree

### A. Course Requirements

1. During the first year in residence, students are normally required to take Principles of Ecology (BEE 550), Principles of Evolution (BEE 551), Biometry (BEE 552), and Research Areas in Ecology and Evolution (BEE 556).
2. Students must take a minimum of three other graduate courses, other than seminars, within this or other departments of this or other universities.
3. Colloquium in Ecology and Evolution (BEE 671-672) must be taken each year.
4. A minimum of one graduate seminar per year is required under normal circumstances.
5. The faculty feels that each student will require advanced training in various ancillary disciplines appropriate to the student's chosen field of research. Requirements for any specific student will be determined by the student's advisory committee and might include one or more foreign languages or advanced studies in mathematics, statistics, computer sciences, biochemistry, taxonomy, or other areas.

### B. General Graduate Examination

During the fall semester of the second year, each student takes a written examination consisting of essay questions in ecology, evolution, genetics, and ancillary areas. This examination, which is uniform for all students in a given year, tests for breadth of the student's command of ecology and evolution.

### C. Preliminary Examination

No later than the end of the fourth year of study a student takes a preliminary examination tailored to the student's interests and administered by his or her advisory committee. The examination includes an oral portion and may include a written portion, at the option of the student. The student and his or her committee agree in advance on the areas of knowledge to be covered in this examination.

### C. Language Requirements

The language requirement will be established by the student's advisory committee and will not exceed reading knowledge of two foreign languages.

### D. Advancement to Candidacy

The faculty will recommend a student to the Graduate School for advancement to candidacy upon satisfactory completion of the preliminary examination and any language requirement established for the student, and upon acceptance of a thesis proposal by the faculty.

### E. Research and Dissertation

A dissertation is required for the Ph.D. degree. It must contain the results of original and significant investigation. A dissertation proposal must be approved by the faculty during an early stage of the student's research. A student's progress in research is monitored by regular evaluations by the faculty in meetings held twice a year. Continued lack of progress may result in probation or dismissal.

### F. Dissertation Committee

Students select a temporary advisor during the first semester in residence and a permanent advisor usually before or during the third semester. The advisory committee, consisting of the permanent advisor and at least two other faculty in Graduate Studies in Ecology and Evolution, is nominated by the student in consultation with his or her permanent advisor and must be approved by the graduate studies director. Additional members from outside Graduate Studies in Ecology and Evolution and/or the university may be appointed to the dissertation committee.

### G. Final Examination

The completed dissertation must be approved by the student's advisory committee. A dissertation examining committee is then appointed by the vice provost for graduate studies. A formal public oral defense of the dissertation is scheduled, at which the student presents his or her findings and is questioned by members of the examining committee and by other members of the audience.

### H. Teaching Requirement

It is expected that all graduate students completing a doctoral degree will have functioned as teaching assistants during at least two semesters of their graduate careers.

### I. Residence Requirement

At least two consecutive semesters of full-time graduate study are required. The demands of the course of study usually necessitate a longer period of residence.

### J. Time Limit

The time limit imposed by the Graduate School is observed by Graduate Studies in Ecology and Evolution. Students must satisfy all requirements for the Ph.D. degree within seven years after completing 24 credit hours of graduate courses in Graduate Studies in Ecology and Evolution.

## Courses

### **BEE 500 Directed Readings in Population Biology**

Directed readings in topics of current interest, under supervision of a faculty sponsor, culminating in one or more critical review papers.  
*Prerequisites:* Sponsor and approval of master's program executive committee.

*Fall and spring, 1-3 credits, repetitive*

### **BEE 501 Directed Readings in the Biology of Organisms**

Directed readings in topics of current interest, under supervision of a faculty sponsor, culminating in one or more critical review papers.  
*Prerequisite:* Sponsor and approval of master's program executive committee.

*Fall and spring, 1-3 credits, repetitive*

### **BEE 550 Principles of Ecology**

Population dynamics, interactions of organisms, theoretical concepts of community structure and their biological and evolutionary implications.  
*Prerequisite:* Permission of instructor

*Fall, 4 credits*

### **BEE 551 Principles of Evolution**

Biological evolution, including the genetics of populations, speciation, evolution of higher taxa, and the fossil record.

*Fall, 4 credits*

### **BEE 552 Biometry**

An intensive course in statistical theory and methodology. The analysis of real biological data is emphasized. Topics include analysis of variance, simple multiple and curvilinear regression analysis, correlation analysis, and goodness of fit tests.

*Spring, 4 credits*

### **BEE 553 Multivariate Analysis in Biology**

An introduction to multivariate statistical analysis for biologists. Topics include general least squares analysis, MANOVA, cluster analysis, and factor analysis.

*Prerequisite:* BEE 552 or equivalent

*Fall, odd years, 3 credits*

### **BEE 554 Population Genetics and Evolution**

A general introduction to mathematical population genetics and evolutionary theory. The effects of mutation, recombination, selection, and migration are studied. Modern concepts in both theoretical and experimental population genetics are covered.

*Prerequisites:* BIO 220, BEE 552 or their equivalents, and a course in evolution  
*Spring, even years, 3 credits*

### **BEE 555 Mathematical Methods in Population Biology**

This course covers a variety of mathematical methods used in modern theoretical biology. Topics include linear algebra and applications, ordinary and partial differential equations, stochastic processes. Examples from population biology, i.e., mathematical ecology and population genetics, are used throughout.

*Spring, 3 credits, even years*

### **BEE 556 Research Areas of Ecology and Evolution**

A description of the current research areas of ecology and evolution, broadly conceived. All first-year ecology and evolution students are expected to participate.

*Fall, 1 credit, spring, variable credit*

### **BEE 557 Numerical Taxonomy**

The application of numerical techniques to classificatory problems in biology. Lectures cover the theory of classification and include phenetic, cladistic, and evolutionary approaches. Topics include character coding, similarity coefficients, cluster analysis, ordination, graph-theoretic methods, and techniques applicable to numerical cladistics.

*Fall, even years, 3 credits*

### **BEE 558 Tutorial Readings**

Individual tutorial study with an instructor in Graduate Studies in Ecology and Evolution for the purpose of background reading in an area of ecology and evolution.

*Fall and spring, variable credit*

### **BEE 559 Individual Studies in Organisms**

A detailed study of the biology of a selected systematic group chosen by the graduate student and a faculty member. This is conducted as a tutorial course.

*Fall and spring, variable credit*

### **BEE 560 Advanced Ecology**

Intensive treatment of topics such as history of community theory, spatially structured competition, plant-animal interactions, parasite population models, multivariate techniques of community analysis, behavioral ecology, and measurement of natural selection.

*Spring, odd years, 4 credits*

### **BEE 562 Advanced Invertebrate Zoology**

Lectures, student seminars, and discussions on selected topics in invertebrate zoology, with emphasis on the local and tropical American faunas.

*Spring, 2 credits, repetitive*

### **BEE 563/OCN 563 Mathematical Marine Ecology**

Course focuses on the use of mathematics in marine ecological problems. Topics include population dynamics, diffusion-reaction models, critical patch-size problems, biofluid mechanics, catastrophe-chaos problems, and animal swarming.

*Prerequisite:* MAR 555 or permission of instructor  
*Spring, 3 credits*

### **BEE 565 Molecular Evolution**

An introduction to the use of molecular information in population genetics, evolution, and taxonomy. This course will combine discussions of methodology, data, and theory to illustrate how molecular information is changing our view of the evolutionary process.

*Prerequisite:* BEE 551 or permission of instructor  
*Spring, odd years, 3 credits*

### **BEE 568 Applied Ecology**

This course focuses on the role of ecology in solving practical environmental problems. Ecologically based technologies and methods of ecological risk analysis applied to terrestrial and aquatic ecosystems are developed. Modern problems related to genetically engineered organism releases, responses of ecosystems to pollution, and overexploitation form the basis of the course.

*Spring, odd years, 2 credits*

### **BEE 571 The Institutions of Environmental Policy**

The environmental effects of existing economic, legal, and other social institutions will be examined with emphasis on identification of areas of agreement and conflict with ecological theory.

*Fall, odd years, 3 credits*

### **BEE 575 Phylogenetics**

A survey of principles and methods of phylogenetic systematics, covering both principles of classification and methods for inferring phylogenetic relationships. A quantitative approach

is stressed throughout and instruction on computer methods of phylogenetic analysis is included. The connection between phylogenetic and biogeographical theories is also covered.  
*Spring, odd years, 3 credits*

### **BEE 587 Computer Programming and Modeling Techniques in Biology**

An introduction for advanced biology, mathematics, and physics majors to PASCAL programming applications in ecology, population genetics, and taxonomy. Mathematical methods used in modeling of biological phenomena. Both analytical and simulation techniques will be emphasized.

*Prerequisites:* A year of calculus; either BIO 151, 152 or PHY 102 or 104

*Fall, 3 credits*

### **BEE 588 Current Topics in Ecology and Evolution**

The subject matter of the special topics course varies from semester to semester, depending upon the interests of students and staff.

*Fall and spring, variable and repetitive credit*

### **BEE 599 Research**

Original investigation undertaken with the supervision of a member of the staff.

*Fall and spring, variable and repetitive credit*

### **BEE 670 Informal Seminar**

Presentation of preliminary research results and current research problems by students and faculty.

*Fall and spring, no credit*

### **BEE 671, 672 Ecology and Evolution Colloquium**

A weekly series of research seminars presented by visiting scientists as well as by the faculty. Required every semester of all ecology and evolution graduate students.

*Fall and spring, no credit*

### **BEE 689 Seminar on Adaptations of Marine Organisms**

Seminars on selected topics concerning ecological, genetical, and evolutionary problems in the marine environment.

*Fall and spring, 2 credits, repetitive*

### **BEE 690 Seminar on Evolutionary Processes**

Seminars on selected topics concerning evolutionary processes.

*Fall and spring, 2 credits, repetitive*

### **BEE 691 Seminar on Systematics and Phylogeny**

Seminars on selected topics in systematics. Topics will include the theory of classification and numerical taxonomy, both phenetic and cladistic.

*Fall and spring, 2 credits, repetitive*

### **BEE 692 Seminar on the Environment and Human Affairs**

Student seminars on selected topics concerned with the effect of man on the environment. Application of ecological and evolutionary theory to the solution of human problems.

*Fall and spring, 2 credits, repetitive*

### **BEE 693 Seminar on Population and Community Ecology**

Student seminars on selected topics in population and community ecology.

*Fall and spring, 2 credits, repetitive*

### **BEE 699 Dissertation Research**

Original investigations undertaken as part of the Ph.D. Program in Ecology and Evolution.

*Prerequisite:* Advancement to candidacy  
*Fall and spring, variable and repetitive credit*



# Economics (ECO)

*Chairperson: R. Bryce Hool*  
*Ward Melville Social and Behavioral Sciences Building S-601*  
*(516) 632-7560*

*Graduate Studies Director: Thomas Muench*  
*Ward Melville Social and Behavioral Sciences Building S-601*  
*(516) 632-7530*

## **Degree Requirements Requirements for the M.A. Degree in Economics**

The department does not admit students who seek only a master's degree, but it is possible to earn the M.A. degree on the basis of performance in the Ph.D. program.

In addition to the minimum Graduate School requirements, the department has specific degree requirements. The M.A. degree requires a minimum of 27 resident graduate course credits in economics (500 level or above, not including ECO 598 or ECO 698) with an average grade of B or higher.

## **Requirements for the Ph.D. Degree in Economics**

The Ph.D. degree requirements are as follows:

### **A. Course Requirements**

A minimum of 15 courses in economics (including core courses) must be completed, with a grade of B or better in each elective course. Included in the elective courses must be at least two in each of two or more fields (listed below). However, the Ph.D. committee may approve (1) the inclusion of up to two elective courses taken in another department, and/or (2) a waiver of part of the 15-course requirement in the case of students with graduate work elsewhere.

#### **1. Core Courses**

Those courses that provide the foundation in economic theory (micro and macro) and quantitative analysis (mathematical methods, statistics and econometrics) are referred to as core courses. Comprehensive examinations are taken in microeconomics and macroeconomics beginning at the end of the first year of study, and are to be completed by the end of the third semester. Comprehensive examinations are written but may be supplemented by oral examinations

at the discretion of the examining committee. An econometrics requirement is to be satisfied by grades of B or higher in the core econometrics courses.

#### **2. Elective Courses and Fields of Specialization**

In addition to core courses, normally at least seven elective courses must be taken, with groupings in at least two fields. It is usual but not necessary that a dissertation topic be chosen from one of these fields of specialization.

Two elective fields must be satisfactorily completed by the end of the sixth semester. One field may be completed on the basis of grades of B+ or higher in the courses in that field. At least one field must be completed by passing a written comprehensive exam. Fields currently offered by the department are advanced micro theory, game theory, advanced macroeconomics, advanced econometrics, labor economics, economic demography, international economics, industrial organization, and comparative economic systems.

### **B. Seminars and Workshops**

Each student takes a research workshop in the fifth semester. The purpose of this workshop is to provide a structured introduction to research methodology. While there is some choice among workshops with respect to the subject areas covered, all are primarily concerned with the common methodological elements of research in economics.

In addition, participation in departmental seminars and research workshops is considered an essential part of a student's progress toward the doctorate. Seminars in economic theory and applied economics

are presented on a regular basis by faculty, visitors, and graduate students. Workshops oriented toward thesis research are conducted by faculty and students working in related areas.

### **C. Advancement to Candidacy**

Advancement to candidacy for the Ph.D. is achieved by completion of all course requirements specified in item A above. Advancement to candidacy normally must be achieved by the end of the sixth semester.

### **D. Dissertation**

A dissertation, presenting the results of original and significant research, must be approved. An examination on a nominated area of dissertation research must be taken by the end of the fifth semester of study and must be passed by the end of the sixth semester of study. The examination may be written or oral, and its syllabus is to be determined by the student's dissertation committee in consultation with the student. A dissertation prospectus must receive approval of the thesis advisor and members of the thesis committee. Final approval of the dissertation will be by a committee including the candidate's principal advisor, two other department members, and one member from another department. The results of the dissertation will be presented at a colloquium convened for that purpose.

### **E. Teaching**

The department is committed to achieving a high quality of teaching and encourages all graduate students to acquire teaching experience during their graduate studies. The department operates a training program to prepare teaching assistants for classroom instruction.

### **F. Time Limit**

If the degree requirements have not been met within five years of entry into the program, departmental approval is required for continuation in the program.

### G. Dismissal Policy

A student may be dismissed from the program at the end of any semester in which he or she does not achieve a B average or fails to meet the pertinent requirements for the Ph.D. as specified above.

## Courses

### ECO 500 Microeconomics I

The first semester of a one-year course in microeconomic theory. Deals with decision making of economic agents in different choice environments using the analytical approach of duality theory. Topics include theory of the consumer, theory of the firm, decision making under risk and uncertainty, intertemporal choice, aggregation, and capital theory.

*Corequisite:* ECO 590  
*Fall, 3 credits*

### ECO 501 Microeconomics II

A continuation of ECO 500, focusing on theories of equilibrium and market structure. Topics include general competitive equilibrium, imperfect competition and game theory, imperfect information, theory of public goods, and social choice.

*Prerequisite:* ECO 500  
*Spring, 3 credits*

### ECO 502 Applied Microeconomic Problem Solving

Development and use of frameworks for applied microeconomic analysis. Specific applications to problems generally dealt with in ECO 500-501.

*Prerequisite:* ECO 501  
*Fall, 3 credits*

### ECO 510 Macroeconomics I

The first semester of a one-year course in macroeconomic theory. Deals with theories and determinants of income, employment, and inflation. Topics include static equilibrium models, theories of money demand and monetary phenomena, theories of the labor market and unemployment, rational expectations and stabilization policy, consumption, and investment.

*Corequisite:* ECO 500  
*Fall, 3 credits*

### ECO 511 Macroeconomics II

A continuation of ECO 510, focusing on dynamic models. Topics include models of economic growth, optimal growth and efficiency, overlapping-generations models, rational expectations, and optimal policy.

*Prerequisite:* ECO 510  
*Corequisite:* ECO 501  
*Spring, 3 credits*

### ECO 520 Mathematical Statistics

The first semester of a one-year course in quantitative methods. Statistical methods and their properties of particular usefulness to economists. Topics include probability theory, univariate and multivariate distributions, limiting distributions, point and interval estimation, hypothesis testing.

*Prerequisite:* ECO 590  
*Spring, 3 credits*

### ECO 521 Econometrics

A continuation of ECO 520. The application of mathematical and statistical methods of economic theory, including the concept of an explanatory economic model, multiple regression, hypothesis testing, simultaneous equations models, and estimating techniques.

*Prerequisite:* ECO 520  
*Fall, 3 credits*

### ECO 522 Applied Econometrics

A continuation of ECO 521. The application and extension of econometric techniques developed in ECO 521. Emphasis on the relationship among

economic theory, econometric modeling and estimation, and empirical inference. Computer usage for calculation of estimators. Critical examination of econometric studies in current journals.  
*Prerequisite:* ECO 521  
*Spring, 3 credits*

### ECO 527 Operations Research I

Offered concurrently with AMS 530. Elementary maxima and minima problems and the Lagrange multiplier. Linear programming including the complex technique. The transportation problem. Queuing problems under different assumptions on input, service mechanism, and queue discipline. Dynamic programming. Basic ideas of inventory theory.

*3 credits*

### ECO 528 Operations Research II

Offered concurrently with AMS 538. Nonlinear programming and programming under uncertainty. Introduction to statistical decision theory and game theory. Monte Carlo techniques. Applications such as inventory theory or traffic theory according to the interest of the class.

*Prerequisite:* ECO 527  
*3 credits*

### ECO 590 Mathematical Foundations of Contemporary Economic Theory I

A one-semester course dealing with mathematical concepts and techniques relevant to economic theory. Topics in set theory, topology, linear algebra, and optimization theory. Applications to economic theory developed as time permits.

*Fall, 3 credits*

### ECO 598 Economic Fundamentals

Directed work for individuals or groups on topics in which students are inadequately prepared at time of admission to program. Typical focus is mathematical methods, as background for ECO 590. Course credits may not be counted toward degree requirement.

*Variable and repetitive credit*

### ECO 599 Research in Special Topics

*Variable and repetitive credit*

### ECO 600 Advanced Microeconomic Theory I

Topics in mathematical economic theory, including general equilibrium and welfare theory, stability theory, economic dynamics, game theory, imperfect information, allocation and incentive mechanisms. Mathematical concepts developed as needed.

*Prerequisites:* ECO 501; ECO 590 or equivalent  
*Corequisite:* MAT 550 or MAT 321  
*3 credits*

### ECO 601 Advanced Microeconomic Theory II

Continuation of ECO 600.  
*3 credits*

### ECO 604 Game Theory and Economics

Introduction to both cooperative and non-cooperative games, with applications to perfect and imperfect economic competition, bargaining, and political theories.

*Prerequisite:* ECO 590 or AMS 504  
*Spring, 3 credits*

### ECO 607 Production and Technology

Economic aspects of research, development, and technological change. Survey of historical and econometric literature and their relation to economic theory.

*Prerequisite:* ECO 501  
*Spring, 3 credits*

### ECO 608 Development of Economic Analysis

Detailed analytical study of the origin and development of the major schools and theoretical problems and approaches of economics. The physiocratic, classical, Marxist, and neoclassical economists and theories are studied, with emphasis on primary source material.  
*3 credits*

### ECO 609 Studies in Economic Theory

*Prerequisite:* ECO 501  
*3 credits, repetitive*

### ECO 610 Advanced Macroeconomic Theory I

Topics in macroeconomic theory, including microfoundations of macroeconomics, temporary general equilibrium and disequilibrium, monetary theory, equilibrium theory of business cycles, implicit contracts, rational expectations, and econometric implications.

*Prerequisites:* ECO 501, ECO 511  
*3 credits*

### ECO 611 Advanced Macroeconomic Theory II

A continuation of ECO 610.  
*Prerequisite:* ECO 610  
*3 credits*

### ECO 613 Business Cycles, Stabilization Policies, and Forecasting

Analysis of modern theories of the business cycle and the use of alternative stabilization policies. Emphasis will be on the selection of optimal policies and the role of forecasting in the implementation of policy.

*Prerequisites:* ECO 501, ECO 511  
*3 credits*

### ECO 619 Studies in Macroeconomics

*Prerequisites:* ECO 501, ECO 511  
*3 credits*

### ECO 620 Advanced Econometrics I

Foundations of econometric theory, emphasizing the problems of model formation, identification, estimation, hypothesis testing, and model evaluation. Topics will be selected from the following areas: general linear models, nonlinear models, multivariate analysis, time series analysis, simultaneous equations systems.

*Prerequisite:* ECO 521 or permission of instructor  
*3 credits*

### ECO 621 Advanced Econometrics II

A continuation of ECO 620.  
*3 credits*

### ECO 622 Seminar in Applied Econometrics

A survey of modern cross section econometric methods with emphasis on methods used in labor economics. Although the discussion will take place in the context of specific empirical applications, the goal is the understanding of the theoretical properties of the estimation methods. Topics include qualitative and limited dependent variables, maximum likelihood, nonlinear regression, random coefficient models, panel data, and Bayesian estimation. An interest in labor economics is desirable but not necessary.  
*Prerequisite:* ECO 521 or permission of instructor  
*3 credits*

### ECO 623 Data Analysis and Economic Applications

Survey of major sources of data in economics and theoretical hypotheses and statistical methods for organizing and analyzing such data. Statistical models for quantitative data as well as qualitative choices are presented. Computer usage is expected.

*Prerequisite:* ECO 521  
*3 credits*

**ECO 629 Studies in Quantitative Methods**

Prerequisite: ECO 521  
3 credits

**ECO 630 Welfare Foundations of Public Sector Economics**

This is a one-semester course designed to explore the micro basis of public sector economics. Emphasis is placed on the contrast between optimization in the private and public sectors, externalities, "second best" social optima, "public" goods, collective choice, public investment criteria, and optimal pricing in the public sector.  
Prerequisite: ECO 501  
3 credits

**ECO 631 Seminar in Public Sector Economics**

Analytical and econometric approach to selected issues in public sector economics drawn from the areas of urban economics, medical economics, environmental economics, welfare economics, and public finance. This course may be taken as a continuation of ECO 630, but 630 is not a prerequisite.  
Prerequisite: ECO 501  
3 credits

**ECO 633 Applied Welfare Analysis**

Development of selected topics in advanced welfare theory, including intertemporal resource allocation, uncertainty, preference transformation, and collective choice. Theoretical aspects of income distribution. Efficiency and equity of alternative economic systems. This course may be taken as a continuation of ECO 630, but 630 is not a prerequisite.  
Prerequisite: ECO 501  
3 credits

**ECO 635 Public Finance**

Analytical and econometric analysis of selected topics in public finance, such as optimal taxation and income distribution; optimal taxation and resource allocation; social security, retirement, and savings behavior; shifting and incidence of corporate, property, and payroll taxes.  
Prerequisite: ECO 501  
3 credits

**ECO 636 Industrial Organization I**

Applications of microeconomic theory to the determinants of market structure. Relationships between market structure, firm behavior, and allocational efficiency. Econometric estimation and testing of some hypotheses suggested by the theory.  
Prerequisites: ECO 501, ECO 521  
3 credits

**ECO 637 Industrial Organization II**

This course is a continuation of ECO 636. It will deal with the same questions and tools as ECO 636, and will provide an introduction to antitrust policy and to public policy toward industry, including regulation and deregulation, the design of optimal regulation, and the effectiveness of current regulation.  
Prerequisites: ECO 501, ECO 521  
3 credits

**ECO 640 Advanced Labor Economics Theory I**

This is primarily a course in advanced labor economics theory. There will, however, be some attention to empirical work. Topics will include the theory of equalizing differentials, human capital, labor supply, life cycle behaviors, and income distribution.  
Prerequisite: ECO 501  
3 credits

**ECO 641 Advanced Labor Economics Theory II**

This is a continuation of ECO 640. There will, however, be more emphasis on empirical application. Topics to be covered are labor contracts, unemployment and job turnover, labor demand, unionism, and signaling and screening.  
Prerequisites: ECO 521, ECO 640  
3 credits

**ECO 642 Demographic Economics I**

This course deals with the economics of the family. It utilizes recently developed techniques in economics and demography to deal with questions concerning marriage, divorce, fertility, contraception, the intrafamily distribution of resources, and the intergenerational distribution of resources. Students will do original theoretical and empirical research under the professor's supervision.  
Prerequisite: ECO 501  
Corequisite: ECO 521  
3 credits

**ECO 643 Demographic Economics II**

This course is a continuation of ECO 642. It will deal with the same questions and tools as ECO 642, but will emphasize primitive and developing economies. The connections between population growth and development will be stressed.  
Prerequisite: ECO 501  
Corequisite: ECO 522  
3 credits

**ECO 646 Economics of Health**

Theoretical and econometric analysis of selected aspects of the health care delivery system, such as the demand for medical services, the supply and distribution of physician services, the utilization of non-physician medical personnel, alternative models of hospital behavior, third-party insurance reimbursement, national health insurance and cost, and price inflation in the hospital and long-term care sectors.  
Prerequisites: ECO 501, ECO 521  
3 credits

**ECO 647 Selected Topics in U.S. Economic History I**

This course applies advanced economic theory to issues concerning the contribution of institutional arrangements to the development of the U.S. economy from colonial times to the present. Among the topics to be studied are implications of the demise of the Second National Bank of the U.S., slavery and economic development, efficiency and equity of the National Banking System, economic institutions and business cycles, and the role of the Federal Reserve System in the Great Depression.  
3 credits

**ECO 648 Selected Topics in U.S. Economic History II**

This course applies advanced economic theory to issues related to the growth of the U.S. economy from colonial times to the present. Among the issues to be studied are the character of modern economic growth in America, savings and growth, technical change, the interaction between growth and U.S. international economic relations, and the relation between population and economic growth.  
3 credits

**ECO 650 International Trade**

A modern and thorough presentation of international trade theory including the classical theory (Ricardo), the neoclassical theory (Heckscher-Ohlin-Samuelson) and extensions, welfare aspects, trade and growth, the theory of tariffs and applications.  
Prerequisite: ECO 501  
3 credits

**ECO 651 International Finance**

Theories of balance of payments adjustment and exchange rate determination, including monetarist, Keynesian, and elasticity theories; disequilibrium macro models; policy analysis; international liquidity; and capital flows.  
Prerequisites: ECO 501, ECO 511  
3 credits

**ECO 654 Foundations of Urban Economics**

Analysis of the nature and functioning of urban areas. The theoretical foundations of urban economics are developed: theories of the consumer and housing producer in economic space, land rent and use, urban structure, and the size distribution and growth of urban areas. Emphasis is placed on methodology and hypotheses generated by the theories.  
Prerequisite: ECO 501  
3 credits

**ECO 655 Problems in Urban Economics**

The theories developed in ECO 654 are applied to specific urban problems such as poverty, housing, slums and urban renewal, urban transportation, financing local government, and environmental quality. Emphasis is also placed on methodology. ECO 654 is recommended although not a prerequisite.  
Prerequisite: ECO 501  
3 credits

**ECO 660 Comparative Economic Systems**

A systematic treatment of systems analysis, stressing decision making, information, and motivation. A conceptual framework is developed for analyzing market, centrally planned, and planned market models; the model and the reality of Soviet-type centrally planned economies and the reforms in these economies; the model and reality of worker management; and measurement of quality of system performance.  
Corequisite: ECO 500  
3 credits

**ECO 661 Theory of Economic Systems**

Introduction to the theory of social preference and choice functions. Voting systems. Informationally decentralized systems. Centralized and coercive systems. Team theory.  
Corequisite: ECO 501  
3 credits

**ECO 662 Economic Development I**

Analysis of the major issues in development and the principal theoretical contributions of economists to developmental problems. An effort will be made to examine the relevance of existing economic theories of development in the light of post-World War II experience, and with regard to the growth of multidisciplinary insights into widely variable institutional patterns of economic organization.  
Prerequisites: ECO 501, ECO 510  
3 credits

**ECO 663 Economic Development II**

A continuation of ECO 662, this course examines issues of development policy and plan formulation and implementation. Special attention will be devoted to selected regional, national, and sectoral cases.  
Prerequisite: ECO 662 or permission of instructor  
3 credits

**ECO 669 Studies in Economic Systems**

1-6 credits

**ECO 690 Seminar in Applied Economics**

Preparation, presentation, and discussion of student and faculty research in applied economics. Topics covered by student papers will usually be related to students' long-term research interests.  
*1-6 credits*

**ECO 691 Seminar in Economic Theory**

Preparation, presentation, and discussion of student and faculty research in economic theory. Topics covered by student papers will usually be related to students' long-term research interests.  
*1-6 credits*

**ECO 692 Research Workshop in Systems and Development**

Preparation, presentation, and discussion of student and faculty research on theoretical and applied topics in the fields of comparative systems and economic development. Topics covered by student papers will usually be related to students' long-term research interests.  
*1-6 credits*

**ECO 695 Research Workshops**

Designed to direct students to the selection of dissertation topics. Oral and written presentation of student papers with active faculty participation. Several sections may be offered each semester in areas of broad research interest.

*Prerequisites:* Three semesters of coursework in the Ph.D. program  
*1-6 credits, repetitive*

**ECO 696 Dissertation Seminar**

A seminar for students engaged in dissertation research. Students give presentations of their dissertation research.

*1-6 credits, repetitive*

**ECO 698 Practicum in Teaching**

*1-6 credits*

**ECO 699 Dissertation Research**

*1-9 credits*

# English (EGL)

*Chairperson: Thomas Kranidas*  
*Humanities Building 225 (516) 632-7420*

*Graduate Studies Director: Stacey Olster*  
*Humanities Building 194 (516) 632-7373*

## **Degree Requirements Requirements for the M.A. Degree in English**

In addition to the minimum requirements of the Graduate School, the following are required:

### **A. Course Requirements**

In broad outline, a master's degree in English requires ten three-credit graduate courses, competence in one foreign language, and passing the master's examination. Of the ten courses, one must be a course in Shakespeare, another a course in Chaucer or Milton, and one in the history and structure of the English language, although courses previously taken on the undergraduate level and passed with a grade of B or better may be accepted as fulfilling these requirements. The required ten courses must be distributed among at least four of the following six areas with at least one course in American literature:

1. Old and Middle English
2. Renaissance (1500-1660)
3. Restoration and 18th Century
4. 19th-Century British
5. American Literature to 1900
6. 20th-Century British and American

**Note: Courses taken to satisfy the Shakespeare and Chaucer or Milton requirements cannot be used to satisfy area distribution.**

### **B. Independent Studies**

Only one course numbered EGL 599, Independent Studies, will be permitted to count toward the total courses required for the degree of Master of Arts in English. EGL 599 cannot be elected during the student's first semester of work toward the master's degree. EGL 599 may be elected during the second semester only if the student has a B+ average the first semester and has no Incompletes at the time of registering for EGL 599. A proposal for a 599 course should be submitted in writing to the faculty member under whose direction the student plans to study. This proposal must be submitted before the end of

the semester previous to that in which the student will register for EGL 599. The proposal must be approved in writing by both the directing faculty member and the graduate program committee of the department before the student registers for EGL 599.

### **C. Foreign Language Requirement**

Competence in one foreign language may be satisfied by having completed the second year of a foreign language at the undergraduate level within the past five years with a grade of B or better, or by examination arranged by the English Department. The following languages are automatically accepted for fulfilling this requirement: Greek, Latin, Hebrew, French, German, Italian, Russian, and Spanish. Other languages relevant to a student's graduate program may be approved upon petition to the graduate program committee.

### **D. Master's Examination**

The master's examination is based on a reading list announced at the beginning of each academic year. The examination may be retaken only once.

## **Requirements for the M.A. Degree, Graduate Studies in Creative Writing**

In addition to the minimum requirements of the Graduate School the following are required:

### **A. Course Requirements**

Those admitted to Graduate Studies in Creative Writing must take three literature courses and four workshops. Each candidate must take workshops in at least two genres: fiction, poetry, drama, and nonfiction.

### **B. Master's Project**

Finally, students in Graduate Studies in Creative Writing are required to submit an extended work of substantial literary merit—for example, eight or ten short

stories, a novella, a novel, two one-act plays, a full-length play, a volume of poems, a film script—to be determined by the student's advisor and the creative writing area committee. One distinction of this curriculum is that the candidate begins the project under close supervision in the first rather than the second year. Students register for a total of nine credits toward completion of this project.

## **Transfer Credit and Standards of Performance in English at the M.A. Level**

Mindful that many applicants may have interrupted an earlier graduate career, the department permits the transfer of six hours of credit in suitable graduate work done elsewhere that resulted in a grade of B or better. The student must, however, make special application after admission. In all coursework done at Stony Brook, an average grade of B is the minimum required, but no more than two grades below B- will be permitted.

## **Requirements for the Ph.D. Degree in English**

In addition to the minimum requirements of the Graduate School, the following are required:

### **A. Course Requirements**

The minimum course requirement for students in the doctoral program is 11 courses, including at least seven 600-level seminars. No course with a grade below B- may be used to satisfy course requirements. An average grade of B or better in all coursework must be maintained at all times, and no more than two grades below B- will be permitted. No transfer credit is accepted at the seminar level.

One of the seven seminars the student must satisfactorily complete is the pro-seminar, EGL 600 The Discipline of Literary Studies. Students must take this course in their first fall semester in the program.

While the majority of courses for the Ph.D. requirements must be taken in the English Department, students may, in con-

sultation with their advisors, take courses of an equivalent level in other departments.

We assume students entering the Ph.D. program will have studied Chaucer, Shakespeare, Milton, and a variety of literary periods in their B.A. or M.A. programs. However, we welcome students with a variety of backgrounds into our Ph.D. program; those without the kind of broad-based knowledge outlined above will work out a suitable program of study with their advisors.

Students with teaching assistantships must take EGL 697 Teaching Practicum in their first fall semester in the Ph.D. program.

### **B. Foreign Language Requirements**

Students must complete one of two options:

*Option I:* Students must, on examination, demonstrate ability to translate writings of moderate difficulty in two foreign languages appropriate to the area of study and hence ability to make use of relevant literary and scholarly writings in those languages.

*Option II:* Students must, on examination, demonstrate (1) ability to read, understand, and speak well one living foreign language, or ability to read and understand well one classical language appropriate to the area of study, and (2) knowledge of the major literature of that language in the original language, and hence ability to make full use of the literature of another language. This option can be satisfied by passing a half-hour oral examination conducted in the language on the major literary figures or works of the language. Students should consult the graduate studies director about setting up such an examination. Passing the reading and/or comprehensive examination at the M.A. level shall not be sufficient evidence that the student has met Option II.

The following languages are automatically accepted for fulfilling the language requirement: Greek, Latin, Hebrew, French, German, Italian, Russian, and Spanish. Other languages relevant to a student's graduate program may be approved upon petition to the graduate studies director.

Students will not be permitted to take the special field examination without first satisfying the foreign language requirement. Students choosing Option I must satisfy one language requirement before taking the three area examinations and the second before taking the special field examination.

### **C. The General Examination**

The general examination is a three-part, three-hour oral with three examiners. Two parts of the examination must address different literary periods, and the third will either address another literary period or engage a problem or area of special interest (e.g., a genre, issues, or a line of theoretical inquiry).

In consultation with their examiners, students will offer reading lists for this examination that outline the area of inquiry for each part of their exam. The period lists may or may not vary from the traditional literary historical divisions of the anthologies; one of the purposes of the exam is to give students the opportunity to make sense of their lists. Whereas one student may follow traditional texts for a literary period, another may choose to study non-canonical texts within a traditional chronological range, while another may redefine the range (e.g., 1750-1850 or 1850-1945 instead of the 18th century, 19th century, or 20th century.)

Taking this examination brings students a step closer to entering a profession in which one writes and publishes scholarship and constructs and teaches courses. To address these facts of professional development, to facilitate students' studying and focus, and to enhance the conversations that make up the examinations:

1. For one of the three parts, the student will submit to his or her committee, at least two weeks prior to the exam, a 15-30 page paper related to that particular period or problem area. In most cases, this will be a revised seminar paper, and will include a bibliography. The paper is not intended as additional work but rather as a way for the student to organize an approach to one of the lists. During the exam, the paper will serve as a springboard for discussion of the entire period or problem area being examined.
2. For another of the three parts, the student will submit to his or her committee, at least two weeks prior to the exam, a syllabus and bibliography of background reading for an advanced undergraduate course in that period or problem area. Questions regarding pedagogical and theoretical approach, as well as inquiries into criteria of selection and content, will help to initiate and focus discussion of the entire period or problem area being examined.
3. For the third of the three parts, the student may simply invite questions without using one of the above devices, or may submit another paper or syllabus (or some other piece of writing agreeable to the committee) as a means of generating and directing discussion of the entire list.

The examination committee will consist of a chairperson selected by the student and two other faculty members appointed by the graduate studies director in consultation with the chairperson. The committee must be formed no later than the student's

fourth semester in the program (preferably earlier), and the exam must be taken before the end of the fifth semester. In consultation with his or her chairperson, the student may choose to take this exam in two parts. All three committee members must sign all three of the lists at least one month prior to the examination.

Each of the three parts will be judged separately, with a 2-1 committee vote constituting a pass for that part. Each failed part may be retaken one additional time, no later than a year after the original examination.

It is the responsibility of the examination committee chairperson to inform the Graduate Office in writing of the date, time, and place of the examination two weeks before the examination.

### **D. The Special Field Oral Examination**

This oral examination will be based on a written rationale and a reading list prepared by the student with the advice and approval of the student's chosen committee, and approved by the graduate studies director at least one month before the examination. The focus of the examination will be the topic that the student has chosen for his or her dissertation; thus, the reading list will embrace the various kinds of texts that the student must engage in order to begin writing. All three members of the examining committee will be chosen by the student.

Students are encouraged, but not required, to include a dissertation proposal as part of this examination. The special field oral examination may be retaken only once.

Students must contact the Graduate Office six weeks prior to the date they wish to be examined to fill out the necessary papers for scheduling this exam. The examination will be scheduled by the Graduate Office.

**All the doctoral requirements described above must be completed before a student is allowed to take the special field examination.**

### **E. Advancement to Candidacy**

After successful completion of the oral examination the student is recommended to the vice provost for graduate studies for advancement to candidacy.

### **F. Dissertation Seminar**

This seminar, which is recommended but not required, is designed to help students prepare their dissertation proposals and get their dissertations under way. It may not be used to fulfill the eleven course requirements.

### **G. Dissertation**

As soon as possible after passing the oral examination, students must prepare a written statement setting out the scope and method of the dissertation and submit it to their dissertation director and two other

members of the department who will serve as readers. After the student's director has conferred with the other readers and the dissertation committee has approved the proposal, the director will submit the proposal and names of the committee members to the graduate program committee of the department for its approval. The graduate studies director, in consultation with the student's dissertation committee, will name a reader from outside the department.

The four readers of the dissertation must recommend acceptance of the dissertation before it can be approved by the Graduate School. Students will present the results of dissertation research at a colloquium convened for that purpose by the Department of English, which will be open to interested faculty and graduate students.

#### **H. Teaching Program**

Training in teaching is stressed by the department and every student should expect to teach as part of the doctoral program. Teaching assistants instruct in a variety of courses including composition; introductions to poetry, fiction, and drama; tutoring in the Writing Center; and assisting in large lecture courses. An important part of the teaching experience is the Practicum in Teaching (EGL 697) required of all teaching assistants.

The director of writing programs for the English Department will, upon application, decide to what extent a student's teaching experience elsewhere will satisfy the requirements at Stony Brook.

#### **I. Residency Requirement**

The Graduate School requires at least two consecutive semesters of full-time graduate study beyond the baccalaureate. Students will be considered in full-time residence during any semester in which they (1) are taking at least one 500-level course or 600-level seminar or are, in the opinion of the graduate program committee, properly preparing for the special field oral examination; (2) are holding no position other than that required under the teaching program; or (3) are registered for EGL 690 Dissertation Research or EGL 699 Directed Reading for Doctoral Candidates, for three, six, nine, or 12 credit hours, depending on the number of other courses being taken and the teaching assignment, the total of all these credits and teaching hours to be no more than 12.

#### **J. The Graduate English Colloquium**

Doctoral students are encouraged to participate in the Graduate English Colloquium, a series of lecture-discussions by

members of the English faculty. The meetings of the colloquium, held in the late afternoon or evening, are intended to provoke engagement with important literary texts and provide informal opportunities to meet faculty and fellow students.

#### **K. Advising and Review of Student's Progress**

Each incoming student will meet with an assigned advisor before the start of classes to plan his or her first semester's coursework. The student will also meet with his or her advisor in November and May before preregistration for each semester's courses. At the end of the first year each student will select his or her own advisor and inform the Graduate Office in writing of the advisor's name. Students will meet at least once each semester with advisors to plan their coursework.

Each fall semester the graduate program committee will review each student's progress and determine whether the student may proceed with doctoral studies, may continue if certain requirements are met, or may not continue in the doctoral program because of unsatisfactory work.

#### **Matters Pertaining to All Advanced Degrees in English (including Graduate Studies in Comparative Literature and Creative Writing)**

A. Extension of time limits: Extensions of time limits are granted at the discretion of the graduate program committee of the department and the vice provost for graduate studies, and are normally for one year at a time.

B. Incompletes: The graduate program committee has established as sufficient grounds for the granting of Incompletes either a student's medical emergency or an emergency arising within a student's family.

C. Graduate courses in the 500 series are open to all graduate students. Courses in the 600 series are normally open only to students admitted to study for the Ph.D. degree, although M.A. students with adequate preparation and background can sometimes be admitted with the permission of the instructor. All graduate courses normally carry three credits.

Each course in the 500 and 600 series to be offered in a given semester will be described by the instructor in some detail in a special departmental announcement prepared and distributed toward the end of the semester prior to that in which it is to be offered. None of the courses numbered 690-699 can be taken to satisfy the requirement of seven seminars as stated in the sections outlining course requirements for the English and Comparative Literature departments.

## **Advisement**

There are a number of problems that the preceding explanations make no attempt to cover; for example, there are students whose careers may fall into two widely separated phases, whose previous records may show only a minor rather than a major interest in English or comparative literature, whose academic preparation now seems remote, or whose recent experiences have kindled new interests.

Students are encouraged to raise individual questions about the graduate program with the graduate studies director in English.

## **Courses**

All courses are for three credits, except where noted with an asterisk. Content varies each semester.

- EGL 501 Studies in Chaucer**
- EGL 502 Studies in Shakespeare**
- EGL 503 Studies in Milton**
- EGL 505 Studies in Genre**
- EGL 506 Studies in Literary Theory**
- EGL 509 Studies in Language and Linguistics**
- EGL 510 Old English Language and Literature**
- EGL 515 Middle English Language and Literature**
- EGL 520 Studies in the Renaissance**
- EGL 525 17th-Century Literature**
- EGL 530 Studies in the Age of Dryden**
- EGL 535 Studies in Neoclassicism**
- EGL 540 Studies in Romanticism**
- EGL 545 Studies in Victorian Literature**
- EGL 547 Late 19th-Century British Literature**
- EGL 550 20th-Century British Literature**
- EGL 555 Studies in Irish Literature**
- EGL 560 Studies in Early American Literature**
- EGL 565 19th-Century American Literature**
- EGL 570 20th-Century American Literature**
- EGL 575 British and American Literature**
- EGL 580 Poetry Workshop**
- EGL 581 Fiction Workshop**
- EGL 582 Drama Workshop**
- EGL 583 Nonfiction Workshop**
- EGL 585 Creative Writing Project**
- EGL 592 Problems in Teaching Writing or Composition**
- EGL 593 Problems in Teaching Literature**

- |          |   |          |   |
|----------|---|----------|---|
| EGL 594  | Contexts of Literary Study                                | EGL 608  | Problems in the Relationship of Literature to Other Disciplines |
| EGL 597* | Practicum in Methods of Research                          | EGL 611  | Critical Theory   |
| EGL 599  | Independent Study   | EGL 612  | Theories in Composition   |
| EGL 600  | Proseminar: The Discipline of Literary Studies            | EGL 613  | Research in Composition   |
| EGL 601  | Problems in History and Structure of the English Language | EGL 614  | Topics in Composition and Writing                               |
| EGL 602  | Problems in Bibliography, Editing, and Textual Criticism  | EGL 690* | Dissertation Research   |
| EGL 603  | Problems in Literary Theory and Criticism                 | EGL 695  | Methods of Teaching English                                     |
| EGL 604  | Problems in Literary Analysis                             | EGL 697  | Practicum in Teaching English Literature                        |
| EGL 605  | Problems in Convention and Genre                          | EGL 698  | Teaching Practicum  |
| EGL 606  | Period and Tradition                                      | EGL 699* | Directed Reading  |
| EGL 607  | Individual Authors  |          |   |

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*\*Variable and repetitive credit*



# French and Italian

## (FRN, ITL, DLF, DLI)

**Chairperson: Mario Mignone**

**Frank Melville, Jr. Memorial Library N4005 (516) 632-7440**

**Graduate Studies Director: Carol Blum**

**Frank Melville, Jr. Memorial Library N4003 (516) 632-7437**

### Degree Requirements Requirements for the M.A. Degree, Graduate Studies in French

A complete course of study in French language, literature, and culture is offered for candidates intending to teach at the secondary school level and for pre-Ph.D. candidates. In addition to the minimum Graduate School requirements, the following are required:

#### A. Course Requirements

	<u>Credits</u>
1. FRN 507 Advanced Stylistics	3
FRN 508 <i>Explication de texte</i>	3
Six courses in literature	18
2. Two electives; FRN 501 Contemporary French Culture and Institutions is highly recommended	6
Total	30

#### B. Performance

Average of B or better for all courses listed under item A is required.

#### C. Comprehensive Examination

At the completion of all coursework, candidates will take an oral and written comprehensive examination.

### Requirements for the M.A. Degree, Graduate Studies in Italian

The Department offers two tracks for concentration in Italian. In addition to the minimum requirements of the Graduate School, the following are required:

#### • Track I—Italian with Concentration in Literature

##### A. Course Requirements

	<u>Credits</u>
1. ITL 501 Contemporary Italy or one course in Romance philology or linguistics	3
ITL 508 Advanced Grammar and Stylistics	3
ITL 511 History of the Italian Language	3
Six courses in literature	18
2. Elective	3
Total	30

Special permission may be granted to replace two of the literature courses (6 credits) with a thesis.

#### B. Performance

Average of B or better for all courses listed under item A is required.

#### C. Comprehensive Examination

At the completion of all coursework, candidates will take an oral and written comprehensive examination.

#### • Track II—Italian with Concentration in Language

##### A. Course Requirements

	<u>Credits</u>
1. ITL 501 Contemporary Italy, ITL 502 <i>Italia in Transizione</i>	6
ITL 505 Strategies for Teaching Italian or any Romance philology or linguistics course	3
ITL 508 Advanced Grammar and Stylistics	3
ITL 511 History of the Italian Language	3
Three courses in literature	9
2. Electives	6
Total	30

#### B. Performance

Average of B or better for all courses listed under item A is required.

#### C. Comprehensive Examination

At the completion of all coursework, candidates will take an oral and written comprehensive examination.

### Requirements for the M.A. Degree in Romance Languages, Concentrations in French and Italian, French and Spanish, or Italian and Spanish

Candidates will choose one language as a major and one as a minor, and must be able to do graduate work in both. To qualify for the degree the M.A. candidate in French and Italian, French and Spanish, or Italian and Spanish will normally complete 36 credit hours (12 courses). The distribution of these courses will vary according to whether the student chooses Track I, with a concentration in literature, or Track II, with a concentration in language.

In addition to the minimum requirements of the Graduate School, the following are required:

#### • Track I—French and Italian with Concentration in Literature

##### A. Course Requirements

Major in French\*

1. FRN 501 Contemporary French Culture and Institutions  
FRN 507 Advanced Stylistics  
FRN 508 *Explication de texte*
2. At least 15 credits in literature divided between Group 1 (16th-, 17th-, and 18th-century literature) and Group 2 (19th- and 20th-century literature)

Minor in Italian\*\*

3. ITL 501, ITL 508
4. Two literature courses to be chosen with permission of advisor

Major in Italian\*

1. ITL 501 Contemporary Italy or ITL 502 *Italia in Transizione*  
ITL 508 Advanced Grammar and Stylistics  
ITL 511 History of the Italian Language or one course in stylistics
2. At least 15 credits in literature divided between Group 1 and Group 2 (see item A,2 above)

Minor in French\*\*

3. FRN 501 or 508, FRN 507
4. Two literature courses to be chosen with permission of advisor

**B. Performance**

Average grade of B or better for all courses listed under item A is required.

**C. Final Examination**

The final examination will cover two areas of specialization in each field, one from group 1 and one from group 2 (e.g., Modern French and Italian Literature and Medieval and Renaissance French and Italian Literature).

**• Track II—French and Italian with Concentration in Language**

**A. Course Requirements**

Major in French\*

1. FRN 501 Contemporary French Culture and Institutions  
FRN 507 Advanced Stylistics  
FRN 508 *Explication de texte*  
3 credits in approved linguistics elective
2. At least 9 credits (three courses) in literature in one area of concentration (see groups 1 and 2 in literature track, item A,2) and one elective

Minor in Italian\*\*

3. ITL 501  
ITL 508
4. Two literature courses in the area of concentration

Major in Italian\*

1. ITL 501 Contemporary Italy  
ITL 508 Advanced Grammar and Stylistics  
3 credits in approved linguistics elective
2. At least 9 credits (three courses) in literature in one area of concentration (see groups 1 and 2 in literature track, item A,2) and one elective

Minor in French\*\*

3. FRN 501  
FRN 507

4. Two literature courses in the area of concentration

**B. Performance**

Average grade of B or better for all courses listed under item A is required.

**C. Comprehensive Examination**

At the completion of all coursework candidates will take an oral and written comprehensive examination.

\* Total of 24 major credits

\*\* Total of 12 minor credits.

Total credits required: 36

**• French and Spanish**

**A. Course Requirements**

<b>French</b>	<u>Credits</u>
1. FRN 501 Contemporary French Culture and Institutions	3
FRN 507 Advanced Stylistics	3
FRN 508 <i>Explication de texte</i>	3
<b>Spanish</b>	
SPN 501 Spanish Linguistics	3
SPN 510 The Hispanic Culture	3
SPN 515 Spanish Composition and Stylistics	3
Approved linguistics elective	3
Total	21

2. At least 12 credits (four courses) in literature in two areas of concentration (6 credits each), three in French and three in Spanish. One area will be chosen from group A, and the other from group B:

A

1. 20th Century
2. 19th Century
3. Theatre
4. Prose Fiction
5. Lyrics (6 credits)

B

1. Enlightenment
2. French Baroque, Classical Theatre, and Spanish Golden Age
3. Medieval (6 credits) 12
3. Elective 3
| Total | 36 |

**B. Performance**

Average of B or better for all courses listed under item A is required.

**C. Comprehensive Examination**

At the completion of all coursework, candidates will take an oral and written comprehensive examination.

**• Italian and Spanish**

**A. Course Requirements**

<b>Italian</b>	<u>Credits</u>
1. ITL 501 Contemporary Italy	3
ITL 508 Advanced Grammar and Stylistics	3
ITL 511 History of the Italian Language or linguistics course	3
Approved linguistics elective	3
<b>Spanish</b>	
SPN 501 Spanish Linguistics	3
SPN 510 Hispanic Culture	3
SPN 515 Spanish Composition and Stylistics	3
Total	21

2. At least 12 credits (four courses) in literature in two areas of concentration (6 credits each). The student will select two areas of concentration and will take 6 credits (two courses) in each of them, three in Italian and three in Spanish. One area will be chosen from group A, and the other from group B:

A

1. 20th Century
2. 19th Century
3. Theatre
4. Prose Fiction
5. Lyrics (6 credits)

B

1. Italian Renaissance, Baroque, and Spanish Golden Age
2. Medieval (6 credits) 12

3. Elective 3
| Total | 36 |

**B. Performance**

Average of B or better for all courses listed under item A is required.

**C. Comprehensive Examination**

At the completion of all coursework, candidates will take an oral and written comprehensive examination.

## Requirements for the Doctor of Arts Degree in Foreign Language, Graduate Studies in French and/or Italian

<b>A. Major Field Courses</b>	<u>Credits</u>
French Major	
Phonetics/Phonology of French	3
Morphology/Syntax of French	3
History of the French Language	3
French Stylistics or Literary Translation	3
French Culture and Civilization	3
Three courses in French literature to be selected from courses within the department	9
	24
Italian Major	
Phonetics/Phonology of Italian	3
Morphology/Syntax of Italian	3
History of the Italian Language	3
Italian Stylistics or Literary Translation	3
Italian Culture	3
Three courses in literature to be selected from courses within the department	9
	24
<b>B. Professional Courses</b>	
Second Language Acquisition	3
Methods of Foreign Language Teaching	3
Practicum	3
Internship or Externship	3
	12

Additional courses may be required to meet individual needs upon consultation with the major advisor and the program director.

Degree candidates who are full-time teachers will, where possible, do their externship at an institution other than where they normally teach, e.g., high school teachers will be encouraged to teach an evening college course, and those teaching at a two-year or four-year college will be encouraged to teach at the secondary school level. When these arrangements are not possible, other provisions will be made in consultation with the D.A. committee.

### C. Language Proficiency

Upon completion of 24 credits, all candidates will be expected to demonstrate proficiency in the major language.

Proficiency in the major language may be demonstrated:

1. By written recommendation of professors of the pertinent courses taken; or
2. Upon recommendation of the supervisor of the practicum, internship, or externship; or
3. By formal written examination (MLA) when the major advisor and D.A. committee deem it necessary.

Unsuccessful candidates may request a second testing during the subsequent semester.

### D. Practical Experience

All candidates are required to fulfill the following teaching assignments during the program:

1. *Practicum*: The student is given charge of a three-hour section in a beginning or intermediate course in the area of language instruction. The practicum is to be assigned after the student has successfully completed a course in language instruction. This experience includes defining objectives, grading, and testing.
2. *Internship*: The student is apprenticed to a professor in charge of an appropriate literature, linguistics, and/or culture course for at least one semester. The internship may not precede the practicum.
3. *Externship*: The student will be required to teach at the undergraduate or secondary level in the local area, when feasible.

### E. Final Evaluation

The final evaluation will be based directly on the specific program of study that the candidate has completed. In addition to demonstrating mastery of the individual curriculum requirements, the candidate is expected to evidence a certain synthesis of knowledge based on the component parts of the program. This final examination will be scheduled twice yearly, in November and April.

1. The final evaluation is to include both a written and an oral comprehensive examination and will include topics from all areas covered in the program. The comprehensive examination will be administered only after the candidate has demonstrated competence in the major area and in language instruction and methodology. All candidates will be provided with a basic reading list. However, it will be the responsibility of the candidates to prepare, with their major advisors, the optional part of the reading list to cover their individual specialties.

2. *Dissertation*: After the comprehensive exam the candidates, in consultation with their dissertation director, must submit a dissertation proposal which will be reviewed by the D.A. committee. After the proposal is approved, a dissertation director and two readers will be appointed, in consultation with the program director. Six optional thesis credits are available for those who desire them.

### Transfer Credit

The D.A. committee may accept six post-M.A. transfer credits earned within the past five years from non-SUNY institutions. Nine credits may be accepted from all SUNY institutions.

Normally, a maximum of six credits of CED courses or CED crosslisted courses may be transferred. Under special circumstances and with approval of the department and the graduate studies director, additional CED/crosslisted credits may be counted toward the D.A. requirements.

### French Courses

#### FRN 500 Techniques of Reading for Graduate Research

Through intensive study of language structures and idiomatic usage, with extensive practice in written translation of scholarly texts, candidates for advanced degrees are able to attain the proficiency level of the graduate French reading requirement. Several departments grant exemption from further examination for successful completion of this course.

*Fall or spring, 3 credits*

#### FRN 501 Contemporary French Culture and Institutions

Analysis of contemporary French civilization through the study of the development of its historical, cultural, political, and social characteristics. Designed for potential teachers of French at the college level as well as in secondary schools, this course will emphasize and trace the evolution of the character and institutions of contemporary France.

*Fall or spring, 3 credits*

#### FRN 507 Advanced Stylistics

Stylistic theory and analysis. Problems of syntax and structure. Translations from English to French and French to English of texts from different modes and levels of discourse. Designed to develop and refine written expression in French and analysis of literary texts.

*Fall or spring, 3 credits*

#### FRN 508 Explication de Texte

This course is designed to develop sensitivity to literary texts. Emphasis will be placed upon weekly *explication de texte*, beginning with Renaissance literature and proceeding to the modern period, in which analysis will be made of those effects that, taken together, constitute a given author's stylistic pattern.

*Fall or spring, 3 credits*

#### FRN 509 Introduction to Bibliography

Students will acquaint themselves with library resources, organization, reference materials, catalogs, and computer access. Each student is to compile a bibliography on a topic related to his or her special field of interest.

*Spring, 1 credit*

**FRN 510 French Phonetics and Diction**

The pronunciation of French with emphasis on intonation and articulation. Theory and practice of linguistic and phonetic factors of the sound system. Coursework includes phonetic transcriptions, recordings, and diagnostic texts. Language laboratory required.

Fall or spring, 3 credits

**FRN 514 Seminar in Medieval French Literature**

This course may be repeated for credit when topic changes. Topic to be arranged. Not offered in 1990-91.

**FRN 521 Literature of the French Renaissance**

A study of the major literary and cultural developments characteristic of the civilization of the Renaissance in France. The works of such writers as Rabelais and Montaigne will serve as both focus and starting point for broader inquiry into the artistic, social, and cultural movements accompanying the rebirth of art and letters in France.

Fall or spring, 3 credits

**FRN 531 Studies in the Classical Theatre**

Analysis of classical dramaturgy and some of the major themes of 17th-century tragedy and comedy. Careful reading of Corneille, Racine, and Molière.

Fall or spring, 3 credits

**FRN 532 *Penseurs, Moralistes, et Mondains***

Intensive reading and analysis of selected texts by authors such as Descartes, Pascal, La Fontaine, La Rochefoucauld, La Bruyère, Mme. de Sévigné, and Mme. de Lafayette. Changing topic.

Fall or spring, 3 credits

**FRN 541 Studies in 18th-Century French Literature**

A study of the major texts in the 18th-century struggle between absolutism and the emerging forces of Enlightenment, as well as readings in preromanticism. In addition to the works of Montesquieu, Voltaire, Diderot, Rousseau, Beaumarchais, and Laclos, other types of writing, such as Bayle's dictionary and the *Encyclopédie*, will be examined.

Fall or spring, 3 credits

**FRN 542 Seminar in 18th-Century French Literature**

Special topics in eighteenth-century literature, such as "Representing the French Revolution," "Dialogics in Diderot and Rousseau," "The Concept of the Individual," and "*Femme, Cloture, Ecriture*," will be studied through the works of major writers of the period as well as those of lesser-known figures like Mme. de Graffigny, Mme. Riccoboni, Mme. d'Épinay, Olympe de Gouges, and other revolutionaries such as Mirabeau, Saint-Just, Condorcet, and Robespierre.

Fall or spring, 3 credits

**FRN 551 Studies in Romanticism**

Reading and research in the background and manifestation of romanticism in French literature.

Fall or spring, 3 credits

**FRN 552 Studies in 19th-Century French Literature**

Close reading of selected works by major authors of the period, such as Balzac, Stendhal, Flaubert, Zola or Baudelaire, Mallarmé, Verlaine, and Rimbaud, with an introduction to some important critical approaches to these texts. Changing topic.

Fall or spring, 3 credits

**FRN 561 Seminar in 20th-Century French Literature**

Investigations of special topics and movements in 20th-century French prose, poetry, and theatre based on the study of the works of such authors

as Cocteau, Colette, Sartre, Beckett, Ionesco, Romain Rolland, Camus, Mauriac, Gide, Malraux, and Proust.

Fall and spring, 3 credits

**FRN 562 Studies in Contemporary Literature**

The active pursuit of humanist ideas from Anatole France to Louis Guilloux, from Romain Rolland to Camus, with emphasis on the works of Valéry Larbaud, Roger Martin du Gard, André Gide, André Malraux, and Sartre.

Fall and spring, 3 credits

**FRN 581 Independent Individual Studies**

Fall and spring, 1-6 credits, repetitive

**FRN 599 Practicum in Teaching**

Fall and spring, variable and repetitive credit

**Italian Courses****ITL 500 Reading Italian**

Designed to prepare graduate students to read contemporary research in their respective disciplines published in Italian, the course will present systematic instruction in the fundamentals of reading comprehension and in specialized subject-oriented vocabulary.

Fall or spring, 3 credits

**ITL 501 Contemporary Italy**

Analysis of contemporary Italy and its civilization through the study of the development of its historical, cultural, political, and social characteristics. Designed for potential teachers of Italian at the college as well as secondary school levels, this course will emphasize and trace the evolution of the character and institutions of contemporary Italy. Crosslisted with CEH 595.

Fall or spring, 3 credits

**ITL 502 *Italia in Transizione***

This course will examine the impact on Italy of new issues such as feminism, and of unresolved problems such as that of the underdeveloped South, from 1968 to the present. Readings will come from leading Italian daily newspapers and newsmagazines, as well as from books dealing with individual problems. Completion of one research project required.

Spring, alternate years, 3 credits

**ITL 505 Strategies for Teaching Italian**

A workshop for teachers of Italian on all levels. Teaching strategies will be discussed and demonstrated. Materials will be developed by the participants. Guest lecturers and workshop leaders from various levels of instruction will assist with several aspects of the course. Topics will include communicative skills, use of realia, testing, visuals, and teaching culture.

Fall or spring, 3 credits

**ITL 507 Italian Linguistics: Diachronic Development and Synchronic Structures**

An examination of the linguistic evolution and the synchronic grammars (phonology, morphology, syntax) of standard Italian and some Italo-Romance dialects.

Fall or spring, 3 credits

**ITL 508 Advanced Grammar and Stylistics**

This course is designed to analyze and discuss the finer points of Italian grammar and to investigate diverse styles in writing. Students will be expected to develop grammatical drills from elementary through advanced levels. Literary masterpieces will be translated from English to Italian in order to demonstrate types of style and possible alternatives in writing.

Fall or spring, 3 credits

**ITL 509 Contrasting Italian and English**

This course seeks to isolate and analyze interference patterns in English-speaking persons learning the Italian language, on all levels—phonetic, morphological, syntactic, and lexical. It should be especially desirable for those planning to teach the language to native English speakers.

Prerequisite: Good knowledge of Italian  
3 credits

**ITL 510 Romance Philology (in English)**

General processes of language change, as exemplified by the development of the Romance languages, with particular reference to Italian and French.

Spring, alternate years, 3 credits

**ITL 511 History of the Italian Language**

A study of the development of the Italian language beginning with its origins in Latin, through the vulgate (dialects), and finally as an outgrowth of Tuscan.

Spring, alternate years, 3 credits

**ITL 513 Romance Linguistics**

This course will examine the linguistic evolution of the Romance languages from the classical period through modern times. The synchronic grammars of Italian, French, and Spanish will be examined. This course will be conducted in English, but students must be fluent in at least one Romance language and must be familiar with Latin and at least one other Romance language.

Spring, alternate years, 3 credits

**ITL 516-517 Seminar on Dante**

The *Vita Nuova*, the *Opere Minori* and the *Divine Comedy* will be studied based on the historical, social, and moral contexts of 13th- and 14th-century Italy.

Fall and spring, 3 credits

**ITL 518 Boccaccio: Seminar**

The course emphasizes the origin of Italian prose fiction as seen through the first attempts at the short story, such as the *Novellino*, but it will deal mainly with Boccaccio's *Decameron* as the perfection of the genre.

Fall or spring, 3 credits

**ITL 522 Seminar in Italian Humanism and Renaissance Literature**

Analysis of the works of such writers as Petrarca, Boccaccio, Ariosto, Machiavelli, Castiglione, Aretino, Tasso, and Michelangelo. Study of the relation of the individual works of these writers to broader historical, cultural, and intellectual developments of the period. This course may be repeated for credit with a different topic.

Fall or spring, 3 credits

**ITL 541 Studies in 17th- and 18th-Century Italian Literature**

A study of baroque and Enlightenment literature in Italy, which also takes into consideration the development of other, peripheral genres such as opera, philosophy, and scientific prose. Authors examined include Galileo, Marino, Metastasio, Vico, Goldoni, Alfieri, and others. The topics will vary from semester to semester, depending on the authors selected.

Fall or spring, 3 credits

**ITL 551 Studies in Italian Romanticism**

Italian romanticism is unique and it will be compared with the movement as it took place in other countries, such as England, Germany, and France. The works of Foscolo, Leopardi, and Manzoni will be studied in the philosophical and sociological contexts of the period.

Fall or spring, 3 credits

**ITL 552 Studies in the Modern Novel**

A study of the development of the Italian novel from Verga to the latest trends. Stress will be

placed on the major shifts in sensibility occurring at the beginning of the 19th century and after World War II. This course may be repeated for credit with a different topic.

*Fall or spring, 3 credits*

**ITL 562 Studies in Contemporary Literature**

*Contemporary Italian Poetry:*

*The Quest for Meaning*

Contemporary Italian poetry reflects a universe that does not answer to human expectations and desires. Although without faith or hope, the poets cannot become prisoners of ignorance about their own destiny, and conduct an indomitable search for new values and answers. Besides the poetry of the two Nobel Prize winners, Quasimodo and Montale, readings will include selected poems by other outstanding poets such as Ungaretti, Saba, Compara, and Pasolini. This course may be repeated with a different topic.

*Fall or spring, 3 credits*

**Modern Literature**

Decadentism, futurism, new realism, and new avant-garde considered as expressions of a total cultural experience through discussion of work of authors such as Svevo, Marinetti, Pirandello, Moravia, Pavese, Vittorini, Montale, Ungaretti, Quasimodo, and others. Specific topics will be poetry, fiction, and theatre. This course may be repeated with a different topic.

*Fall or spring, 3 credits*

**ITL 571 Italian Autobiography**

A study of the development of introspection and self-awareness in Italian autobiography from Petrarch to the 20th century.

*Fall or spring, 3 credits*

**ITL 581 Independent Individual**

**Studies**

*Fall and spring, variable and repetitive credit*

**ITL 599 Practicum in Teaching**

*Fall and spring, variable and repetitive credit*

**D.A. Courses**

*The following courses are available only to candidates in the Doctor of Arts program:*

**DLF 601, DLI 601 Internship in Foreign Languages: French and Italian**

Students in the Doctor of Arts program will assist an instructor as an aide in a literature, culture, or language course on the undergraduate level.

*Fall and spring, 1-3 credits*

**DLF 602, DLI 602 Externship in Foreign Languages: French and Italian**

Students in the Doctor of Arts program will teach one to three courses at the high school, junior college, or college level under the supervision of a master teacher.

*Prerequisite:* All other coursework completed

*Fall and spring, 1-3 credits*

**DLF 699, DLI 699 Doctoral Research in Foreign Languages: French and Italian**

Independent research for the Doctor of Arts degree. Open only to candidates for the Doctor of Arts who have passed the preliminary examination.

*Fall and spring, 1-6 credits, repetitive*

# Genetics (BGE)

*Graduate Studies Director: Nicholas Muzyczka*  
*Life Sciences Building 260 (516) 632-8817*

## **Degree Requirements Requirements for the M.A. Degree**

Graduate Studies in Genetics normally does not accept a student whose goal is a master's degree. In exceptional instances, a student already in the Graduate Studies may be awarded an M.A. degree upon completing an approved course of study, including a minimum of 30 graduate credit hours, passing a comprehensive examination, presenting and defending a research thesis, and fulfilling the minimum requirements of the Graduate School.

## **Requirements for the Ph.D. Degree**

In addition to the requirements of the Graduate School, the following are required:

### **A. Course Requirements**

1. Molecular Genetics (HBM 503/BMO 521).
2. Graduate Genetics (BGE 510).
3. Graduate Biochemistry (BMO 520), Population Genetics (BGE 540).
4. Graduate Student Seminar in Genetics (BGE 531) must be taken four semesters.
5. Laboratory Rotation in Genetics (BGE 530) two semesters. The student will generally work in two different laboratories during the two semesters. The particular laboratories will be decided by the student's advisory committee in conjunction with the student. One or two additional rotations may be taken in the summer.
6. The faculty feels that each student will require advanced training appropriate to the student's area of specialization within genetics. Requirements for any specific student, in addition to those enumerated above, will be determined by the student's advisory committee.

### **B. Comprehensive (Preliminary) Examination**

At the end of the fourth semester, the student will take a written comprehensive (preliminary) examination covering all areas of genetics.

### **C. Thesis Proposal Examination**

After successful completion of the comprehensive (preliminary) examination, the student selects a thesis advisor and writes a proposal for thesis research. After approval by the thesis advisor, the proposal is orally defended before a thesis committee. The defense should generally occur by the end of the fifth semester.

### **D. Advancement to Candidacy**

After successful completion of all required and elective courses, the comprehensive (preliminary) examination, and the thesis proposal examination, the student will be recommended to the Graduate School for advancement to candidacy.

### **E. Ph.D. Dissertation**

The research for the Ph.D. dissertation is conducted under the supervision of the thesis committee. Upon approval of the completed dissertation by this committee, a dissertation examining committee is appointed by the vice provost for graduate studies. A formal public oral defense of the dissertation is scheduled, at which the student presents his or her findings and is questioned by members of the examining committee and by other members of the audience.

### **F. Teaching Requirement**

It is expected that each graduate student completing a doctoral degree will have functioned as a teaching assistant during at least two semesters of his or her graduate career (BIO 600).

### **G. Residence Requirement**

The university requires at least two consecutive semesters of full-time graduate study. The demands of the course of study necessitate a longer period of residence.

## **Courses**

### **BGE 510 Graduate Genetics**

This introductory course for graduate students will cover a specific topic each time it is offered and will treat that topic from different scientific perspectives, such as molecular genetics, developmental genetics, immunogenetics, evolutionary genetics, and human genetics. The semester topics will include genetic recombination, mutation, and gene organization.

*Prerequisite:* Permission of instructor  
*Spring, 3 credits*

### **BGE 530 Laboratory Rotation**

The student rotates through two professors' laboratories during the first year. The selection of laboratories is made by the student in consultation with his or her advisory committee. By taking part in ongoing projects the student will learn experimental procedures and techniques and become acquainted with research opportunities in the participating departments.

*Prerequisite:* Permission of instructor  
*Fall and spring, 2 credits each semester*

### **BGE 531 Graduate Student Seminar in Genetics**

Seminars are given by graduate students on the current literature in genetics.

*Prerequisite:* Permission of instructor  
*Fall and spring, 1 credit each semester*

### **BGE 540 Readings in Genetics**

*Prerequisite:* Permission of instructor  
*Fall, 1-3 credits, variable*

### **BGE 550 Genetics Seminar**

A weekly series of seminars in genetics given by outstanding visiting scientists, supplemented by members of the staff, postdoctoral students, and advanced graduate students.

*Prerequisite:* Permission of instructor  
*Fall and spring, 1 credit each semester*

### **BGE 599 Research**

Original investigation undertaken with the supervision of a member of the staff.

*Fall and spring, 1-9 credits, variable*

### **BGE 699 Dissertation Research**

Original investigations undertaken as part of the Ph.D. program under supervision of a member of the staff.

*Prerequisite:* Advancement to candidacy  
*Fall and spring, 1-9 credits, variable*

# Germanic and Slavic Languages and Literatures (GER, SLV, DLG, DLR)

*Chairperson: Thomas Kerth*  
*Frank Melville, Jr. Memorial Library N3011 (516) 632-7360*

*Graduate Studies Director: Russell Brown*  
*Frank Melville, Jr. Memorial Library N3003 (516) 632-7361*

## Degree Requirements

### Requirements for the M.A. Degree in Germanic Languages and Literatures

#### • Option 1:

#### A. Course Requirements

	<i>Credits</i>
1. GER 549 Modern Trends in Literary Theory	3
One 20th-century German literature course: e.g., GER 545 or GER 546	3
GER 557 History of the German Language	3
GER 561 <i>Goethezeit</i>	3
GER 599 Thesis	6
2. Four additional offerings at the graduate level from courses within the department or, upon prior approval by the department, from those of other departments within the Graduate School	12
	30

#### B. Performance

Average of B or higher for required courses.

#### C. M.A. Paper

Submission of a scholarly essay on a topic and of a standard acceptable to the department is required.

#### • Option II:

#### A. Course Requirements

No thesis required—all 30 credits can be fulfilled by coursework as follows:

	<i>Credits</i>
1. GER 504 German Cultural History	3
GER 539 Contrastive Structures	3
One course in older Germanic languages: e.g., GER 558, GER 562, or GER 563	3
One course in 20th-century German literature: e.g., GER 545 or GER 546	3
2. Six additional offerings at the graduate level from courses within the department or, upon prior approval by the department, from those of other departments within the Graduate School.	18
	30

#### B. Performance

Average of B or better for all courses listed under item A is required.

### Requirements for the M.A. Degree in Slavic Languages and Literatures

#### A. Course Requirements

	<i>Credits</i>
SLV 571 Comparative Slavic Linguistics	3
RUS 506 Stylistics of Russian	3
SLV 504 Topics in Slavic Cultures	3
RUS 539 Strategies of Teaching Russian	3
Special Topic in Slavic Language I, II	6

One course in 19th-century Russian literature	3
One course in 20th-century Russian literature	3
Two electives at the graduate level with approval of the department	6
	30

#### B. Language Proficiency

The required proficiency in Russian and one other Slavic language may be met by one or more of the following:

1. A proficiency examination administered by the department according to ACTFL guidelines
2. Appropriate coursework in the department in consultation with the graduate studies director
3. One semester of study abroad in an approved program in Eastern Europe or the Soviet Union

#### C. Thesis

A master's thesis or comprehensive examination based on a reading list and coursework is required.

Students in the M.A. program in Germanic Languages and Literatures and in the M.A. program in Slavic Languages and Literatures are subject to Graduate School regulations and policies with respect to transfer credit, extension of time limitation, grade point average, supervised teaching experience, registration, and other requirements.

### Requirements for the D.A. Degree in Foreign Language

A minimum of 36 credits is required, to be distributed as follows:

<b>A. Major Field Courses</b>		<b>Credits</b>
<b>German Major</b>		
Phonetics/Phonology of German	3	
Morphology/Syntax of German	3	
History of the German Language	3	
German Stylistics or Literary Translation	3	
German Culture and Civilization	3	
Three courses in German literature to be selected from courses within the department.	9	
	<hr/>	24
<b>Russian Major</b>		
Phonetics/Phonology of Russian	3	
Morphology/Syntax of Russian	3	
History of the Russian Literary Language	3	
Russian Stylistics or Literary Translation	3	
Russian or Slavic Culture	3	
Three courses in Russian literature to be selected from courses within the department.	9	
	<hr/>	24
<b>B. Professional Courses</b>		
Second Language Acquisition	3	
Methods of Foreign Language Teaching	3	
Practicum	3	
Internship or Externship	3	
	<hr/>	12

Additional courses may be required to meet individual needs upon consultation with the major advisor and the program director.

Degree candidates who are full-time teachers will, where possible, do their externship at an institution other than where they normally teach, e.g., high school teachers will be encouraged to teach an evening college course. Those teaching at a two-year or four-year college will be encouraged to teach at the secondary school level. When these arrangements are not possible, other provisions will be made in consultation with the D.A. committee.

**C. Language Proficiency**

Upon completion of 24 credits, all candidates will be expected to demonstrate proficiency in the major language.

Proficiency in the major language may be demonstrated:

1. By written recommendation of professors of the pertinent courses taken; or

2. Upon recommendation of the supervisor of the practicum, internship, or externship; or
3. By formal written examination (MLA) when the major advisor and D.A. committee deem it necessary.

Unsuccessful candidates may request a second testing during the subsequent semester.

**D. Practical Experience**

All candidates are required to fulfill the following teaching assignments during the program:

1. *Practicum*: The student is given charge of a three-hour section in a beginning or intermediate course in the area of language instruction. The practicum is to be assigned after the student has successfully completed a course in language instruction. This experience includes objectives, grading, and testing.
2. *Internship*: The student is apprenticed to a professor in charge of an appropriate literature, linguistics, and/or culture course for at least one semester. The internship may not precede the practicum.
3. *Externship*: The student will be required to teach at the undergraduate or secondary level in the local area, when feasible.

**E. Final Evaluation**

The final evaluation will be based directly on the specific program of study that the candidate has completed. In addition to demonstrating mastery of the individual curriculum requirements, the candidate is expected to evidence a certain synthesis of knowledge based on the component parts of the program. This final examination will be scheduled twice yearly, in November and April.

1. The final evaluation is to include both a written and an oral comprehensive examination and will include topics from all areas covered in the program. The comprehensive examination will be administered only after the candidate has demonstrated competence in the major area and in language instruction and methodology. All candidates will be provided with a basic reading list. However, it will be the responsibility of the candidates to prepare, with their major advisors, the optional part of the reading list to cover their individual specialties.
2. *Dissertation*: After the comprehensive exam the candidates, in consultation with their dissertation director, must submit a dissertation proposal, which will be reviewed by the D.A. committee. After

the proposal is approved, a dissertation director and two readers will be appointed, in consultation with the program director. Six optional thesis credits are available for those who desire them.

**Transfer Credit**

The doctor of arts committee may accept six post-M.A. transfer credits earned within the past five years from non-SUNY institutions. Nine credits may be accepted from all SUNY institutions.

Normally, a maximum of six credits of CED courses or CED crosslisted courses may be transferred. Under special circumstances and with approval of the department and the graduate studies director, additional CED crosslisted credits may be counted towards the D.A. requirements.

**Requirements for the Ph.D. Degree in Germanic and Slavic Languages and Literatures\***

In addition to the minimum requirements, the following are required:

**A. Course Requirements**

In addition to those listed under the master's degree, students must take the following courses:

	<b>Credits</b>
1. In preparation for the independent research involved in the dissertation, students must take at least two advanced tutorials:	
GER 601 Special Author	3
GER 602 Special Period	3
2. Six additional offerings at the graduate level from courses within the department or, with prior approval from the department, from those of other departments within the Graduate School. (Students should note that the comprehensive examination can be expected to cover material drawn from not only the four courses listed under the M.A. requirements but also GER 558 Middle High German and GER 563 Old High German).	
	<hr/>
	18
	<hr/>
	24

\*The doctoral program is currently not accepting new students.



Persons wishing to stress Germanic philology will be encouraged to do so by substituting appropriate courses from within the department's offerings as well as those from other departments, such as FRN 511, EGL 509, EGL 510, EGL 515, and EGL 601.

Graduate work in Slavic is offered and may be credited toward the M.A.L.S., D.A., and Ph.D. degrees.

### B. Comprehensive Examination

Before the end of the fourth semester of full-time residence after receiving the M.A., a student will be required to take and pass the departmental comprehensive examination testing knowledge and critical understanding of German literature and language.

### C. Foreign Language Requirements

A student who has not fulfilled the language requirement during the master's program must pass an examination in at least one other ancient or modern language approved by the department.

### D. Dissertation Subject

A candidate must present a proposal for a doctoral dissertation that is supported by the member of the department who has agreed to sponsor the dissertation.

### E. Residence Requirement

A minimum of two consecutive semesters of full-time study is required.

## German Courses

### GER 500 Intensive Reading German

Intensive introductory German for graduate students in other programs. Practice in reading and translation; German prose; use of dictionaries and reference materials; as much attention as possible to special problems of various disciplines.

*Fall and spring, 3 credits each semester*

### GER 501 Strategies of Teaching German

Detailed examination of various approaches to teaching German as a foreign language, conventional teaching aids, use of media in instruction. (Given at Goethe House in New York City.)

*Fall, 3 credits*

### GER 502 Language Practicum

Techniques of classroom instruction; teacher and peer visitation and evaluation. To be taken in conjunction with initial teaching assignment.

*Fall and spring, 3 credits each semester*

### GER 503 Literature Practicum

Apprenticeship to a senior professor for work in an undergraduate literature course. Preparation and delivery of lectures. Evaluation of students' performance in class and written work.

*Fall and spring, 3 credits each semester*

### GER 504 German Cultural History

Examination of major developments in the German speaking countries in the areas of history, philosophy, education, and the arts as related to various literary periods.

*Spring, 3 credits*

### GER 505 Minor Germanic Languages

German loan words in Scandinavian: Intensive study of Swedish, Dutch, or Danish, as indicated, and their relation to English and German.

*Fall, 3 credits*

### GER 506 Advanced Stylistics

Advanced stylistics and textual analysis. Designed to deepen the advanced student's knowledge of the finer points of syntax, structure, and stylistic versatility of the German language.

*Spring, 3 credits*

### GER 539 Contrastive Structures:

#### German-English

Contrastive study of German and English language structure.

*Fall, 3 credits*

### GER 541 Literature of the

#### Goethe Period

*Die Weimarer Klassik*: Goethe and Schiller. The major figures considered as poets, philosophers, and theoreticians of the arts and literature.

*Spring, 3 credits*

### GER 542 Literature of the

#### Romantic Period

Selections from representative prose works, drama, and poetry from the period 1795-1830 are examined from various perspectives, including the sociology of literature.

*Fall or spring, 3 credits*

### GER 545 20th-Century Prose

#### and Poetry

A survey of 20th-century prose and/or poetry with emphasis on the poetry of expressionism.

*Spring, 3 credits*

### GER 546 20th-Century Drama

Concentration on aspects of modern drama, e.g., Brecht's anti-illusionistic theater, and drama as a vehicle for dissemination of political ideology. Readings will also include works by Ionesco, Beckett, Frisch, and Grass.

*Fall, 3 credits*

### GER 547 Special Author Studies

Tutorial.

*Fall and spring, 3 credits*

### GER 548 Special Period Studies

Tutorial.

*Fall and spring, 3 credits*

### GER 549 Theory and Criticism

From Herder to Habermas and beyond: idealist and materialist dialectic, sociology of literature, Marxism and socialist realism, theories of reception, problems of hermeneutics, semiotics, discourse analysis, speech acts, problems of popular culture. Special emphasis will be on the achievements of the "Frankfurt School" and its heirs, relatives, and foes.

*Spring, 3 credits*

### GER 551 Baroque

A survey of the literature of the period.

*Spring, 3 credits*

### GER 553 Realism

Selections from representative prose works, drama, and poetry from the period 1835 to 1895 are examined from various perspectives, including the sociology of literature.

*Spring, 3 credits*

### GER 555 Scandinavian Literature

Scandinavian Nobel Prize winners: Bjornson, Undset, Hamsun, Lagerlof, Heidenstam, Lagerkvist, Laxness, J. V. Jensen, and Blixen-Dinesen.

*Spring, 3 credits*

### GER 557 History of the German Language

The development of the German language from Indo-European to modern High German: a representative selection of texts from different periods will be examined.

*Fall, 3 credits*

### GER 558 Middle High German

An introduction to Middle High German grammar with representative reading from the Middle High German classics.

*Fall, 3 credits*

### GER 561 Goethezeit

A study of the cultural changes in Germany during Goethe's lifetime, 1749-1832.

*Fall or spring (as feasible), 3 credits*

### GER 562 Gothic and Indo-European

An introduction to the principles of historical linguistics, with the applications of these principles applied to the tracing of Gothic from Indo-European. The bulk of the course will be devoted to the Gothic language *per se*, with readings from the Ulfilas translation of the Bible.

*Fall or spring (as feasible), 3 credits*

### GER 563 Old High German

An introduction to the literary form of German of the ninth century. The language will be approached as a foreign language. The bulk of the course, however, will be directed toward a discussion of the genres of the period, the heroic epic, charms and incantations, glossaries, homilies, sermons, and excerpts from the Bible.

*Fall or spring (as feasible), 3 credits*

### GER 565 Middle High German

#### Literature

An introduction to German literature of the high courtly period (1150-1250). Among genres discussed will be the courtly romance, the heroic epic, and the *Minnelieder*.

*Spring, 3 credits*

### GER 580 Translation from Germanic Languages

A course enabling those who take it to translate from Icelandic, Danish, Norwegian, and Swedish according to the needs of the class, concentrating on medieval texts such as *Saxo Grammaticus*, *Sankta Birgitta*, and various types of Icelandic and Norwegian sagas. We will translate folk stories from the various Scandinavian countries.

*Spring, 3 credits*

### GER 599 Master's Thesis

*1 credit, repetitive*

### GER 601 Special Author

Tutorial to be arranged with appropriate staff member.

*Fall and spring, 3 credits each semester*

### GER 602 Special Period

Tutorial to be arranged with appropriate staff member.

*Fall and spring, 3 credits each semester*

### GER 603 The Middle Ages

Medieval German lyric, Middle High German lyric, and their antecedents.

*Fall, 3 credits*

### GER 699 Doctoral Dissertation

Taken after advancement to candidacy.

*1 credit, repetitive*

## Russian and Slavic Courses

### RUS 500 Reading Russian

An intensive introduction to Russian for non-majors. Practice in reading and translation of selected Russian texts and technical literature. As much attention as possible will be given to special problems of various disciplines.

*Spring, alternate years, 3 credits*

### RUS 506 Stylistics of Russian

Advanced stylistic and textual analysis of the diverse styles of the Russian language: journalistic, literary, and technical.

*Fall, alternate years, 3 credits*

**RUS 508 Major Russian Authors**

A seminar in selected major Russian authors, focusing on one or two authors such as Pushkin, Gogol, Dostoevsky, Turgenev, Tolstoy. May be repeated.

Fall, 3 credits

**RUS 509 Dostoevsky and the West**

Dostoevsky's major texts viewed in cross-cultural perspective with particular emphasis on literary and philosophical traditions common to Russia and Europe. Crosslisted with CLT 504.

Fall, alternate years, 3 credits

**RUS 511 Studies in Literary Genres**

A seminar devoted to a specific genre (poetry, novel, short fiction, drama) in Russian literature. May be repeated.

Spring, 3 credits

**RUS 512 Early 20th-Century Russian Literature**

An introduction to the various schools that characterize the prerevolutionary period of 20th-century Russian literature—symbolism, acmeism, and futurism. Particular emphasis is placed on the works of Blok, Sologub, Axmatova, Mandelstam, Pasternak, Esenin, and Mayakovsky.

Fall, 3 credits

**RUS 514 Russian Literature Since 1917**

A seminar in Soviet postrevolutionary and emigre prose. The course deals with Russian prose fiction such as prose genres, literary movements, and major authors such as Bulgakov, Pasternak, and Solzhenitsyn.

Fall, 3 credits

**RUS 517 History of the Russian Literary Language**

The development of the Russian literary language from the 10th century to the present. Although its emphasis is primarily on the historical development of the language, the course includes readings from early East Slavic and Middle Russian texts, such as the *Tale of Igor's Campaign*, *The Life of Avvakum*, etc., as well as discussions of genre and style.

Fall, 3 credits

**RUS 520 Russian Syntax**

An advanced practical course in Russian syntax, idiomatic phraseology, and word order.

Fall, alternate years, 3 credits

**RUS 538 Structure of Russian**

The course investigates the phonetics, phonology, and morphology of contemporary standard Russian.

Fall, alternate years, 3 credits

**RUS 539 Teaching Strategies in Russian**

An investigation of the methodology and materials available to teachers of Russian. The course examines applied linguistics in teaching.

Spring, 3 credits

**RUS 540 Techniques of Class Instruction (Practicum)**

Teacher supervision, visitation, and evaluation as well as help in development of lesson plans. To be taken in conjunction with a teaching assignment.

Fall or spring, alternate years, 3 credits

**RUS 599 Master's Thesis**

1 credit, repetitive

**RUS 602 Literature and Theatre**

The relationship of literature and theatre with specific examples taken from Russian cultural history. The stage adaptations of prose by Stanislavsky, Meyerhold, and contemporary directors will be studied as forms of aesthetic conjunction and as responses to the social-ideological context.

Spring, 3 credits

**SLV 501 Special Topics in Slavic Literature**

Special topics in Slavic literature investigating an author, period, genre, or theoretical issue. Designed to provide a forum for advanced research in critical methodology.

Spring, 3 credits

**SLV 502 Problems of Literary Translation**

The course addresses theoretical and practical problems of translation from the Slavic languages. Published translations of literary texts as well as translations prepared by participants of the seminar will be compared and analyzed.

*Prerequisite:* Advanced knowledge of Slavic languages.

Spring, alternate years, 3 credits

**SLV 503 Special Topics in Slavic Linguistics**

The course will investigate various topics in Slavic linguistics. Its orientation is primarily theoretical and may include discussion of Slavic accentology, history of Slavistics, or poetics.

Spring, 3 credits

**SLV 504 Topics in Slavic Cultures**

The course examines major topics in Slavic cultures and focuses on Slavic contributions to Western civilization.

Fall or spring, 3 credits

**SLV 505 Introduction to Scholarly Editing and Bibliography**

Students will be involved in editing, translating, and preparing final copy for one issue of the professional journal *Slavic and East European Arts*. The course will also include training in bibliography, reference materials, and annotation.

Fall or spring, 3 credits

**SLV 571 Introduction to Slavic Linguistics**

An investigation of the major West, East, and South Slavic languages with particular attention to their historical development. The course includes comparative and contrastive studies in the areas of phonology, morphology, and syntax.

Fall, 3 credits

**SLV 578 Directed Independent Studies**

Fall, 1-6 credits

**SLV 579 Directed Independent Studies II**

Spring, 1-6 credits

**SLV 580 Special Topic in Slavic Languages I**

The study of the phonology, morphology, and syntax of another Slavic language, e.g., Polish, Czech, Ukrainian, Serbo-Croatian, or Bulgarian. May be repeated if different language studied.

Fall, 3 credits

**SLV 581 Special Topic in Slavic Languages II**

A continuation of the study of a Slavic language other than Russian. May be repeated if different language is studied.

Spring, 3 credits

**Scandinavian Courses****SCN 506 Advanced Stylistics—Scandinavian Language**

Advanced stylistics and textual analysis. Designed to deepen the advanced student's knowledge of the finer points of the syntax, structure, and stylistic versatility of the Scandinavian languages.

Spring, 3 credits

**SCN 564 Old Norse Language**

Formerly GER 564

Fall, 3 credits

**SCN 565 Old Norse Literature**

Spring, 3 credits

**D.A. Courses**

The following courses are available only to candidates in the Doctor of Arts Program:

**DLG 601, DLR 601 Internship in Foreign Languages: German and Russian**

Students in the Doctor of Arts Program will assist an instructor as an aide in a literature, culture, or language course on the undergraduate level.

Fall and spring, 1-3 credits

**DLG 602, DLR 602 Externship in Foreign Languages: German and Russian**

Students in the Doctor of Arts Program will teach one to three courses at the high school, junior college, or college level under the supervision of a master teacher.

*Prerequisite:* All other coursework completed

Fall and spring, 3-6 credits

**DLG 603, DLR 603 Independent Readings in Foreign Languages: German and Russian**

Independent readings on a selected topic in German language or literature and Russian language or literature.

Fall and spring, 1-6 credits, repetitive

**DLG 699, DLR 699 Doctoral Research in Foreign Languages: German and Russian**

Independent research for the Doctor of Arts degree. Open only to candidates for the Doctor of Arts who have passed the preliminary examination.

1 credit, repetitive

# Hispanic Languages and Literature (SPN, DLS)

*Chairperson: Lou Charnon-Deutsch  
Frank Melville, Jr. Memorial Library N3022 (516) 632-6950/6935*

*Graduate Studies Director: Georgina Sabat-Rivers  
Frank Melville, Jr. Memorial Library N3025 (516) 632-6950/6935*

## **Degree Requirements**

Before registering for each semester, the student must consult with the graduate committee of the Department of Hispanic Languages and Literature to schedule an approved combination of courses. Normally at the Ph.D. level two or three years of full-time study are necessary before advancing to candidacy. A minimum of two consecutive semesters of full-time graduate study in residence is required of all students.

Undergraduate courses may also be considered as part of a full-time course load, but do not count towards a graduate degree. Graduate reading proficiency courses (FRN 500, ITL 500, POR 500) fulfill the language requirement and count toward a full-time course load but not toward a graduate degree. According to university requirements, a minimum of a B average must be maintained in all graduate coursework.

## **Master of Arts**

### **M.A. in Spanish**

The curriculum leading to the Master of Arts degree may be terminal or may be combined with the Doctor of Arts or Doctor of Philosophy program. In addition to proficiency in Spanish and English, reading knowledge in a third language is required (French is recommended for students who intend to continue toward a Ph.D. degree). There is a general requirement of 36 graduate credit hours. After completion of 30 graduate credit hours, a student must either take a basic comprehensive examination or complete a thesis/project. Each of these options is equivalent to 6

graduate credit hours. Students working on a part-time basis should complete all requirements within five years after their first regular graduate registration.

The M.A. comprehensive examination is based on a reading list consisting of 75 titles: 50 in the field of major emphasis (Spanish Peninsular or Spanish-American) and 25 in the minor field. The student, with the advice of the graduate studies director, will choose three members of the graduate faculty to form the examining committee, one of them to act as chairperson. The examination consists of five hours of written work: three on the field of major emphasis and two on the minor field.

The M.A. thesis is written under the supervision of a member of the graduate faculty with the advice of a second reader.

An applicant whose creative writing skills surpass his or her academic record may qualify for admission to a special M.A. track in Creative Writing in Spanish. No more than one full-time student per year is accepted for this track. Students must complete all M.A. requirements and a project consisting of a body of original literary writing by the fourth semester of studies, under the direction of an ad hoc committee of advisors consisting of three faculty members. Creative writing students may be admitted to the Ph.D. program in Spanish by passing the qualifying examination at the beginning of the fourth semester of full-time study.

### **M.A. in Hispanic Languages and Linguistics**

Students must complete 36 credits of coursework in Hispanic language and linguistics, arranging an appropriate course of study in consultation with the advisor in Spanish linguistics. Students must demonstrate proficiency in English, Spanish, and another language. They must

also pass a comprehensive examination based on a special reading list, or write an M.A. thesis.

### **M.A. in Romance Languages**

An interdepartmental M.A. in Romance languages is offered, based on 36 graduate credit hours of specified coursework in two different languages (Spanish/French, Spanish/Italian). Students must pass a comprehensive examination based on a special reading list. This M.A. may also be combined with the D.A. or Ph.D. program.

## **Doctor of Arts**

The curriculum leading to the Doctor of Arts degree is designed to train professionals on the secondary, junior college, and college levels. It also provides a basis in language training for language education specialists, specialists in bilingual media and communications, and marketing consultants whose expertise in the foreign language(s) will aid in areas such as business or advertising. The program is flexible, based on competency, and, where possible, tailored to individual needs.

The program is open to full-time and part-time students who have the M.A. or its equivalent.

For the Spanish major, a minimum of 15 graduate credit hours (or more, if previous preparation is not deemed sufficient) are to be distributed evenly among advanced Spanish language, literature (19th century, 20th century, and another elective area), and culture courses, with no less than one course in each of these five areas.

For the minor (French, German, Italian, Slavic, linguistics, or any field related to second-language acquisition), 12 credits

are required (if a minor in language is chosen, candidates must present at least 18 prior credits in that language).

In addition, one course in general linguistics and two education courses (testing and methods) are required. A practicum, an internship, and an externship may also be required. Six credits may be obtained in preparatory work toward the dissertation.

The total number of credits normally ranges from 45 to 51. Practical experience, passing a comprehensive examination (written and oral) based on an individually designed reading list, and a doctoral dissertation are required.

## Doctor of Philosophy

The Ph.D. degree is the highest teaching and research degree offered by the university. The Ph.D. prepares the recipient for an academic career at the level of the four-year college and/or research university, or for other careers in humanistic study, research, and writing. The entering graduate student who is considering working toward a Ph.D. should immediately consult with the graduate committee to plan a broad program of reading and coursework in all areas offered by the department.

The student should take courses from as many different faculty members as possible. In addition, the candidate must complete one course in Spanish historical linguistics and from two to four 600-level seminars depending on his or her previous preparation. A student's curriculum must include at least one course each in Cervantes, Spanish-American modernism, and literary theory (at the 500 or 600 level). Specializations are offered in Spanish or Spanish-American literature. The number of credit hours required for the Ph.D. depends on the student's previous preparation. Teaching experience and one practicum course are required and may be counted toward the student's full-time credit load.

In planning their graduate studies, students should keep in mind the following:

(a) Students with a B.A. in Spanish or its equivalent are usually expected to earn between 60 to 72 credits, depending on their previous background, and they must complete four 600-level seminars;

(b) Students with an M.A. in Spanish or its equivalent must earn between 30 and 36 credits, and they must complete three 600-level seminars;

(c) Students who have already completed a minimum of a year's work in another institution beyond the master's level are required to take at least two consecutive semesters of full-time graduate study at Stony Brook; they must complete two 600-level seminars.

## Language Requirements

In addition to proficiency in Spanish and English, the Ph.D. student must demonstrate a reading knowledge of (a) French, and (b) another language among Latin, Portuguese, Italian, German, and another language if related to the field chosen for the dissertation. The student is urged to demonstrate a reading knowledge of French by the beginning of his or her second year of full-time study; he or she is required to fulfill both language requirements prior to being advanced to candidacy. A language requirement may be fulfilled by (1) passing the Princeton Graduate School Foreign Language Test (GSFLT), (2) successful completion (grade of B or higher) of a graduate reading course or regular graduate course in the foreign language, or (3) passing a special reading examination administered under the supervision of the Department of Hispanic Languages and Literature. If option 3 is chosen, the student should consult with the graduate studies director, who, along with the department chairperson, will designate an appropriate examiner. Texts will be assigned for the examination, during which a dictionary may be used for the translation of sight passages.

## Qualifying Examination

The qualifying examination is an instrument designed to give the entire faculty of the department an opportunity to evaluate the student's academic abilities and promise. The exam seeks to assess the student's sensitivity to literature, capacity to deal critically with the text, and ability to express him- or herself cogently. Elaborate bibliographical information regarding the texts, while not discouraged, is not required.

Students who wish to be confirmed as Ph.D. students must take the qualifying examination (1) at the beginning of their fourth semester if they enter the program with a B.A. in Spanish or equivalent, or (2) at the beginning of their second semester if they enter the program with an M.A. in Spanish, its equivalent, or any higher level of preparation.

As it stands now, the department selects five texts and submits the list to the student not later than four months before the exam, which is usually scheduled for the first week of the spring semester. It consists of (a) four hours of written work; the student answers four of five questions (one on each text), omitting the one that he or she has selected for the oral presentation, and (b) an oral presentation of some 20 minutes on the selected text; notes may be used, but the student should not read from a text. Following the presentation, the faculty will ask questions.

Students will be evaluated by the department as a whole to determine whether their teaching assistantships will be continued

during the second year. This evaluation will be conducted according to the following criteria, which include but go beyond the strict grade point average: (1) previous intellectual experience, both general and in the area of Hispanism: breadth of courses taken in related fields, and other features that can help to determine the quality of each student. If the recent experience (i.e., the work done while at Stony Brook) is significantly better or worse than the student's previous experience, this shall be taken into consideration; (2) serious research capacity of each student as demonstrated by papers written for courses; (3) theoretical capacity of each student, as demonstrated by papers written for courses; (4) writing and speaking ability in the Spanish language; and (5) quality of each student as a teaching assistant.

The graduate committee receives evaluations from each faculty member who has worked with the student. The committee may also reread term papers written for courses. Students holding incompletes will inevitably find themselves at a disadvantage in the process of evaluation.

Students enrolled in the D.A. or M.A. program who wish to continue as TAs during their second year will be evaluated as described above.

## Committee for Comprehensive Examination

The student, with the advice of the graduate studies director, will choose five members of the Hispanic Department faculty, one of whom will act as chairperson of the committee for his or her comprehensive examination. This committee will prepare the questions and administer the examination. After the written examination has been reviewed carefully, a date will be set for the committee to discuss strong and weak points with the student and to continue the examination orally.

## Comprehensive Examination

Reading lists are provided as a guide to graduate students preparing for their comprehensive examinations. These lists consist of 113 titles, of which students will read 85, depending on the major area of specialization. In addition, students will supplement the list with at least 30 titles of their own choosing. After completion of required coursework (no incomplete grades outstanding) and demonstration of reading proficiency in at least French, the student is ready to take this examination. The student will receive 14 questions: ten in the major and four in the minor field, and he or she will have one hour to plan the exam, which will be completed in three stages: (1) three hours of written work, to take place immediately after the hour of planning has

expired. During this time the student will answer two questions in the major field, and one in the minor field (one hour per question); 2) the student will have one month to answer two more questions in the major field and one in the minor field (chosen from the same list of fourteen questions). Failure to deliver the answers by the established deadline means failure in this stage of the exam; (3) approximately two weeks later, the committee will meet to evaluate the written work done by the student. Immediately after this evaluation the student will address the committee in a 20- to 25-minute oral presentation, answering one of the other questions chosen by him or her within the major field, followed by a general discussion of the exam with the committee. This stage lasts approximately one hour. Upon successful completion of all three stages, the student is granted the degree of Master of Arts and he or she is advanced to candidacy.

Before the comprehensive examination, students may peruse samples of prior comprehensive examinations. This may be done only under the supervision of the graduate secretary, graduate studies director, or department chairperson.

### Dissertation Project

Within six months of completing the comprehensive examination, the student must present a written dissertation project planned in consultation with the prospective director of his or her dissertation. It will consist of a thesis prospectus accompanied by a specialized bibliography of relevant works. This project will be reviewed by the prospective dissertation committee. It is left to the discretion of the committee to approve this project as submitted or to meet with the student (the committee as a whole or each member individually) for suggestions and/or changes.

### Dissertation Committee

The student forms a dissertation committee with the advice of the graduate studies director. This committee reviews the prospectus, the open draft, and the final draft of the dissertation. There will normally be five members: a dissertation director who will be the first reader, a second reader, and three others (one or two from outside the department). The dissertation director and student will arrange a date and a time for the defense with the committee and will take care of all necessary paper work. A faculty member other than the dissertation director will preside as chairperson at the oral defense.

### Dissertation

The qualified doctoral candidate will concentrate on a dissertation (written results of specialized study and research) under the

supervision of a member of the graduate faculty and the advice of a second reader. (See item E, "Dissertation," p. 18.)

At least six weeks before his or her scheduled defense, an open draft of the complete dissertation must be submitted for advice and discussion to the members of the dissertation committee.

After the dissertation is completed, a final draft is submitted to this committee, accompanied by a dissertation abstract. Immediately after the committee meets to discuss the dissertation, it invites the candidate to summarize and defend his or her work. If the dissertation is approved by the committee, the candidate is recommended for the Doctor of Philosophy degree, and is usually asked to give a public lecture on the subject of the dissertation.

### Courses

Courses described as repetitive are topic courses that may be taken an indefinite number of times as long as the topic varies. Other courses may not be repeated.

#### SPN 501 Historical Linguistics

General processes of language change, as exemplified by the development of the Romance languages, with particular reference to Spanish. *Fall or spring, 3 credits*

#### SPN 502 Methods in Linguistics Research

Methods for elicitation and collection of linguistic data and their analysis. Relation between theory and research design, and between qualitative and quantitative analysis. Introduction to commonly used tests of statistical significance, and to reasoning and argumentation from limited data.

*Prerequisite:* Permission of instructor  
*Fall or spring, 3 credits*

#### SPN 503 Spanish Linguistics

Major issues related to the general structure of the Spanish language (phonetics, phonology, morphosyntax, semantics, etc.)

*Fall or spring, 3 credits, repetitive*

#### SPN 504 Contrastive Analysis: Spanish and English

Topics vary, and may include linguistic interference and its basis and manifestations, in-depth discussion of specific syntactic/semantic areas with reference to possible Spanish/English interference, major phonological differences between Spanish and English and consequent learning difficulties, nonlinguistic factors that may affect learning in different groups in different situations.

*Fall or spring, 3 credits, repetitive*

#### SPN 505 Hispanic Dialectology and Sociolinguistics

Major theoretical issues involved in analysis of geographical and social variation and with the principal methods used in its investigation, as applied to varieties of Spanish, Portuguese, Catalan, and Galician.

*Fall or spring, 3 credits, repetitive*

#### SPN 509 Literary Theory

A study of the most outstanding methods of analysis and literary research, and a survey of major works pertaining to the study of literature. A required course for students in the Spanish Ph.D. program.

*Fall or spring, 3 credits*

#### SPN 510 Hispanic Culture

An introduction to the essential aspects of Peninsular and/or Latin American cultures and civilizations, designed to provide incoming graduate students with sufficient background to undertake the advanced study of Hispanic languages and literature.

*Fall or spring, 3 credits, repetitive*

#### SPN 512 Medieval Literature

Major literary works of the medieval period will be read and discussed in depth, and their interrelation with the cultural context analyzed.

*Fall or spring, 3 credits, repetitive*

#### SPN 515 Spanish Composition and Stylistics

Theory and practice of problems in composition and translation with revision of difficult points in advanced Spanish grammar. Classroom analysis and discussion. Required for Doctor of Arts (DLS) students; also useful for M.A. and Ph.D. students.

*Fall or spring, 3 credits*

#### SPN 523 Golden Age Literature

Major literary works within the Renaissance and/or baroque periods are read and analyzed in depth, and their interrelation with the cultural context is discussed.

*Fall or spring, 3 credits, repetitive*

#### SPN 528 Cervantes

Miguel de Cervantes' works are read, analyzed, and discussed in depth. A required course for Ph.D. students. Advanced D.A. and M.A. students are accepted. A bilingual course: readings and discussions in both Spanish and English. *Prerequisite:* M.A. degree or permission of instructor

*Fall or spring, 3 credits, repetitive*

#### SPN 531 Spanish Enlightenment and Romanticism

A course devoted to the Spanish literature of the Enlightenment and the romantic period, with particular attention to the significance of the ideas prevalent at the time in literary theory.

*Fall or spring, 3 credits, repetitive*

#### SPN 541 19th-Century Spanish Literature until the Generation of 1898

Major literary works of the period are read and analyzed in depth, and their interrelation with the cultural context is discussed.

*Fall or spring, 3 credits, repetitive*

#### SPN 543 20th-Century Spanish Literature

Major literary works of the period will be read, analyzed, and discussed in depth, and their interrelation with the cultural context will be discussed.

*Fall or spring, 3 credits, repetitive*

#### SPN 552 Colonial Spanish-American Literature

Major authors and literary works of the period. Readings will be analyzed and discussed in depth, and their interrelation with the cultural context explored.

*Fall or spring, 3 credits, repetitive*

#### SPN 562 19th-Century Spanish-American Literature

Major authors and literary works of the period. Readings will be analyzed and discussed in depth, and their interrelation with the cultural context will be discussed.

*Fall or spring, 3 credits, repetitive*

#### SPN 569 Spanish-American Modernism

A course devoted to major authors and literary works of the modernistic period (1880-1916) in Spanish America. Readings are analyzed and discussed. A required course for Ph.D. students. Advanced D.A. and M.A. students are accepted.

*Fall or spring, 3 credits, repetitive*

**SPN 571 20th-Century Spanish-American Literature**

A course devoted to major authors and literary works of the period. Readings will be analyzed and discussed in depth, and their interrelation with the cultural context discussed.

*Fall or spring, 3 credits, repetitive*

**SPN 580 Poetry Workshop in Spanish**

Theoretical and practical study of poetry in Spanish with the aim of enhancing the development of students' writing skills and skills of critical analysis.

*Prerequisite:* Permission of department based on student's original works

*Every three semesters, 1-3 credits, repetitive up to 3 credits*

**SPN 582 The Hispanic Tradition in the United States**

A general historical analysis of the influence of Hispanic culture in the United States as a consequence of the continuous interaction between Spanish- and English-speaking people. Special attention is given to cultural manifestation in a bicultural setting.

*Fall or spring, 3 credits, repetitive*

**SPN 585 Caribbean Literature**

A course devoted to major writers and works of the Caribbean area. Readings will be analyzed in relation to cultural contexts.

*Fall or spring, 3 credits, repetitive*

**SPN 588 Directed Master's Research**

For work toward the M.A. thesis or preparation for the M.A. comprehensive examination only. This course is mainly intended for students who are not continuing toward the Ph.D.

*Prerequisite:* Permission of graduate studies director, M.A. thesis director, and/or director of the M.A. comprehensive examination committee.

*Fall and spring, 1-6 credits, repetitive*

**SPN 595 Directed Independent Individual Studies**

For M.A., D.A., and Ph.D. candidates only. Requires a written proposal signed by the faculty member involved and the approval of the graduate studies director and the departmental chairperson. No more than a total of nine credits may be applied toward a Spanish graduate degree or combination of degrees.

*Prerequisite:* Permissions mentioned above

*Fall and spring, 1-6 credits, repetitive*

**SPN 612 Topics Seminar**

A seminar course designed primarily for doctoral students. The topic will be chosen by the professor from any of the major areas of Hispanic literature and linguistics required of all Ph.D. students. Ph.D. students must take from two to four of these seminars depending on their previous preparation.

*Prerequisite:* Admission to the Spanish Ph.D. program or permission of instructor

*Fall and spring, 3 credits, repetitive*

**SPN 681 Directed Readings**

For students who have completed all doctoral requirements and wish to dedicate themselves to full- or part-time preparation for the comprehensive examination.

*Prerequisite:* Coursework toward the Ph.D. must be completed; permission of the dissertation director, graduate studies director, or department chairperson

*Fall and spring, 1-9 credits, repetitive*

**SPN 691 Practicum in the Teaching of Spanish Language**

Theory and practice of language teaching. Applied methodology and linguistics in classroom situations. A required course for teaching assistants.

*Prerequisite:* Permission of instructor, department chairperson, or graduate studies director

*Fall, 3 credits*

**SPN 695 Directed Doctoral Research**

For students who have already passed the Ph.D. comprehensive examination and need to devote their time to preparation of their dissertation.

*Prerequisites:* Ph.D. comprehensive examination completed; permission of the dissertation director, graduate studies director, or department chairperson.

*Fall and spring, 1-9 credits, repetitive*

**Portuguese****POR 500 Reading Portuguese**

Systematic instruction in the fundamentals of reading comprehension and in specialized subject-oriented vocabulary.

*Prerequisite:* Permission of instructor

*Fall or spring, 3 credits*

**POR 575 Luso-Brazilian Readings**

Major literary works from 19th- and 20th-century Portugal and Brazil, especially narratives.

*Prerequisite:* Reading proficiency in Portuguese and permission of instructor.

*Fall or spring, 3 credits, repetitive*

**D.A. Courses**

The following courses are available only to candidates in the Doctor of Arts program:

**DLS 601 Internship in Foreign Languages: Spanish**

Students in the Doctor of Arts program will assist an instructor in an undergraduate literature, culture, or language course.

*Fall and spring, 1-3 credits*

**DLS 602 Externship in Foreign Languages: Spanish**

Students in the Doctor of Arts program will teach one to three courses at the high school, junior college, or college level under the supervision of a master teacher.

*Fall and spring, 3-6 credits*

**DLS 699 Doctoral Research in Foreign Languages: Spanish**

Independent research for the Doctor of Arts degree. Open only to candidates for the Doctor of Arts who have passed the preliminary examination.

*Fall and spring, 1-6 credits, repetitive*

# History (HIS)

**Chairperson: Fred Weinstein**  
Ward Melville Social and Behavioral Sciences Building N-309  
(516) 632-7500/7490

**Graduate Studies Director: Wilbur R. Miller**  
Ward Melville Social and Behavioral Sciences Building S-325  
(516) 632-7487/7500

## **Degree Requirements Requirements for the M.A. Degree**

In addition to the minimum Graduate School requirements, the following are required:

### **A. Advising**

Upon registration, M.A. candidates will be assigned advisors in their anticipated area of study (e.g., U.S., Europe, Latin America). The students will work out fields of study and schedules of appropriate courses with their advisors.

### **B. Courses**

The M.A. program is designed to provide background in the department's three major areas of concentration (U.S., Europe, Latin America) for students in each field. It will also provide training in research and writing skills. To achieve these goals, the M.A. curriculum consists of required courses that full-time students can complete in one academic year. These courses are as follows:

1. HIS 500 Introduction to Historiography
2. HIS 501-502, 521-522, 545-546: Introductory field seminars surveying the literature and controversies in each of the major fields (U.S., Europe, and Latin America).
3. HIS 510-511, 530-531, 541-542: One-year sequence reading-research seminars to introduce students to the literature and methods of broad areas such as social or intellectual history. The first semester is introductory reading and discussion oriented toward formulation of a research topic. The second will concentrate on production of a research paper.

4. HIS 582: Exam preparation workshop; readings under faculty supervision that will help the student prepare for the special emphasis (e.g., political history) within his or her M.A. examination field. Graded S/U.
5. HIS 583-586: Directed readings, similar to 582 except that this tutorial requires written work and is graded with a letter grade.

For students holding an assistantship (and, therefore, enrolled in HIS 581 Supervised Teaching) required courses will amount to the full 30 credits; those without assistantships (and, therefore, without HIS 581) will make up the six credits through directed readings with individual faculty members.

The M.A. degree will be awarded upon satisfactory completion of the specified required courses, at least 30 graduate credits, and demonstration in an oral examination of competence in a field of history.

### **C. Examination**

A committee of three faculty members, chosen by the student in consultation with an M.A. advisor, will assess the work accomplished and the knowledge acquired by the student in an oral examination. This examination will be taken in the student's final semester of M.A. work.

## **Requirements for the Master of Arts in Teaching (M.A.T.) in Social Studies**

**A.** The Master of Arts in Teaching in Social Studies Program, offered in conjunction with the Center for Excellence and Innovation in Education, leads to New York State provisional certification for teaching social studies in secondary schools. Completion of the M.A.T. requires at least three semesters of work for full-time students.

### **B. Courses**

1. **15 Credits in History**  
HIS 500 Historiography (3 credits)  
12 credits from the following:  
HIS 521,22 Seminars-U.S. History (3 or 6 credits)  
HIS 501,02 Seminars-European History (3 or 6 credits)  
HIS 541,42 Seminars-Latin American History (3 or 6 credits)  
HIS 562 Topics Seminar-African and/or Asian History (3 or 6 credits)
2. **15 Credits in Professional Study in Education**  
CEE 505 Education: Theory and Practice (3 credits)  
CEE 565 Adolescent Growth and Development (3 credits)  
CEE/HIS 577 Teaching Social Studies (fall only) (3 credits)  
CEE/HIS 578 Social Studies Strategies (spring only) (3 credits)  
CEE/HIS 580 Student Teaching Seminar
3. **6 credits in Supervised Student Teaching (CEE/HIS 579)**

### **C. Written Project**

Students will also be required to complete a written project in the form of a four-week social studies teaching module specifically designed for the students being taught in the supervised student teaching experience.

## **Requirements for the Ph.D. Degree**

The Ph.D. is the highest professional degree granted by the History Department. Candidates for the degree must hold an M.A. awarded either by the University at Stony Brook or by another institution it

recognizes. Candidates must have been formally admitted to the Ph.D. program in history and have an advisor/thesis director who has agreed in writing, even if conditionally, to guide the student through the Ph.D. qualifying examinations and direct the dissertation.

The Ph.D. program, which is organized differently from the M.A. program, is supervised by a Ph.D. preparation committee made up of members of the graduate faculty in fields in which the student has an interest. The preparation committee will prescribe the content of the student's program. A foreign language requirement will be set by this committee and will in no case be less than a reading knowledge of one foreign language. The Ph.D. preparation committee will assist the student in defining and mastering two fields of knowledge:

*Field 1, Dissertation Field:* An area of historical knowledge that includes the student's expected research interest, and that comprises a field sufficiently broad for the purpose of undergraduate teaching. Example: Modern European History with emphasis on 19th-century Germany.

*Field 2, Comparative Field:* An area of study comprising a second, distinct field based on selected historical problems or themes and the methods used in studying them. The topics chosen should cover more than one country or region. In Field 2, the department offers four options that reflect the faculty's strengths and interests:

1. Social history with emphasis on, e.g., women, urbanization, the industrial working class, blacks, peasantry, the family.
2. Intellectual history with emphasis on, e.g., ideas, popular culture, political economy.
3. Political history with emphasis on, e.g., institutions, parties or movements, ideologies, foreign policy.
4. History of science and technology with emphasis on, e.g., intellectual and/or social history of physical or biological sciences, history of medicine, history of technology.

In addition to the minimum Graduate School requirements, the following are required:

#### **A. Coursework**

The program should be planned in consultation with the student's Ph.D. preparation committee. In every case, however, it must include four graduate seminars beyond the M.A., two of which must be research seminars. In addition, each student is required to take a formal reading course and a thesis prospectus workshop. These course requirements must be met before the qualifying (preliminary) examination is taken. All students holding full or partial traineeships must register for three credits of HIS 581 Supervised Teaching in

each semester in which they hold such an appointment. Students who have not held a traineeship in the course of their graduate careers must take HIS 581 for at least one semester during their Ph.D. program. Full-time students are expected to take their qualifying (preliminary) examination at the end of their fourth semester of post-M.A. work.

#### **B. Ph.D.-Level Seminars**

There are two types of doctoral-level seminars: reading (numbered above 500), which are principally discussion and written analysis of selected historical works; and research (numbered above 600), which provide the opportunity for original research and writing of a substantial paper based on the research. In addition to regular courses, students may take directed readings with faculty members to cover specialized fields.

#### **C. Dissertation Prospectus Workshop**

All Ph.D. students will be required to take the dissertation prospectus workshop (HIS 695) in order to help them prepare their dissertation prospectuses. This prospectus should contain an explanation of the research problem under investigation, a summary of the relevant secondary literature, a statement of hypothesis, and an outline of both the research sources and the methods that the student expects to employ. The prospectus must be acceptable to both the instructor of the thesis workshop and the student's Ph.D. committee. The workshop should be completed either before or in the same semester as the qualifying (preliminary) examination. Completion of the workshop and the dissertation prospectus are required for advancement to candidacy.

#### **D. Qualifying (Preliminary) Examination**

The Ph.D. examination will be an oral examination covering both the dissertation and comparative fields, each given equal emphasis. The examining committee will take into consideration the student's overall graduate record before recommending advancement to candidacy.

#### **E. Foreign Languages**

Proficiency in at least one foreign language must be demonstrated before a student may be advanced to Ph.D. candidacy. The student and his or her Ph.D. committee will decide which language is most suitable, with the approval of the graduate committee.

#### **F. Supervised Teaching**

Teaching assistants in the History Department are expected to perform either research or teaching functions in the department, up to a maximum of 12 hours a week.

Those who are teaching will enroll in HIS 581 Supervised Teaching for three credits per semester. Their work will be supervised by the member of the faculty to whom they are assigned.

All doctoral students beyond the M.A. level, whether teaching assistants or not, are expected to perform some kind of supervised teaching during their graduate careers.

#### **G. Advancement to Candidacy**

After the student has passed the qualifying examination, the department shall propose to the vice provost for graduate studies that the student be advanced to Ph.D. candidacy.

#### **H. Dissertation**

A dissertation is required for the Ph.D. degree. All students will be required to complete a preliminary dissertation prospectus before taking their qualifying examination.

After advancement to candidacy, a student will register for dissertation credits in consultation with the advisor. The student will select a dissertation topic within the major field. At present, the department offers dissertation fields in United States, Modern European, and Latin American history, and the expansion of Europe.

Upon completion, the dissertation must be approved by a dissertation examining committee of at least four members of the faculty, appointed by the vice provost for graduate studies. This committee must include the dissertation supervisor and at least one person from outside the department.

Before final approval can be granted the student must present the results of the dissertation research at an informal dissertation colloquium convened for that purpose by the department and open to interested faculty members and graduate students.

#### **I. Time Limit**

All requirements for the Ph.D. degree must be completed within seven years after completing 24 hours of graduate courses in the department. In rare instances, the vice provost for graduate studies will entertain a petition to extend this time limit, provided it bears the endorsement of the chairperson of the department.

For further details, see the appropriate section of the Graduate School regulations.

## **Courses**

### **HIS 500 Historiography**

Introduction to historiography through reading and writing about interpretations of history, historical methods, and major historians. Term paper on historian of choice. Required for all M.A. students.

3 credits



**HIS 501 Introduction to Early Modern Europe**

Field seminar in early modern European history, 1450–1789. Surveys the major historical problems and interpretations from the Renaissance to the coming of the French Revolution. Required for M.A. students in European history.  
3 credits

**HIS 502 Introduction to Late Modern Europe**

Field seminar in late modern European history, 1789–1945. Surveys the major historical problems and interpretations from the French Revolution through the Second World War. Required for M.A. students in European history.  
3 credits

**HIS 510, 511 Reading and Research Seminar in European History**

A one-year sequence designed to develop research skills. First semester focuses on background reading, identifies a research problem, and prepares a prospectus and bibliography. Second semester concentrates on research and writing the project. This sequence is offered in broad topic areas such as intellectual history and stresses a comparative perspective. Required for M.A. in European history.  
Fall, 3 credits; spring, 6 credits

**HIS 521 Introduction to United States History to the Civil War**

Field seminar in U.S. history from the founding of the British colonies to the beginning of the Civil War. Surveys the major topics and interpretations. Required for M.A. students in U.S. history.  
3 credits

**HIS 522 Introduction to United States History Since the Civil War**

Field seminar in U.S. history from the Civil War to the Cold War. Surveys the major topics and interpretations. Required for M.A. in U.S. history.  
3 credits

**HIS 530, 531 Reading and Research Seminar in U.S. History**

One-year sequence. See description of HIS 510, 511. Required for M.A. in U.S. history.  
Fall, 3 credits; spring, 6 credits

**HIS 541, 542 Reading and Research Seminar in Latin American History**

One-year sequence. See description of HIS 510, 511. Required for M.A. in Latin American history.  
Fall, 3 credits; spring, 6 credits

**HIS 545 Introduction to Colonial Latin American History**

Field seminar in colonial Latin American history. Surveys major historical problems and debates from the colonial period through the wars for independence. Required for M.A. in Latin American history.  
3 credits

**HIS 546 Introduction to Modern Latin American History**

Field seminar in modern Latin American history. Surveys major historical problems and debates from the postindependence period to the present. Required for M.A. in Latin American history.  
3 credits

**HIS 562 Introduction to Modern African and/or Asian History**

Field seminar in modern African and/or Asian history. Surveys major topics such as nationalism, anticolonial movements, and modernization.  
3 credits

**HIS 577 Teaching Social Studies**

A study of social studies as taught in the secondary schools: the nature of the social studies, curricula models, scope and sequence of topics offered, new programs of social studies instruction, etc. Required for M.A.T. students.  
3 credits

**HIS 578 Social Studies Teaching Strategies**

An examination of various models of teaching and their application to the teaching of secondary social studies. Required for M.A.T. students.  
3 credits

**HIS 579 Student Teaching in Social Studies**

Prospective secondary school social studies teachers will participate in a supervised internship in selected Long Island secondary schools. The teaching intern reports to his or her assigned school each full school day for the entire semester. Frequent consultation with the supervising teacher helps the student interpret and evaluate the teaching internship experience. Applications must be filed in the semester preceding that in which the student plans to do the internship. Required for M.A.T. students.  
6 credits

**HIS 580 Student Teaching Seminar**

Seminar on problems and issues of teaching social studies at the secondary school level. Analysis of actual problems and issues encountered by the student in his or her internship experience. Required for M.A.T. students.  
3 credits

**HIS 581 Supervised Teaching**

Teaching practicum that usually accompanies a student's traineeship.  
3 credits

**HIS 582 M.A. Examination Workshop**

A study group under faculty supervision that focuses on preparing specific fields for the M.A. examination. A tutorial approach is used when insufficient numbers or special attention merits it. No written assignments. Required for all M.A. students.  
3 credits, repetitive

**HIS 583-586 Directed Readings for M.A. Candidates**

Specialized tutorials based on contractual relationship between individual student and faculty. Required for M.A. students.  
Variable and repetitive credit

**READING COLLOQUIA FOR M.A. AND PH.D. STUDENTS**

The following are specialized reading colloquia that vary with student demand and faculty interest.  
3 credits each

**HIS 503, 504 Reading Colloquia in Ancient and Medieval History****HIS 505-509, 515-517 Reading Colloquia in European History Since 1500****HIS 512 Reading Colloquium in the History of Science****HIS 523-529, 532-534 Reading Colloquia in U.S. History****HIS 535 Reading Colloquium in History and Public Policy****HIS 543, 544 Reading Colloquia in Latin American History****HIS 552-555 Reading Colloquia in English History****HIS 561 Reading Colloquium in East Asian History****HIS 590 Reading Colloquium in Historical Methods****HIS 593 Reading Colloquium in Social Theory and History****RESEARCH SEMINARS**

Research seminars provide advanced training for Ph.D. students in the practice of historical research and writing. They are offered on the basis of student need and the availability of faculty. At least one research seminar is scheduled for each major field, i.e., U.S., European, and Latin American history, in the course of an academic year.  
3 credits each

**HIS 600 Research Seminar in Political History****HIS 601 Research Seminar in Economic History****HIS 602 Research Seminar in Social History****HIS 603 Research Seminar in Intellectual and Cultural History****HIS 604-610, 615-617 Research Seminars in Europe and History Since 1500****HIS 621-634 Topical Research Seminars in U.S. History****HIS 641-645 Topical Research Seminars in Latin American History****HIS 652-655 Topical Research Seminars in English History****HIS 661 Topical Research Seminars in East Asian History****HIS 682-686 Directed Readings for Ph.D. Candidates**

Specialized tutorials based on contractual relationship between individual student and faculty member.  
Variable and repetitive credit

**HIS 695 Dissertation Prospectus Workshop for Ph.D. Candidates**

Required of all Ph.D. candidates in order to prepare a dissertation prospectus. This seminar should be completed either before or in the same semester as the qualifying examination. Offered once each year.  
3 credits

**HIS 699 Research for Ph.D. Candidates**

Dissertation research under direction of advisor.  
Variable and repetitive credit

# Linguistics (LIN, DLT)

**Chairperson: Mark Aronoff**  
 Ward Melville Social and Behavioral Sciences Building N-509  
 (516) 632-7775

**Graduate Studies Director: Daniel Finer**  
 Ward Melville Social and Behavioral Sciences Building N-521  
 (516) 632-7782

## Degree Requirements Requirements for the M.A. Degree in TESOL

In addition to the minimum Graduate School requirements, the following are required:

### A. Formal Course Requirements

	<u>Credits</u>
1. LIN 522 Phonetics	3
LIN 524 Methods of TESOL	3
LIN 527 The Structure of English	3
LIN 530 Introduction to General Linguistics	3
LIN 571 Practicum in TESOL I	3
LIN 572 Practicum in TESOL II	3
2. Three of the following:	9
LIN 525 Contrastive Analysis	
LIN 526 Analysis of an Uncommonly Taught Language	
LIN 531 Language Testing	
LIN 532 Second Language Acquisition	
LIN 541 Bilingualism	
LIN 542 Sociolinguistics	
Or any other TESOL-related courses approved by the graduate studies director	
3. One elective course approved by the department	3
Total	<u>30</u>

### B. Performance

The student must achieve a grade point average of B or higher in order to be graduated from the program.

### C. Course Waivers

Certain required courses may be waived for students showing an exceptional background in linguistics or TESOL. Application for such waivers must be made in writing to the department. In any case, all students must complete 30 graduate credits of approved coursework to receive a degree.

## Requirements for the M.A. Degree in Applied Linguistics

In addition to the minimum Graduate School requirements, the following are required:

### A. Course Requirements

A total of 30 graduate credits, including:  
 LIN 521 Syntax I  
 LIN 561 Syntax II  
 LIN 523 Phonology I  
 LIN 563 Phonology II  
 LIN 562 Semantics

Three courses in applied linguistics such as:

- LIN 521 Phonetics
- LIN 541 Bilingualism
- LIN 542 Sociolinguistics
- LIN 532 Second Language Acquisition
- LIN 543 Psycholinguistics

Or any other courses in applied linguistics approved by the graduate studies director.

Two electives approved by the graduate studies director

### B. Comprehensive Exam

Acceptable performance on the written MA comprehensive exam is required for the degree. The exam is administered at the end of the third semester.

### C. Language Requirement

Proficiency in English and a reading knowledge of one other language.

## Requirements for the D.A. in Foreign Language Instruction with a Concentration in TESOL

In addition to the minimum Graduate School requirements, the following are required:

### A. Formal Course Requirements

<i>Major Field Courses</i>	<u>Credits</u>
1. LIN 521 Syntax	3
2. LIN 522 Phonetics	3
3. LIN 523 Phonology	3
4. LIN 541 Bilingualism or LIN 542 Sociolinguistics	3
5. LIN 535 Historical Linguistics or an appropriate course in the history of English, to be approved by the D.A. advisor. (Example: EGL 509)	3
6. 3 electives	9
Subtotal	<u>24</u>
<i>Professional Courses</i>	
7. LIN 524 Methods of TESOL	3
8. LIN 532 Second Language Acquisition	3
9. LIN 571, 572 Practica	6
Total	<u>36</u>

Elective courses must be approved by the departmental advisor. A maximum of six transfer credits may be recognized for non-SUNY candidates and nine for SUNY candidates. The requirement of item 9, Practica, may be waived upon production of satisfactory teaching record.

### B. Language Requirement

Demonstration of proficiency in speaking, understanding, reading, and writing a language other than the candidate's native tongue.

### C. Comprehensive Examination

The comprehensive examination may be taken only *after* the student has completed 36 credits of coursework with an average

grade of B or higher. The comprehensive examination will consist of two parts: (1) a written examination, and (2) an oral examination. Students who pass the exam will advance to candidacy. Students are expected to complete the comprehensive exam before the end of the fifth semester of full-time study in the D.A. program.

#### **D. Dissertation Proposal Defense**

The candidate will form his or her doctoral committee, which will consist of at least two members of the faculty in the Department of Linguistics and one member from outside the department. The director of the Doctor of Arts Program will serve as an ex officio member of the committee. One of the committee members from the Department of Linguistics will be the dissertation director. The candidate will prepare a dissertation proposal in consultation with the dissertation director and must successfully defend it orally at a meeting of the doctoral committee.

#### **E. Defense of Dissertation**

The candidate must successfully defend his or her dissertation at a meeting of the doctoral committee.

## **Courses**

### **LIN 521 Syntax**

A study of the fundamental notion of a grammar as a formal device that generates (describes) all and only the well-formed sentences of a language. The general methodology of modern syntax is applied to a wide range of problems in a variety of languages, providing students with the tools for independent analysis. Crosslisted with ANT 571.  
3 credits

### **LIN 522 Phonetics**

A study of articulatory phonetics and the international phonetic alphabet, with intensive practice in phonetic transcription from a wide variety of languages. Acoustic phonetics, speech perception, and the applications of phonetics to foreign language teaching. Crosslisted with ANT 572.  
Fall, 3 credits

### **LIN 523 Phonology I**

An introduction to the formal study of sound patterns. Problems from various languages serve as the basis for developing a theory of the representation of sound structure.  
3 credits

### **LIN 524 Methods and Materials of TESOL**

Theoretical bases of foreign language pedagogy: inputs from linguistics, psychology, and education; overview of methods; syllabus design; lesson plans; teaching aids; techniques for teaching grammar, vocabulary, pronunciation, reading, and writing; teaching communicative competence; evaluating and creating textbooks and supplementary materials.  
Fall, 3 credits

### **LIN 525 Contrastive Analysis**

A survey of linguistic typology and a comparison of various languages as a basis for understanding the errors made by language learners and devising strategies for teaching a foreign language. Crosslisted with CEL 551.  
Pre- or corequisites: LIN 530, or LIN 521 and LIN 523  
3 credits

### **LIN 526 Analysis of an Uncommonly Taught Language**

Working from primary and secondary sources, students construct an outline of the phonology, morphology, and syntax of a language previously unknown to them.

Pre- or corequisites: LIN 530, or LIN 521 and LIN 523

3 credits, repetitive

### **LIN 527 Structure of English**

A description of the major sentence elements, subsystems, and productive grammatical processes of English. The justification of grammatical categories, interaction between systems and processes, and notions of standard and correctness are discussed with a view to their application in the ESL classroom.

Fall, 3 credits

### **LIN 530 Introduction to General Linguistics**

An introduction to modern theoretical and applied linguistics, including phonology, morphology, syntax, language acquisition, historical linguistics, and sociolinguistics. Crosslisted with CEC 530.  
3 credits

### **LIN 531 Language Testing**

The application of the principles of measurement to the assessment of linguistic functioning. The relation of test strategies to validity and reliability. The role of testing in research, schools, and society. Examination of specific language tests.  
3 credits

### **LIN 532 Second Language Acquisition**

Study of the acquisition of a second language by children and adults. The focus is on data (the systematicity of the learners' errors, the ease of acquisition in childhood, etc.), the adequacy of theories (e.g., inter-language processes, the monitor model, the critical period) to explain data, and the reliability of methods of obtaining data. Students conduct an empirical study testing a current hypothesis.

Pre- or corequisites: LIN 530, or LIN 521 and LIN 523

3 credits

### **LIN 534 Applied Linguistics**

A survey of the potential and actual applications of linguistic principles and findings to a variety of human concerns. The implications of linguistics for theories of language learning, syllabus design, error prediction and correction, literary analysis, nonstandard and nonnative varieties of language, language teaching for specific functions, and bilingual functioning.

Pre- or corequisites: LIN 530, or LIN 521 and LIN 523

3 credits

### **LIN 535 Historical Linguistics**

A study of linguistic change. Some general topics to be discussed are the genetic classification of languages; language families, language, and prehistory; reconstruction; types of sound change; types of semantic change; borrowing.  
3 credits

### **LIN 541 Bilingualism**

Study of the social, linguistic, educational, and psychological aspects of bilingualism. Crosslisted with CEL 541.

Pre- or corequisites: LIN 530, or LIN 521 and LIN 523

3 credits

### **LIN 542 Sociolinguistics**

An introduction to major topics in sociolinguistics, including variation theory, language attitudes, language planning, language change, and pidgins and creoles. Crosslisted with CEL 542.  
3 credits

### **LIN 543 Psycholinguistics**

An introduction to the main issues in the psychology of language. The course will deal with three major areas: 1) the psychological reality of linguistic theories and categories; 2) theoretical models and experimental studies of language comprehension, production, and acquisition; and 3) topics in representation of language in memory.

Prequisites: LIN 521 and LIN 523, or LIN 530  
3 credits

### **LIN 550 Selected Topics in Linguistics**

Topics will be announced each semester. The course may be repeated for credit if topic differs.  
Fall and spring, 3 credits each semester

### **LIN 555 Error Analysis**

Study of the systematic errors made by foreign language learners and the potential of various linguistic theories to predict and account for these errors.

Prequisites: LIN 521, LIN 522, and LIN 525, or permission of instructor  
3 credits

### **LIN 561 Syntax II**

A detailed consideration of recent developments in syntactic theory, including treatments of constituency and word order, grammatical relations, typological variation and linguistic universals, and constraints on grammatical rules and representations.

Prequisite: LIN 521  
3 credits

### **LIN 562 Semantics**

An investigation of the role of semantics (the theory of meaning) in the overall theory of grammar, structured around such topics as formal semantics, the interaction of syntax and semantics, and lexical semantics.

Prequisite: LIN 521  
3 credits

### **LIN 563 Phonology II**

A study of recent developments in phonological theory, with particular attention to nonlinear models of phonological representation.

Prequisite: LIN 523  
3 credits

### **LIN 564 Morphology and Word Formation**

The internal structure of words and the place of the word in syntax, phonology, and the lexicon. A variety of analytical methods—distributional, experimental, and computational—will be introduced.

Prequisites: LIN 521 and LIN 523  
3 credits

### **LIN 570 Student Teaching**

Supervised student teaching in the public schools.  
Prequisites: LIN 524 and permission of instructor  
Corequisite: LIN 574  
Fall, 9 credits

### **LIN 571 Practicum in TESOL I**

Each student will have primary responsibility for teaching a section of English as a Second Language under the supervision of a member of the Linguistics Department.  
Fall and spring, 3 credits each semester

### **LIN 572 Practicum in TESOL II**

Each student will have primary responsibility for teaching a section of English as a Second Language under the supervision of a member of the Linguistics Department.  
Fall and spring, 3 credits each semester

### **LIN 574 Student Teaching Seminar in English as a Second Language**

Seminar on problems and issues of teaching English as a second language at the elementary, middle, and secondary school levels. Analysis of actual problems and issues encountered during the student teaching experience.

Prequisites: LIN 524 and permission of instructor  
Corequisite: LIN 570  
3 credits

**LIN 578 Language and Cultural Context**  
Language and its use in cultural context. Topics include structure of languages, origin and development of human language, relationship of language and culture (ethno-linguistics, sociolinguistics), language and cultural change, language and mind, language acquisition. Crosslisted with ANT 578.  
*Spring, 3 credits*

**LIN 591 Directed Readings**  
Students read and evaluate the literature on a topic of special academic interest or professional relevance under the direction of a faculty member.  
*Prerequisite:* Permission of instructor  
*1-3 credits, repetitive*

**LIN 592 Directed Research**  
Students conduct research on a topic of special academic interest or professional relevance under the direction of a faculty member.  
*Prerequisite:* Permission of instructor  
*1-3 credits, repetitive*

**LIN 595 Thesis**  
Exceptionally well-qualified students may be given the opportunity to present a thesis consisting of original work on a topic in linguistics. Only students who are specifically invited to do so by the faculty may take this course.  
*Fall and spring, 3 to 6 credits*

**DLT 601 Internship in TESOL**  
Students in the Doctor of Arts Program will assist an instructor as an aid in a language course on the undergraduate level.  
*Fall and spring, 1-3 credits*

**DLT 602 Externship in TESOL**  
Students in the Doctor of Arts Program will teach one to three courses at the high school, junior college, or college level under the supervision of a master teacher.  
*Prerequisite:* All other coursework completed  
*Fall and spring, 1-3 credits*

**DLT 699 Doctoral Research in TESOL**  
Independent research for the Doctor of Arts degree. Open only to candidates for the Doctor of Arts who have passed the comprehensive examination.  
*Fall and spring, 1-6 credits, repetitive*

**DLT 680 Doctoral Seminar**  
Doctoral candidates will present and discuss their own research work.  
*Prerequisite:* Advanced standing  
*Fall and spring, 3 credits each semester*

# Mathematics

## (MAT)

**Chairperson: H. Blaine Lawson**  
**Mathematics Building 5-116 (516) 632-8290**

**Graduate Studies Director: Bernard Maskit**  
**Mathematics Building 5-112 (516) 632-8282**

### Degree Requirements Requirements for the M.A. Degree

In addition to the requirements of the Graduate School, the following are required:

- A. 30 credits in graduate courses approved by the department.
- B. Passing the comprehensive examination.
- C. A nine-credit minor.

For students in the Secondary Teacher Option, the 30-credit requirement is ordinarily satisfied by the following courses: MAT 511 Fundamental Concepts of Mathematics, MAT 512 Algebra for Teachers, MAT 513-514 Analysis for Teachers I-II, MAT 515 Geometry for Teachers, MAT 516 Probability and Statistics for Teachers, MAT 518 Seminar in the Uses of Mathematics, MAT 519 Seminar in Mathematics Teaching, CEN 560 or CEN 561 Introduction to Computing, and a three-credit elective. The comprehensive examination consists of the final examinations in MAT 512, 513, 514, and 515. The minor requirement is met by the three courses MAT 516, MAT 518, and either CEN 560 or CEN 561.

For students in the Professional Option, the courses that satisfy the 30-credit requirement are worked out individually with each student but ordinarily include MAT 530-531 Topology/Geometry I-II, MAT 534-535 Algebra I-II, MAT 542 Complex Analysis I, MAT 544 Analysis, MAT 550 Real Analysis I, and MAT 598 Teaching Practicum. In addition, students preparing for the doctoral program ordinarily take MAT 590 Problem Seminar. The comprehensive examination consists of the final examinations in MAT 530, 531, 534, 535, 542, 544, and 550, or the equivalent. The minor program consists of three courses in an allied area such as applied mathematics, statistics, computer science, or theoretical physics.

### Requirements for the Ph.D. Degree

In addition to the requirements of the Graduate School, the following are required:

- A. Passing the doctoral comprehensive examination.
- B. Passing the doctoral preliminary examination.
- C. Demonstrating proficiency in reading mathematics in two relevant foreign languages, usually French and German.
- D. Advancement to candidacy.
- E. Writing an acceptable dissertation.
- F. Two consecutive semesters of full-time study.

#### *The Doctoral Comprehensive Examination*

This examination, which is offered twice a year (at the start and finish of the spring semester), is designed to test mastery of the fundamentals of mathematics. A detailed syllabus for this examination is available upon request. Students who transfer from graduate programs in other universities may, in some cases, be granted exemption from this requirement at the time they are admitted.

#### *The Doctoral Preliminary Examination*

This examination is oral. Each student must take this examination no later than two years after passing the comprehensive examination or receiving an exemption therefrom. The chairperson and one additional member of the examining committee are chosen by the student; one additional member is chosen by the department.

### Professional Academic Training Program

All full-time graduate students in mathematics are required to participate in this program. It consists of supervised teaching or tutoring at the lower undergraduate levels.

### Courses

#### CORE COURSES FOR TEACHER OPTION

#### **MAT 511 Fundamental Concepts of Mathematics**

The axiomatic method. The theory of sets. Introduction to mathematical logic. The construction of number systems. The philosophy of mathematics. Primarily for secondary school teachers of mathematics.

*Fall, spring, or summer, 3 credits*

#### **MAT 512 Algebra for Teachers**

Linear algebra, the algebra of polynomials, algebraic properties of the complex numbers, number fields, solutions of equations.

*Fall, spring, or summer, 3 credits*

#### **MAT 513 Analysis for Teachers I**

Topics in differential calculus, its foundations, and its applications. This course is designed for teachers and prospective teachers of advanced placement calculus.

*Fall, spring, or summer, 3 credits*

#### **MAT 514 Analysis for Teachers II**

Topics in calculus, its foundations, and its applications. Emphasis will be on integration and on numerical techniques. This course is designed for teachers and prospective teachers of advanced placement calculus. Analysis for Teachers I is *not* a prerequisite for this course.

*Fall, spring, or summer, 3 credits*

#### **MAT 515 Geometry for Teachers**

A re-examination of elementary geometry using concepts from analysis and algebra.

*Fall, spring, or summer, 3 credits*

#### **MAT 516 Probability and Statistics for Teachers**

A priori and empirical probabilities; conditional probability; mean and standard deviation; random variables; financial distributions; continuous distributions; sampling; estimation; decision making.

*Fall, spring, or summer, 3 credits*

#### **MAT 518 Seminar on the Uses of Mathematics**

This seminar will explore the ways in which secondary school and elementary college mathematics are used in such diverse areas as psychology, sociology, political science, economics, business, engineering, physics, chemistry, biology, and medicine. Primarily for secondary school teachers of mathematics.

*Fall, spring, or summer, 3 credits*

**MAT 519 Seminar in Mathematics Teaching**

Study of recent curricular and pedagogical developments in secondary school mathematics. *Fall, spring, or summer, 3 credits*

**CORE COURSES FOR PROFESSIONAL OPTION**

**MAT 530 Topology/Geometry I**

Basic point set topology; connectedness, compactness, continuity, etc. Metric spaces, function spaces, and topological manifolds. Introduction to algebraic topology; fundamental group and covering space; homology; applications. *Fall, 3 credits*

**MAT 531 Topology/Geometry II**

Foundations of differentiable manifolds: differentiable maps, vector fields and flows, and differential forms and integration on manifolds. Stokes' theorem. Frobenius theorem. Lie derivatives. Immersions and submersions. Introduction to Lie groups and to the classical groups. *Spring, 3 credits*

**MAT 534 Algebra I**

Linear algebra: fields, vector spaces, dimension, bases, matrices, linear maps, determinants, canonical forms. Multilinear algebra: bilinear forms, Hermitian forms, spectral theorem, symmetric and tensor products, exterior products. *Fall, 3 credits*

**MAT 535 Algebra II**

Groups: normal subgroups, Jordan-Hölder theorem, fundamental theorem of Abelian groups. Rings: ideals and homomorphisms, Euclidean rings, polynomial rings, unique factorization. Fields: transcendence, algebraic extensions, primitive elements, fundamental theorem of Galois theory, applications. *Fall, 3 credits*

**MAT 539 Algebraic Topology**

Homology and cohomology groups, homotopy groups and the Hurewicz theorem, the universal coefficient theorem, cup and cap products, Poincaré duality, and introduction to spectral sequences. *Spring, 3 credits*

**MAT 542 Complex Analysis I**

Elementary functions, holomorphic functions. Cauchy theory, power series, classification of isolated singularities, calculus of residues, open mapping theorem, Riemann mapping theorem. *Spring, 3 credits*

**MAT 543 Complex Analysis II**

Monodromy theorem and analytic continuation. Elliptic functions. Dirichlet problem and Green's function. Conformal mappings. Introduction to Riemann surfaces and/or several complex variables. *Fall, 3 credits*

**MAT 544 Analysis**

An introduction to the theory of ordinary and partial differential equations. Existence and uniqueness of solutions. Matrix methods. Power series methods. Fourier series and the Fourier transform. The heat equation. Laplace's equation and the wave equation. Harmonic functions. *Fall, 3 credits*

**MAT 546 Differential Equations**

Basic concepts in ordinary and partial differential equations. Existence, uniqueness, and stability theorems. Geometric theory of characteristics and the Frobenius theorem. Typical features of elliptic, hyperbolic, and parabolic equations. *Spring, 3 credits*

**MAT 550 Real Analysis I**

Lebesgue measure and integration, Radon-Nikodym theorem, Lebesgue-Stieltjes measures, Fubini and Tonelli theorems, classical Banach spaces. *Spring, 3 credits*

**MAT 551 Real Analysis II**

Banach space, Hilbert space, Hahn-Banach and uniform boundedness theorems, topics in topological vector spaces, distribution theory. *Fall, 3 credits*

**MAT 566 Differential Topology**

Vector bundles, transversality, and characteristic classes. Further topics such as imbeddings and immersions, intersection theory, surgery, and foliations. *Prerequisite: MAT 531*  
*Fall, 3 credits*

**MAT 568, 569 Differential Geometry**

Connections, curvature, geodesics, parallelism, and completeness. Riemannian manifolds, geometry of sub-manifolds; method of integral formulas; applications to global extrinsic theorems. Riemannian curvature. Gauss-Bonnet Theorem, Hopf-Rinow Theorem, first and second variation formulas, conjugate points and Jacobi fields, comparison theory. Curvature and fundamental group: spaces of positive and of negative curvature, space forms, Lie groups, homogeneous spaces, and symmetric spaces. *Prerequisite: MAT 531*  
*Fall and spring, 3 credits each semester*

**MAT 580 Combinatorial Analysis**

Permutations, combinations; generating functions, linear recursions; matching theory, Ramsey's theorem, block designs, orthogonal Latin squares, finite geometries, extremal problems, chromatic number, probabilistic methods. *Fall, 3 credits*

**MAT 588 First-Year Seminar I**

Workshop on basic graduate-level mathematics skills and knowledge. Skills include reading and writing proofs, solving problems, reading mathematics. Topics cover fundamental ideas and theories such as constructions of number systems, interchange of limits, the Euclidean algorithm, and the axiom of choice. *Fall, 3 credits*

**MAT 589 First-Year Seminar II**

Same concept as MAT 588, but covers different materials. *Spring, 3 credits*

**MAT 590 Problem Seminar**

Analyze problems and explore supplementary topics related to the core courses in the Professional M.A. Option. Focus on preparation for the doctoral comprehensive examination. *Fall and spring, 3 credits each semester, repetitive*

**MAT 598 Teaching Practicum**

Seminar and workshop for new teaching assistants. *Fall, 3 credits*

**INTERMEDIATE COURSES**

These courses are designed for second- and third-year graduate students who are preparing for the doctoral preliminary examination or are starting work toward a dissertation. The only prerequisite is consultation with the instructor. Topics covered will be chosen to reflect interest of instructors and students. All of these courses may be taken for repeated credit.

**MAT 602, 603 Topics in Algebra**

Typical topics will be drawn from group theory, ring theory, representation theory of groups and algebras, fields and commutative algebra, homological algebra. *Fall and spring, 3 credits each semester, repetitive*

**MAT 608, 609 Topics in Number Theory**

Typical topics will be drawn from analytic number theory, algebraic number theory, diophantine equations, and transcendental number theory, with indications of methods from algebra, geometry, analysis, and logic. *Fall and spring, 3 credits each semester, repetitive*

**MAT 614, 615 Topics in Algebraic Geometry**

Typical topics will be drawn from varieties and schemes, algebraic curves, and their arithmetics. *Fall and spring, 3 credits each semester, repetitive*

**MAT 620, 621 Topics in Algebraic Topology**

Topics will be of current interest such as foliations, surgery, singularities, group actions on manifolds, and homotopy theory. *Fall and spring, 3 credits each semester, repetitive*

**MAT 626, 627 Topics in Complex Analysis**

Topics selected from Riemann surfaces, quasi-conformal mappings, several complex variables, Fuchsian groups, Kleinian groups, moduli of Riemann surfaces and Kleinian groups, analytic spaces, singularities. *Fall and spring, 3 credits each semester, repetitive*

**MAT 632, 633 Topics in Differential Equations**

Typical topics are hyperbolic or elliptic systems, parabolic equations, spectral theory, finite difference equations, Cauchy-Riemann equations and complex vector fields, equations with constant coefficients, solvability of linear equations, Fourier integral operations, non-linear equations. *Fall and spring, 3 credits each semester, repetitive*

**MAT 638, 639 Topics in Real Analysis**

Topics selected from functional analysis, harmonic analysis, Banach algebras, operator theory. *Fall and spring, 3 credits each semester, repetitive*

**MAT 644, 645 Topics in Differential Geometry**

Typical topics will be drawn from areas such as comparison theorems, pinching theorems, Morse theory, characteristic classes, minimal varieties, Hodge theory, spectrum of the Laplacian, and geometry of general relativity. *Fall and spring, 3 credits each semester, repetitive*

**MAT 650, 651 Topics in Combinatorics**

Typical topics will be drawn from combinatorics and graph theory, Ramsey theory, extremal problems, and methods of enumeration. *Fall and spring, 3 credits each semester, repetitive*

**ADVANCED COURSES**

These courses are designed for students doing advanced work, especially in connection with doctoral dissertations. The only prerequisite is consultation with the instructor. The topics will be selected from the areas listed under the corresponding intermediate course, and will generally be on a more advanced level. A course will normally begin in the fall and may continue in the spring. Course offerings will depend on student demand and availability of faculty to supervise advanced work in the area. These courses may be taken for repeated credit. Each of these courses carries three credits.

**MAT 662, 663 Advanced Topics in Algebra**

**MAT 666, 667 Advanced Topics in Algebraic Topology**

**MAT 670, 671 Advanced Topics in Complex Analysis**

**MAT 674, 675 Advanced Topics in Differential Equations**

**MAT 678, 679 Advanced Topics in Real Analysis**

**MAT 682, 683 Advanced Topics in Differential Geometry**

#### **OTHER COURSES**

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**MAT 696 Mathematics Seminar**

**MAT 697 Mathematics Colloquium**

**MAT 698 Independent Study**

**MAT 699 Dissertation Research**

Each of the above courses may be taken only with the approval of the graduate studies director.

*Variable and repetitive credit*

# Molecular Biology and Biochemistry (BMO)

*Chairperson, Department of Biochemistry and Cell Biology: William J. Lennarz*  
*Life Sciences Building 450 (516) 632-8550*

*Graduate Studies Director: Rolf Sternglanz*  
*Life Sciences Building 472 (516) 632-8550*

## Degree Requirements Requirements for the M.A. Degree

Graduate Studies in Molecular Biology and Biochemistry normally does not accept students whose goal is a master's degree. In exceptional instances, a student already in the Graduate Studies program may be awarded an M.A. degree upon completing an approved course of study, including a minimum of 30 graduate credit hours, passing a comprehensive examination, submitting and defending a master's thesis, and fulfilling the minimum requirements of the Graduate School.

## Requirements for the Ph.D. Degree

### A. Course Requirements

Core courses:

1. Graduate Biochemistry I (BMO 520).
2. Molecular Genetics (BMO 503/HBM 503).
3. Physical Biochemistry (BMO 512).
4. Experimental Biochemistry (BMO 509, 510), a two-semester course in which the student spends a half semester in each of four different faculty laboratories actively participating in the research work of the laboratory.
5. Comparative Cell and Tissue Biology (BCD 656).
6. Three elective courses in molecular biology or related fields.
7. Enrollment every semester in three seminar courses: Colloquium in Molecular Biology (BMO 601, 602), which is a series of invited lectures by visiting scientists from other institutions; Student Seminar (BMO 603, 604), in which each student presents a talk on a topic from the current literature; and Molecular Biology Workshop (BMO

605, 606), in which faculty members, postdoctoral fellows, and advanced students present informal progress reports on their current research activities.

### B. Qualifying Examination

At the end of the first year all students take a written qualifying examination covering the material from the core courses. This examination tests the student's ability to integrate basic concepts and information from the core courses.

### C. Proposition Examination

After passing the written qualifying examination, each student is required to prepare and defend one proposition. The student proposes an original mechanism or theory that could serve to explain a biological phenomenon in molecular terms, and devises hypothetical experiments designed to test the proposal. The proposition may be in any area of molecular biology, including the probable area of the Ph.D. dissertation. The student presents a detailed write-up of the background and logic of the proposition and the experiments proposed to test it, which then forms the basis for an oral proposition examination. The qualifying examination and the proposition examination together constitute the preliminary examination specified in the regulations of the Graduate School.

### D. Advancement to Candidacy

When the above requirements have been satisfactorily completed, a recommendation for advancement to candidacy for the Ph.D. will be forwarded to the Graduate School.

### E. Ph.D. Dissertation

During the second year the student initiates a dissertation research project in the laboratory of a particular member of the pro-

gram faculty. After the student has passed the proposition examination, a research committee is appointed to guide the dissertation research, and when the research nears completion, a dissertation examining committee is appointed by the vice provost for graduate studies.

### F. Dissertation Defense

The dissertation defense, which completes the requirements for the Ph.D., consists of a public seminar presentation of the dissertation work followed by an oral examination before the dissertation examining committee.

### G. Teaching Experience

All students in molecular biology and biochemistry, whether or not they are supported by teaching assistantships, are required to gain experience in teaching by assisting in laboratory sections, leading discussion sections, or helping to formulate and grade examination papers. The teaching experience may be in either undergraduate or graduate courses, and extends over a period of three semesters.

### H. Residence Requirement

The university requires at least two consecutive semesters of full-time graduate study. The demands of the course of study necessitate a longer period of residence.

## Courses

### BMO 500 Directed Readings in Molecular Biology

Directed readings in topics of current interest, under supervision of a faculty sponsor culminating in one or more critical review papers.  
*Prerequisite:* Sponsor and approval of Master's Program Executive Committee  
*Yearly, 1-3 credits*



**BMO 503/HBM 503 Molecular Genetics**

Introduces the classical work and current developments in lower and higher genetic systems. Covers gene structure and regulation in prokaryotic and eukaryotic organisms, mutational analysis and mapping, transposable elements, and biological DNA transfer mechanisms. Bacteriophage as well as lower and higher eukaryotic systems are used to illustrate aspects of molecular genetic structure and function. Crosslisted with HBM 503.

*Prerequisite:* Permission of instructor  
*Fall, 3 credits*

**BMO 507/BNB 540 Molecular Approaches to the Nervous System**

An advanced course for critical evaluation of biochemical, molecular biological, and cellular electrophysiological analysis of neuronal function and synaptic transmission. The format emphasizes discussion and evaluation of recent research findings by all participants.

*Prerequisite:* BMO 520, BNB 561, or permission of instructor

*Spring, alternate years, 2 credits*

**BMO 509, 510 Experimental Biochemistry**

An introduction to modern biochemical research techniques. The student spends a half-semester in the laboratory of each of four different members of the faculty. In each laboratory the student participates in some aspect of the research being pursued by the faculty member.  
*Fall and spring, minimum 2 credits each semester, variable*

**BMO 512 Physical Biochemistry**

Theoretical principles and experimental methods used in the study of proteins and nucleic acids, e.g., hydrodynamics, spectroscopy, magnetic resonance, and diffraction.

*Prerequisites:* BMO 520; CHE 301 or 312  
*Fall, 3 credits*

**BMO 517 Biomembranes**

The molecular architecture of membranes: the organization, functions, and assembly of lipids and proteins in biological membranes; biophysical phenomena such as diffusion and conductivity, which are amenable to detailed molecular analysis, will also be examined.

*Spring, 3 credits*

**BMO 520 Graduate Biochemistry I**

Several topics in modern biochemistry will be treated at an advanced level. Topics covered will include protein structure; enzyme kinetics and mechanisms; metabolism of carbohydrates; amino acids and lipids; biomembranes, membrane transport, and bioenergetics.

*Prerequisite:* Introductory biochemistry  
*Fall, 4 credits*

**BMO 599 Research**

Original investigation undertaken with the supervision of a faculty member.

*Fall and spring, credit to be arranged*

**BMO 601, 602 Colloquium in Molecular Biology**

A weekly series of talks and discussions by visiting scientists in which current research and thinking in various aspects of molecular and cellular biology will be presented. This course is required of all students every semester in which they are registered in Graduate Studies in Molecular Biology and Biochemistry, and attendance is mandatory. Visitors are welcome.

*Fall and spring, 1 credit each semester*

**BMO 603, 604 Student Seminar in Molecular Biology**

Seminars given by graduate students on recent work taken from the literature in the area of molecular or cellular biology. This course is required of all students every semester in which they are registered in Graduate Studies in Molecular Biology and Biochemistry, and attendance is mandatory. Visitors are welcome.

*Fall and spring, 1 credit each semester*

**BMO 605, 606 Molecular Biology Workshop**

Progress reports given each week by members of the faculty, postdoctoral fellows, and advanced graduate students on their current research. This course is required of all students every semester in which they are registered in Graduate Studies in Molecular Biology and Biochemistry, and attendance is mandatory. Visitors are welcome.

*Fall and spring, 1 credit each semester*

**BMO 685-688 Advanced Seminars**

Topics to be arranged. Visitors are welcome.

*Fall and spring, 1 credit each semester*

**BMO 699 Dissertation Research**

Original investigations undertaken as part of the Ph.D. program under supervision of a research committee.

*Prerequisite:* Advancement to candidacy  
*Fall and spring, credit to be arranged*

# Music (MUS)

*Chairperson: Richard Kramer*  
Staller Center 3307 (516) 632-7330

*Graduate Studies Director: David Lawton*  
Staller Center 3310 (516) 632-7330

## **Degree Requirements\* Requirements for the M.A. Degree, Graduate Studies in Music History**

### **A. Course Requirements**

Thirty graduate credit hours (exclusive of those in MUS 501 Compositional Skills of Tonal Music, MUS 505 Foundations of Musicianship, and MUS 591 Practicum in Teaching) chosen in consultation with the student's advisor. The program must include:

1. MUS 505 Foundations of Musicianship, and MUS 506 Graduate Musicianship, to be taken during the first year of study. Qualified students may be exempted from these courses through a placement exam given at the beginning of the fall semester.
2. MUS 502 Proseminar in Tonal Analysis, to be taken during the spring semester of the first year of study. Students who are well prepared in analysis may be exempt from this requirement by examination.
3. MUS 503 Music in the 20th Century.
4. At least two courses from the group MUS 543-555 (Special Topics Courses).

If a course in a department other than Music is taken toward the degree, approval from the graduate studies committee must be obtained.

### **B. Foreign Languages**

A reading knowledge of French and German is required. The German examination must be taken at the beginning of the first semester of study. Both examinations must have been taken by the end of the second semester.

\*Note: All graduate students whose programs have a foreign language requirement (M.A., Ph.D., D.M.A., and M.M. in harpsichord) must take the Music Department's foreign language exam during their first semester of residence. Students who fail the examination must take an appropriate language course or demonstrate evidence of comparable formal preparation (such as private tutoring) before retaking the examination.

### **C. Comprehensive Examinations**

Written and oral examinations in the history of music and in the analysis of preassigned compositions.

### **D. Research Paper**

A substantial essay, normally one the student has written as part of the coursework, is required. The paper should be submitted no later than the third week of the semester in which the student expects to receive the degree.

## **Requirements for the M.A. Degree, Graduate Studies in Music Theory**

### **A. Course Requirements**

Thirty graduate credit hours (exclusive of those in MUS 501 Compositional Skills of Tonal Music, MUS 505 Foundations of Musicianship, and MUS 591 Practicum in Teaching) chosen in consultation with the student's advisor. The program must include:

1. MUS 505 Foundations of Musicianship and MUS 506 Graduate Musicianship, to be taken during the first year of study. Qualified students may be exempted from these courses through a placement exam given at the beginning of the fall semester.
2. MUS 502 Proseminar in Tonal Analysis, to be taken during the spring semester of the first year of study. Students who are well prepared in analysis may be exempt from this requirement by examination.
3. Seminars in Music Theory: three courses from the group MUS 531-534.
4. MUS 559 Topics in Analysis (two semesters).
5. One course from the group MUS 539-555 (Special Topics Courses)
6. One of the following:  
MUS 511 Compositional Techniques of the 20th Century

MUS 516 Electronic Music Workshop  
MUS 521 Composition in Traditional Styles.

If a course in a department other than Music is taken toward the degree, approval from the graduate studies committee must be obtained.

### **B. Foreign Languages**

A reading knowledge of French and German is required. The German examination must be taken at the beginning of the first semester of study. Both examinations must have been taken by the end of the second semester.

### **C. Comprehensive Examinations**

Written examination in the history of music theory and week-long projects involving problems in analysis and theory are required.

### **D. Research Paper**

A substantial essay, normally one the student has written as a part of the coursework, is required. The paper should be submitted no later than the third week of the semester in which the student expects to receive the degree.

## **Requirements for the M.A. Degree, Graduate Studies in Composition**

### **A. Course Requirements**

Thirty graduate credit hours (exclusive of those in MUS 501 Compositional Skills of Tonal Music, MUS 505 Foundations of Musicianship, and MUS 591 Practicum in Teaching) chosen in consultation with the student's advisor. The program must include:

1. MUS 505 Foundations of Musicianship and MUS 506 Graduate Musicianship, to be taken during the first year of study. Qualified students may be exempted from these courses through a placement exam given at the beginning of the fall semester.

2. MUS 502 Proseminar in Tonal Analysis, to be taken during the spring semester of the first year of study. Students who are well prepared in analysis may be exempt from this requirement by examination.
3. An advanced theory course from the group MUS 531-534, or MUS 559.
4. One course in the history of music before 1900.
5. MUS 523 Advanced Composition, to be taken every semester of residence.
6. MUS 515 The Fundamentals of Electronic Music.
7. MUS 516 Electronic Music Workshop.

If a course in a department other than Music is taken toward the degree, approval from the graduate studies committee must be obtained.

#### **B. Foreign Language**

A reading knowledge of French, German, or Italian is required. The examination must be taken at the beginning of the first semester of study.

#### **C. Comprehensive Examination**

Written examination in the analysis of preassigned compositions is required.

#### **D. Compositions**

Students must satisfy the departmental requirement that they have written compositions of sufficient quality and variety during the period of study after admission to the Graduate School. Fair copies of all these compositions must be submitted to the graduate studies committee as they are completed. The last day for graduate students to submit theses and dissertations, as specified in the academic calendar, will be the final deadline for all works to be submitted.

### **Requirements for the M.M. Degree**

#### **A. Course Requirements**

Thirty graduate credit hours (exclusive of those in MUS 501 Compositional Skills of Tonal Music, MUS 505 Foundations of Musicianship, and MUS 591 Practicum in Teaching) chosen in consultation with the student's advisor. Up to 15 credits in individual study of the major instrument or voice may be counted toward the degree. None of the remaining 15 degree credits may be in individual study of another instrument or voice.

The program must include at least one course in music history (MUS 503, 507, or a course from the group MUS 441-478) and one course in music theory (MUS 502, 504, 508, 515, 521, or a course from the

group MUS 432, 434, and 439). If advanced undergraduate courses (MUS 432-478) are used to satisfy the requirement, the credit earned will not count toward the thirty graduate credits required for the degree. Students who can demonstrate adequate preparation may take more advanced courses to fulfill this requirement.

Students who play orchestral instruments are required to enroll in MUS 565 Graduate Orchestra every semester of full-time residence. Under special circumstances a student may petition to have this requirement waived on a per-concert basis; a memorandum outlining policies and procedures for such a waiver is available from the Music Department's Graduate Office. Students in voice are required to enroll in MUS 566 Camerata Singers for two semesters. This requirement may be waived at the request of either the conductor or the major teacher. Participation in the accompaniment pool is required of all pianists and harpsichordists during each semester of full-time residence. Students in harpsichord are expected to participate in the Collegium Musicum for two semesters. All students except those in the conducting programs must be enrolled in MUS 571 during each semester of full-time residence.

If a course in a department other than Music is taken toward the degree, approval from the graduate studies committee must be obtained.

#### **B. Ear Training**

MUS 505 Foundations of Musicianship and MUS 506 Graduate Musicianship must be taken during the first year of study. Qualified students may be exempted from these courses through a placement exam given at the beginning of the fall semester.

#### **C. Piano Proficiency**

Students in voice are required to take the piano proficiency examination upon entering the program. Those who do not pass the examination must take appropriate courses and pass the examination before the degree will be granted.

#### **D. Jury Examinations**

These are offered each semester.

1. Students must take one jury examination during each academic year.
2. Students must take and pass the jury examination in the semester prior to the one in which the degree recital is given.
3. For students in harpsichord, the examinations will include continuo realization.

#### **E. Foreign Language**

A reading knowledge of French or German is required of students in harpsichord. Entering students in voice are expected to

have a basic proficiency equivalent to one year each of Italian, French, and German. Deficiencies must be remedied before the degree will be granted.

#### **F. Public Recital**

### **Requirements for the Doctor of Musical Arts Degree, Contract toward Candidacy**

A plan of study in the form of a working contract toward candidacy will be drawn up by the student and a directing committee early in the student's first semester. The directing committee will consist of the student's advisor and a member of the academic faculty, to be appointed by the graduate studies director. The committee may include additional faculty members from within or outside the department if appropriate. Final approval of the contract, and of any revisions that may be necessary, rests with the graduate studies committee.

The design of the program is to be developed around the requirements given below, and the contract should specify such terms as the core of courses to be taken; the length of full-time residence; and the schedule and substance of various recitals, essays, and examinations. The term of the contract should normally be completed after two years of full-time residence.

#### **A. Work in the Student's Area of Specialization**

Progress during residence in the program will be demonstrated to the directing committee through the presentation of four recitals, not including the doctoral degree recital, showing mastery of a broad range of musical styles. Two of these must be solo recitals, unless otherwise specified by the directing committee. Students who propose to work in a second area of specialization should see section H below.

#### **B. Public Lecture-Recital**

See the description of MUS 696.

#### **C. Essays**

Two papers, one on an analytical topic and one on a historical topic, are required. These essays may be on performance-oriented subjects. Each must grow out of work in a separate graduate music course. The revision of each essay must be provisionally approved by the course instructor and the student's directing committee no later than one year after the end of the semester in which the course was taken.

#### **D. Work in the Area of 20th-Century Music**

Either a substantial portion of one of the recitals, described above in section A, or the lecture-recital, section B, must be devoted to 20th-century music. Participation in MUS 611 resulting in a significant performance may satisfy this requirement in part.

#### **E. Foreign Language**

A reading knowledge of French, German, or Italian is required. Students in harpsichord must read both French and German. Students in voice must pass reading examinations in any two of the following languages: Italian, French, German, or Russian, and must demonstrate singing competence in Italian, French, and German. The contract toward candidacy may specify further language proficiency depending upon the proposed plan of study.

#### **F. Teaching**

A minimum of two semester-long courses, either or both of which may comprise individual lessons, ensemble coaching, or classroom teaching, is required.

#### **G. Orchestra/Accompaniment**

Students who play orchestral instruments are required to enroll in MUS 565 Graduate Orchestra every semester of full-time residence. Under special circumstances, a student may petition to have this requirement waived on a per-concert basis; a memorandum outlining policies and procedures for such a waiver is available from the Music Department's Graduate Office. Students in voice are required to enroll in MUS 566 Camerata Singers for two semesters. This requirement may be waived at the request of either the conductor or the major teacher. Pianists and harpsichordists are required to participate in the accompaniment pool during each semester of full-time residency.

#### **H. Secondary Area of Specialization**

Students who propose to do advanced work in composition, history, or theory as an integral part of the program must do one or both of the following:

1. Present a number of musical compositions demonstrating fluency in working with a variety of contemporary performance media.
2. Present a number of essays demonstrating proficiency in various aspects of musicological research, theoretical studies, analysis, or criticism. The essays may have been prepared as part of coursework.

#### **I. Doctoral Jury Examinations**

One jury will be played at the end of the first full year of residency. A second, 30-minute jury examination will be taken at the end of the period of residency covered

under the contract toward candidacy. Both juries must be passed as a condition for advancement to candidacy.

#### **J. First-Year Academic Review**

In order to be in good standing, D.M.A. students must have taken one of the two academic courses required (History or Theory) by the end of the first year of the program, and must have taken the foreign language proficiency exam by the beginning of the second semester. The graduate studies director will monitor the academic progress of D.M.A. students by asking all academic advisors to submit contract checklists in February of each year.

#### **K. Advancement to Candidacy**

Upon completion of the above requirements (A-I), the student may be advanced to candidacy. Advancement to candidacy is granted by the Graduate School upon recommendation from the departmental graduate studies director.

#### **L. Doctoral Degree Recital Examination**

After being advanced to candidacy, the student must:

1. Submit a program of the proposed doctoral degree recital, bearing the signature of the major teacher, to the graduate studies director. The program must not include works previously performed to satisfy other graduate degree requirements.
2. Submit a doctoral examination prospectus that focuses on significant features and interpretative aspects of the works to be performed. The prospectus will serve as the basis of the doctoral examination.
3. Appear before an examining committee to demonstrate mastery of the doctoral degree recital program and of areas pertinent to the works to be performed. The doctoral degree recital examination normally takes place within one year after advancement to candidacy.

#### **M. Doctoral Degree Recital**

The doctoral degree recital may be performed after the degree recital examination has been passed. It must demonstrate a distinguished, professional level of performance. A recording of this recital, along with the program and the doctoral examination prospectus is to be deposited in the university library.

#### **Requirements for the Doctor of Philosophy Degree, Contract toward Candidacy**

A plan of study in the form of a working contract toward candidacy will be drawn up by the student and a directing commit-

tee early in the student's first semester. The directing committee will consist of the student's advisor and at least two other faculty members. The graduate studies director will appoint the directing committee and will designate its chairperson, who shall not be the student's advisor. The committee may include faculty members from outside the department when that is appropriate. Final approval of the contract, and of any revisions that may be necessary, rests with the graduate studies committee.

The design of the program is to be developed around the requirements given below, and the contract should specify such terms as the core of courses to be taken, the length of full-time residence, and the schedule and subject areas of various examinations including the preliminary examination. The terms of the contract should be completed within one or two years, depending upon the scope of the program. Successful completion of relevant master's requirements is assumed for the Ph.D. degree; see Admission to the Ph.D. Program, in *Graduate Studies Opportunities*.

#### **A. Work in the Student's Area(s) of Specialization**

Progress during residence in the program will be demonstrated to the directing committee in one or a combination of the following ways:

1. The presentation of a number of musical compositions demonstrating fluency in working with a variety of contemporary performance media.
2. The presentation of a number of essays demonstrating proficiency in various aspects of musicological research, theoretical studies, analysis, or criticism. The essays may have been prepared as part of coursework.
3. A public lecture or colloquium. For historians and theorists, the topic will be determined by the student, in consultation with his or her directing committee. For composers, the lecture or colloquium must be on a topic of significant interest in 20th-century music. See section B, paragraph 2 below.

Students who propose to do work in performance as an integral part of the program must, in addition, present at least two recitals showing mastery of a broad range of musical styles.

#### **B. Work in the Area of 20th-Century Music**

Competence is to be demonstrated to the directing committee through the following:

1. An essay dealing with 20th-century music from a historical, theoretical, critical, or analytical point of view.
2. A public lecture or colloquium on a topic of significant interest in 20th-century music. See the description of MUS 696.

In order to satisfy the requirement, composers must complete both the essay and the lecture or colloquium. Historians and theorists may satisfy the requirement either with the essay or with the lecture or colloquium.

### C. Foreign Language

Reading knowledge of German and French for students in history or theory is required; reading knowledge of French, German, or Italian for composition students is required. (See pertinent M.A. language requirements, above). The contract toward candidacy may specify further language proficiency depending on the area of the dissertation.

### D. Teaching

A minimum of two semester-long courses, at least one of which shall be an introductory college course in musicianship, theory, or literature, is required. Students must also participate in the seminar on the teaching of music for a minimum of one semester and must present to the seminar at least one project or report.

### E. Advancement to Candidacy

After completing the terms of the contract, a student is eligible for advancement to candidacy. To be advanced to Ph.D. candidacy, the student must:

1. Submit a prospectus outlining the nature and aims of the dissertation.
2. Pass a preliminary examination that will demonstrate preparation in his or her special competence, normally the area of the dissertation.

### F. Dissertation

The dissertation shall be a significant original work of scholarship or composition. Approval of the dissertation in scholarship will rest upon a formal oral defense to be conducted by the dissertation committee. Approval of the dissertation in composition rests with the dissertation committee. The composer will present a public colloquium on the dissertation work(s).

## Courses

### MUS 500 Introduction to Music Research

Music bibliography, research techniques, and editorial procedures. Students will write several short papers covering a broad spectrum of historical periods and repertoires.  
3 credits

### MUS 501 Compositional Skills of Tonal Music

An intensive course in chorale harmonization and tonal counterpoint. (Enrollment limited to 12. MUS 501 may not be included in the courses taken in fulfillment of degree requirements.)  
Fall, 3 credits

### MUS 502 Proseminar in Tonal Analysis

The application of various techniques of analysis to tonal works. Rhythmic, harmonic, linear, thematic, and other elements of musical structure will be considered. Preparation equivalent to MUS 501 is assumed.  
Spring, 3 credits

### MUS 503 Music in the 20th Century

An intensive course in 20th-century musical styles, focusing on historical problems. Seminar reports and research papers on works of major significance.  
Fall, 3 credits

### MUS 504 Analysis of 20th-Century Music

Detailed analyses of various works that are representative of the significant compositional systems of recent music.  
Fall, 3 credits

### MUS 505 Foundations of Musicianship

An intensive workshop in the skills of sight singing and dictation of tonal melodies, rhythm, and diatonic harmony; exercises in score reading, conducting, and transcription will be included. Repertoire will be drawn from diverse styles and periods. Qualified students may be exempted from this course through a placement exam given at the beginning of the semester.  
Fall, 2 credits

### MUS 506 Graduate Musicianship

An intensive course in sight singing and dictation of chromatic and atonal melodies and complex rhythms. Projects in score reading, transcription, improvisation, and performance of 20th-century repertoire, as well as works drawn from non-Western cultures. Qualified students may be exempted from this course through a placement exam given at the beginning of the semester.  
Spring, 2 credits

### MUS 507 Studies in Music History

Concentrated study of the works of a single composer, or of repertoires that comprehend single compositional tendencies in Western music. Various topics are offered each semester.  
Fall and spring, 3 credits each semester  
(See note following MUS 509)

### MUS 508 Studies in Composition and Theory

Study of contemporary compositional techniques or of traditional writing styles, including both analysis and exercises in writing. Various specific topics offered each semester.  
Fall and spring, 1-3 credits, variable  
(See note following MUS 509)

### MUS 509 Performance Studies

This course provides the opportunity for a student who is not in a performance degree program, but who can demonstrate graduate-level performance ability, to pursue performance studies without investing the time and credit required of M.M./D.M.A. students. The course is not open to M.M./D.M.A. students, except for conducting students who can demonstrate graduate-level ability in an instrument or voice.  
Fall and spring, 2-3 credits

Note: Not more than eight credits of MUS 507, 508, and 509 combined may be counted toward the degree.

### MUS 511 Compositional Techniques of the 20th Century

A study, by means of practical exercises in writing, of some of the important techniques of the present century in the organization or non-organization of pitch, rhythm, line, motive, and form.  
Fall, 3 credits

### MUS 515 The Fundamentals of Electronic Music

A short survey of the history and literature of the medium will be followed by study of the pertinent background in theoretical acoustics and practical engineering. Students will then be instructed in the basic techniques of electronic sound production and modification.  
Fall, 3 credits

### MUS 516 Electronic Music Workshop

Individual short experimental works on specific assignments. Uses of electronic music equipment.  
Prerequisite: MUS 515 or the equivalent  
Spring, 3 credits

### MUS 521 Composition in Traditional Styles

A study of one of the established disciplines such as fugue, homophonic forms, or composition in the sacred style of the 16th century. The content of the course will be announced each time it is offered.  
3 credits

### MUS 523 Advanced Composition

Individual projects for graduate students in composition.  
Fall and spring, 3 credits each semester

### MUS 531 Seminar in Music Theory: Compositional Theory Before 1700

Studies in the writings of theorists from the Middle Ages through the 17th century in the context of contemporary repertoires. Topics, varying from semester to semester, will include the following areas of investigation: modal theory as model for melodic composition, and the efforts to adapt modal theory to polyphonic practice; problems of *musica ficta* as symptoms of the confrontation of modality and the melodic dimension with tonality and the harmonic dimension; discant and counterpoint.  
Fall, 3 credits

### MUS 532 Seminar in Music Theory: Rhythm and Its Notation

Investigations, with the aid of theoretical writings ancient and recent, and through musical analyses, into the nature of the rhythmic impulse; studies in the efforts throughout musical history to make rhythm as performance competence and as compositional parameter; studies in the relation of rhythm and meter in theory and practice. The work in any single semester may be confined to a special aspect of such topics.  
3 credits

### MUS 533 Seminar in Music Theory: Topics in Tonal Theory

Studies in the problems of such concepts as root; harmonic syntax; tonality; consonance and dissonance, as abstractable from musical time and as immersed in it; and of the basic writings on these problems, from Rameau and the theorists of the 18th century through Schenker and the commentaries on his work.  
3 credits

### MUS 534 Seminar in Music Theory: 20th-Century Topics

Studies in the formation of systematic theories pertinent to various idioms from C. Debussy to the present. The following would be representative areas: attempts to extend prolongational (Schenkerian) theory beyond "tonality;" attempts, Forte's in particular, to systematize a theoretical basis for pitch-structure in "atonal" music; classical 12-tone theory; rhythmic systems in Babbitt, Boulez, and Stockhausen.  
3 credits

**MUS 535 Lecture-Workshop in the Performance of Baroque Music**

An examination of problems confronting the performer of music from the period ca. 1600-1750, from both musicological and practical points of view. The basso continuo, its function and realization; phrasing and articulation; ornaments, notated and improvised; period instruments; aspects of notation; bibliography. The course will meet in lecture for two hours each week with a third hour devoted to the coaching of a rehearsal or performance of music prepared by members of the class.

3 credits

**MUS 537 Seminar in Analysis and Performance**

A study of the relationship of technical aspects of performance such as tempo, phrasing, articulation, and dynamics, to conceptual problems such as rhythmic and metric levels, tonal structure, and serial organization, based upon the analysis and performance of representative solo and chamber works from the 18th through the 20th century.

3 credits

**MUS 538 Phenomenological Approaches to Music Analysis**

Concepts from phenomenological philosophy will be used as a basis for the study of music from various periods and cultures, with an emphasis on recent music in the Western, classical tradition. Readings include Heidegger, Husserl, and later writings in phenomenology; philosophies of space and time; and music theoretic studies by Clifton, J. Kramer, Lewin, and others.

3 credits

**MUS 539 Contemporary Criticism and Analysis in Music, Literature, and Art**

The methodology of contemporary criticism. A discussion of theories of form and style, and the relations and crosscurrents among contemporary criticisms in different media. Formalist theories (Schenker in music, Riegl and Wölfflin in art), statistical analysis, sociological criticism and Marxism (Adorno), structuralism, psychological theory, and traditional psychology.

3 credits

**MUS 540 Studies in Cultural Historiography**

This course is intended to promote the student's knowledge and reflection about the study of the history of the arts as history. It is organized on the following topics: origins and philosophical foundations of the modern historical consciousness; the nature of historical knowledge and explanation; historiographic models; and origins, philosophical foundations, and genres of historical musicology.

3 credits

**SPECIAL TOPICS COURSES**

Topics to be chosen each time a course is offered will depend upon the needs of the students and the interests of the instructor.

**MUS 543 Topics in Medieval Music**

3 credits

**MUS 545 Topics in Renaissance Music**

3 credits

**MUS 547 Topics in Baroque Music**

3 credits

**MUS 549 Topics in 18th-Century Music**

3 credits

**MUS 553 Topics in 19th-Century Music**

3 credits

**MUS 555 Topics in 20th-Century Music**

3 credits

**MUS 559 Topics in Analysis**

3 credits

**MUS 560 Score Reading**

Intensive drill in score reading. Singing, composing, and playing in open score with movable clefs. Students must have basic proficiency at the keyboard. Limited to eight students. Priority given to students in the conducting program.

3 credits

**MUS 561 Orchestral Conducting**

Advanced training in the preparation and conducting of orchestral scores from the standard repertory. Students will study the works in a seminar, and then conduct them in regular supervised readings with the Graduate Orchestra. Open only to students in the graduate conducting programs.

Fall and spring, 3 credits each semester

**MUS 563 Advanced Choral Conducting A**

Advanced training in preparing and conducting choral works. Students will spend a semester in score study, receive individual private instruction, and be expected to participate in the rehearsing of the University Chorus, the University Chorale, and the Chamber Singers. Open only to students enrolled in graduate conducting programs.

Fall and spring, 3-6 credits each semester

**MUS 564 Advanced Choral Conducting B**

Advanced training in preparing and conducting choral works. Not open to students enrolled in the graduate conducting programs.

Fall and spring, 3 credits each semester

**MUS 565 Graduate Orchestra**

Study and performance of orchestral works from the baroque period to the present. Weekly readings of important works from the standard repertory.

Fall and spring, 1-2 credits, variable

**MUS 566 Camerata Singers**

Study and performance of choral works for chamber chorus from all periods of music history. May be repeated.

Fall and spring, 1 credit each semester

**MUS 567 Master Class in Orchestral Repertory**

Study of orchestral parts for sections (brass, strings, woodwinds) or for individual instruments. The course will emphasize overall ensemble skills and audition preparation. Different sections directed toward specific groups. See the course listing for offerings in any particular semester.

2 credits

**MUS 569 Performance Problems in 20th-Century Music**

A study of performance skills required in new music, with emphasis on polyrhythms, composite rhythms, control of tone color and dynamics, and the understanding of new methods of notation. Exercises and the study of selected 20th-century works.

Fall, 2 credits

**MUS 570 20th-Century Conducted Ensemble**

Works to be studied will range from five to 15 players. Representative composers would be Boulez, Carter, Stockhausen, Stravinsky, Varese, and Webern. Performance of the works will be a normal part of the course. Instrumental students will be conducted by the instructor for one and one-half hours per week, and by the student conductors for one hour per week. Conducting students will meet with the instructor alone for one and one-half hours per week; besides working with the instrumentalists, they will also observe the sessions conducted by the instructor. Enrollment of conducting students will be limited to three.

Prerequisite: MUS 569 or the equivalent  
Spring, 3 credits for conducting students, 2 credits for instrumentalists

**MUS 571 Advanced Instruction in Instrument or Voice**

Individual guidance in technique and repertory, with 30 practice hours required each week. Each student is required to perform at least one solo piece per semester, unless excused by the instructor in a written note to the department's graduate studies committee.

Fall and spring, 2-6 credits each semester

**MUS 573 Chamber Music**

Chamber ensembles such as the string quartet, wind quintet, solo vocal ensemble, two-piano team, and other special groups meet, each under the direction of a member of the performance faculty, for the study of works from the repertoires of the respective groups, with particular attention given to the music of the 20th century.

Required: Presence at a weekly coaching session, at least three hours per week of uncoached rehearsal, and at least one performance per semester.

Fall and spring, 2 credits

**MUS 574 Master Class in Chamber Music**

Advanced studies in the repertoires for various chamber ensembles. Each section will be limited to three ensembles, to be chosen by the instructor of the section prior to the beginning of the semester. Enrollment by groups only.

2 credits

**MUS 575 Master Class in Solo Repertory for Instrument or Voice**

Performance techniques and problems in works for instrument or voice, drawn from all historical periods. The instructor will be a teacher of the specific instrument in each case, except that his or her section may be open to students of certain other instruments with his or her permission. Not offered each semester in every instrument.

Fall and spring, 2 credits each semester

**MUS 577 Master Class in Performance Pedagogy**

Guidance and supervision in the teaching of an instrument or voice.

2 credits

**MUS 579 Opera Workshop**

Study and performance of scenes or complete operas from the standard and 20th-century repertoires. An interdisciplinary approach involving the departments of Music and Theatre Arts.

Fall and spring, 2-4 credits, variable

**MUS 581 20th-Century Repertory for Instrument or Voice**

A study of the solo works of the 20th century, with emphasis on performance techniques and problems. The instructor will be a teacher of the specific instrument in each case, except his or her section may be open to students of certain other instruments with his or her permission. Not offered each semester in every instrument.

Fall and spring, 2 credits each semester

**MUS 583 Continuo Realization**

Practical and theoretical instruction in figured bass realization, based on the study of vocal and instrumental scores from 1600-1750. Required of students in harpsichord. Open, with consent of the instructor, to other qualified students who have some knowledge of figured bass realization.

2 credits

**MUS 584 Early Music Ensemble**

A group of ensembles, working from scholarly editions and original sources, dedicated to the performance of early music. The course will be divided into three sections 1) Baroque Chamber Ensemble, 2) Renaissance Consort, 3) Collegium Musicum. Instrumentalists may perform on replicas of early instruments. Acceptance is by audition.

Fall and spring, 1 credit each semester

**MUS 585 Renaissance and Baroque Brass Performance Practice**

Study and survey of original and transcribed Renaissance works, and of various baroque works, for brasses. Investigation of styles and techniques of Renaissance ornamentation using mainly Ganassi's *Fontegara* (1535) as text. Investigation of baroque ornamentation styles and symbols.

*Fall, 2 credits*

**MUS 591 Practicum in Teaching**

Instruction in the department under the supervision of the faculty. (MUS 591 may not be included in the courses taken in fulfillment of degree requirements.)

*Fall and spring, 1-3 credits each semester*

**MUS 592 Semester on the Teaching of Music**

Discussion of fundamental problems in teaching music. Topics may include the explanation of musical processes; communication to non-professionals; and integration of aspects of performance, theory, history, and analysis with one another. Required of all students who teach one of the introductory undergraduate courses in musicianship, theory, or literature; to be taken during the first semester of teaching.

*Fall, 1 credit*

**MUS 595 Chamber Players**

The Graduate String Quartet, the Graduate Brass Quintet, the Graduate Wind Quintet, and the Graduate Piano Trio, which are specially appointed groups, work under the direction of a member of the performance faculty and present concerts and workshops at the university and elsewhere.

*Fall and spring, 3 credits each semester*

**MUS 596 Contemporary Chamber Players**

The study and performance of 20th-century music for ensemble, ranging from duos to larger conducted groups. Repertoire will include 20th-

century classics as well as new works, including compositions written by Stony Brook students. A full schedule of public performances will take place.

*Prerequisite:* Permission of instructors

*Fall and spring, 1-3 credits each semester, repetitive*

**MUS 599 Independent Studies**

Individual studies under the guidance of a faculty member. Each student must submit to the graduate studies committee of the department a written prospectus of the work he or she intends to pursue, with the amount of credit proposed, together with the written endorsement of the prospective instructor. Approval of the graduate studies committee is required; hence this material should be submitted as soon as possible, and in any case within the first two weeks of the semester (or the first week of a summer session).

*Fall and spring, variable credit*

**MUS 602 Music and Other Disciplines**

An interdisciplinary seminar offered from time to time with members of other graduate departments, on topics to vary from semester to semester.

*3 credits*

**MUS 611 Workshop in Composition and Performance**

Student composers and student performers will be under the joint supervision of the composition faculty and a member of the performance faculty. The composers will write examples to be performed and discussed in class that confront specified problems in performance and composition. The course can be repeated once for credit toward the degree.

*Spring, 3 credits*

**MUS 615 Seminar in Electronic Music Composition**

Individual compositions of substantial proportions in electronic or concrete music media. The course may be repeated. Open only to qualified students in a music degree program.

*Prerequisite:* MUS 516 or the equivalent

*Fall and spring, 3 credits each semester*

**MUS 623 Directed Study in Composition**

Intended for doctoral students in composition. *Fall and spring, 1-12 credits each semester, repetitive*

**MUS 661 Directed Study in Conducting**

Intended for doctoral students in conducting. *Fall and spring, 1-12 credits each semester, repetitive*

**MUS 671 Directed Study in Instrumental and Vocal Performance**

Intended for doctoral students in instrumental and vocal performance. *Fall and spring, 1-12 credits each semester, repetitive*

**MUS 696 Doctoral Colloquium**

Students are required to enroll in MUS 696 in a semester prior to the one in which the Ph.D. colloquium or the D.M.A. lecture-recital is given. The instructor, chosen in consultation with the directing committee, will act as an advisor or tutor, and will signal to the graduate studies committee that the colloquium or lecture-recital may be given.

*Fall and spring, 1 credit*

**MUS 697 Directed Reading**

Intended for preparation for the preliminary examinations and related requirements. *Fall and spring, 1-12 credits each semester, repetitive*

**MUS 698 Directed Dissertation Research**

Intended for work in the area of the dissertation. *Fall and spring, 1-12 credits each semester, repetitive*

# Neurobiology and Behavior (BNB)

*Chairperson: Lorne Mendell*  
*Life Sciences Building 550 (516) 632-8616*

*Graduate Studies Director: Joel Levine*  
*Life Sciences Building 550 (516) 632-8616*

## Degree Requirements Requirements for the M.A. Degree

Graduate Studies in Neurobiology and Behavior normally does not accept a student whose goal is an M.A. degree. In exceptional instances, a student already in the Graduate Studies may be awarded an M.A. degree upon completion of an approved course of study, including 30 graduate credit hours, a comprehensive examination, a research thesis, and the minimum requirements of the Graduate School.

## Requirements for the Ph.D. Degree

### A. Course Requirements

1. Basic Biology
  - a. Biochemistry (BMO 520). This requirement can be waived if the student can demonstrate that a sufficient course has been successfully completed.
  - b. Cell Biology (BCD 657). This requirement can be waived if the student can demonstrate that a sufficient course has already been taken.
2. Introduction to Neurobiology and Behavior I, II (BNB 561, BNB 562). A two-semester course taught by members of the Department of Neurobiology and Behavior in which the student is introduced to a broad variety of topics in neurobiology. These will be taken in the fall and spring semesters of the first year. This requirement cannot be waived.
3. Advanced Neurobiology and Behavior (BNB 531, BNB 532). Four of these one-semester courses given by various faculty members are required to be taken consecutively during the period of residency and will begin normally in the fall of the second year.

These courses will include presentations by both faculty and students. Each semester will be organized around a specific topic, e.g., neurochemistry, development and plasticity, excitable membranes, etc.

4. Medical Neuroanatomy (HBA 534) or Mammalian Neuroanatomy (HBA 660). This requirement can be waived if the student can demonstrate that a sufficient course has been successfully completed.
5. Electives. At least one course in various biological sciences (graduate level), or physical or mathematical sciences (either graduate or undergraduate level) must be selected by the student in consultation with the student's grade advisor. Students may take additional elective courses if they desire.

### B. Comprehensive Examination

In January or February of the second year after admission, each student must take the comprehensive examination. The examination consists of both written and oral parts and emphasizes integration of information from a variety of sources, including courses, seminars, and readings.

### C. Advancement to Candidacy

The faculty will recommend a student to the Graduate School for advancement to candidacy upon satisfactory completion of all course requirements, the comprehensive examination, and the dissertation proposal.

### D. Ph.D. Dissertation

A dissertation that constitutes an original and significant contribution to the field of neurobiology and behavior is required for the Ph.D. The work must be of a quality

acceptable for publication in a recognized scientific journal. By the end of the second year, the student should initiate a dissertation research program in the laboratory of a member of the department. After consultation with an advisory committee appointed to guide the dissertation research, the student should present and defend a dissertation proposal. Upon completion of the dissertation research, the student will present a departmental seminar based on the dissertation. Following this the student will be given an oral examination on the dissertation research and related areas by the dissertation committee.

### E. Teaching Requirements

All students, as part of their training, are required to participate in teaching at the undergraduate level for at least two semesters. If supported by a teaching assistantship, the student must participate in teaching each semester the assistantship is held.

### F. Residence Requirement

The university requires at least two consecutive semesters of full-time study. The demands of the course of study necessitate a longer period of residence.

### G. Academic Standing

All students must maintain a 3.0 grade average at all times. Due to the importance of BNB 561 and 562 as the basis for advanced study in Neurobiology and Behavior, students who have a grade of C in these courses must repeat them satisfactorily prior to taking the comprehensive examination. Research (BNB 599 and 699) is graded on a satisfactory/unsatisfactory basis. Any student who receives a grade of U in two concurrent semesters will be terminated from the program.



## Courses

### **BNB 500 Directed Readings in Neurobiology and Behavior**

Directed readings in topics of current interest, under supervision of a faculty sponsor, culminating in one or more critical review papers.

*Prerequisite:* Sponsor and approval of master's program executive committee

*Annually, 1-3 credits, repetitive*

### **BNB 531 Advanced Neurobiology**

Advanced seminar course centered around a topic to be determined. Examples include neurochemistry, membrane biophysics, neuronal plasticity, synaptic mechanisms, molecular neurobiology, developmental neurobiology. Students will be expected to read original literature and deliver oral presentations of material.

*Prerequisite:* Permission of instructor  
*Fall, 3 credits, repetitive*

### **BNB 532 Advanced Neurobiology**

Advanced seminar course centered around a topic to be determined. Students will be expected to read original literature and deliver oral presentations of material.

*Prerequisite:* Permission of instructor  
*Spring, 3 credits, repetitive*

### **BNB 533 Advanced Seminar in Behavioral Neurobiology**

Advanced seminar course centered around selected topics in behavioral neurobiology. Topics include, for example, neuropharmacology, biological rhythms, neuroendocrinology, and neural control of feeding and drinking. Students will be expected to read original literature and deliver oral presentations of material.

*Spring, 3 credits, repetitive*

### **BNB 540 Molecular Approaches to the Nervous System**

An advanced course for critical evaluation of biochemical, molecular biological, and cellular electrophysiological analysis of neuronal function and synaptic transmission. The format emphasizes discussion and evaluation of recent research findings by all participants.

*Prerequisite:* BMO 520, BNB 561, or permission of instructor

*Spring, 2 credits, alternate years*

### **BNB 547 Readings in Neurophysiology**

Discussion and critical evaluation of neurophysiological research published in biological journals. Critical analyses of techniques, methodology, and conclusions of the research will provide the primary focus of this seminar.

*Prerequisite:* Permission of instructor

*Fall and spring, 1-3 credits each semester*

### **BNB 551 Neurobiological Techniques I**

A series of laboratory exercises designed to give students hands-on experience in the basic laboratory techniques of contemporary neuroscience. This includes intracellular and extracellular recording, neuronal tissue culture, neuroanatomical techniques, and integrative physiology.

*Fall, 2 credits*

### **BNB 555 Neuropharmacology**

An advanced course for graduate students interested in developing an understanding of neuropharmacology and research on this topic. Following a general introduction to the nerve cell structure, synaptic and chemical transmission, three themes of receptors, receptors as channels, and G-protein-coupled receptors will be developed. Recent advances in cell and molecular biology provide the framework for instruction and discussion.

*Prerequisites:* Staff approval  
*Fall, 3 credits*

### **BNB 561 Introduction to Neurobiology and Behavior I**

A survey of cellular neurobiology. Topics to be treated include cell biology of neurons; electrophysiology of axons, synapses, and sensory receptors; neurochemistry of synaptic transmission; neural development.

*Prerequisite:* BIO 334 or permission of instructor  
*Fall, 3 credits*

### **BNB 562 Introduction to Neurobiology and Behavior II**

A survey of integrative neurobiology. Topics include sensory and motor systems, autonomic nervous system, and organization of brain stem and cortex.

*Prerequisite:* BNB 561  
*Spring, 3 credits*

### **BNB 563 Introduction to Behavioral Neurobiology**

A survey of behavioral neurobiology. Topics to be discussed include neurotransmitters and behavior, development and plasticity of the brain, neural control of homeostatic behaviors, and biological rhythms.

*Fall, 3 credits*

### **BNB 579 Topics in Developmental Neurobiology**

An introduction to the development of the nervous system. Topics include neuroembryology, neuronal differentiation, synapse formation, and specificity and plasticity of connections in vertebrates and invertebrates. Students will be expected to do at least one oral presentation.

*Prerequisite:* Permission of instructor  
*Spring, alternate years, 3 credits*

### **BNB 583-585 Special Seminars**

Topics to be arranged.

*Fall and spring, variable and repetitive credit*

### **BNB 599 Research**

Original investigation undertaken with supervision of a member of the staff.

*Fall and spring, credit to be arranged*

### **BNB 693-696 Advanced Seminars**

Topics to be arranged.

*Fall and spring, variable and repetitive credit*

### **BNB 697 Advanced Neurobiology and Behavior Seminar**

Seminar presentations delivered by faculty, associates, students, and visiting speakers.

*Prerequisite:* Permission of instructor  
*Fall and spring, repetitive credit, 1 credit each semester*

### **BNB 699 Dissertation Research**

Original investigation undertaken as part of the Ph.D. program under the supervision of the dissertation committee.

*Fall and spring, credit to be arranged*

# Philosophy

## (PHI)

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**Chairperson: Donn Welton**  
Harriman Hall 209 (516) 632-7590

**Doctoral Program Director: Marshall Spector**  
Harriman Hall 219 (516) 632-7580

**Master's Program Director: David Allison**  
Harriman Hall 232 (516) 632-7580

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### Degree Requirements

#### Requirements for the M.A. Degree, Graduate Studies in Philosophical Perspectives (MA/PP)

In addition to the minimum Graduate School requirements, the following are required:

#### A. Formal Course Requirements

A student preparing for the degree of Master of Arts in Philosophy with Graduate Studies in Philosophical Perspectives is required to take a total of 10 courses amounting to 30 graduate credit hours, as listed below:

1. Two three-credit courses (PHI 510-511), Resources in the History of Philosophy
2. Two three-credit courses (PHI 515-516), Resources in Contemporary Philosophy
3. One three-credit course (PHI 518-519) in the detailed examination of the work of a single philosopher
4. Five three-credit courses in the MA/PP offerings.

These distribution requirements may be applied with some flexibility to meet the needs of individual students, with the approval of the director of the program.

Reading knowledge of a foreign language, while desirable, is neither required nor presumed.

#### B. The M.A. Essay

The essay is a research paper in which the student exhibits an ability to locate, comprehend, and articulate a concept or theme that bears upon a contemporary problem. The paper is usually begun under the direction of the instructor in one of the MA/PP offerings and will eventually be presented to that instructor and one other faculty member upon completion.

Other options for satisfying this degree requirement are available to students, upon approval by the MA/PP program committee:

#### 1. The M.A. Practicum

The practicum is for those students who are teaching in high school and who can obtain permission to introduce a philosophy course into the curriculum, under the direction of a faculty member in the Department of Philosophy. The student will be required to present course plans, bibliographies, and other evidence of his or her academic readiness, prior to the teaching of the course, to the faculty advisor and to the MA/PP program committee for approval. During the course the construction and grading of exams and papers will be supervised and several classes will be visited. Overall evaluation will take place at the conclusion of the course and upon submission of a report written by the student.

#### 2. Fieldwork

A student, with the direction of two faculty members (as advisors), chooses a problem related to the perspectives on moral and ethical issues or public issues and perspectives that he or she wishes to investigate by going into the community (e.g., hospitals, government agencies, schools, etc.). A written plan of the project will be submitted for review and approval by the advisors and the MA/PP program committee. Overall evaluation will take place at the conclusion of the study and upon submission of a written report by the student.

#### C. Performance

An average grade of B is the minimum, but no more than six credits of C grades will be permitted to count for credit toward the degree. Any student who accumulates 12 credits of C grades will be dropped from the program.

#### D. Transfer Credits

A maximum of six hours of postbaccalaureate credit in philosophy from other institutions may be transferred toward the M.A. in Philosophy (Philosophical Perspectives). The transference of credit will not be automatic, but will depend upon the suitability of the courses to the goals of MA/PP and upon the grades received in the courses. A maximum of six credits of CED courses in philosophy earned in Stony Brook's MA/LS program are transferrable, subject only to the performance and distribution regulations mentioned above.

### Requirements for the Ph.D. Degree in Philosophy

The doctoral program is designed to be completed in five years of full-time work. The Graduate School regulations prescribe a minimum of two semesters of full-time enrollment. In addition to the minimum degree requirements of the Graduate School, the following are required:

#### A. Seminars

1. Two seminars each in the history of philosophy from among courses concentrating on the history of ancient or medieval philosophy or of early modern (16th and 17th centuries) and modern philosophy (18th and 19th centuries).
2. Two seminars on problems or areas, one from each of the following groups:

##### Group A:

- PHI 630 Philosophy of Science and Logic
- PHI 631 Metaphysics
- PHI 632 Epistemology
- PHI 633 Philosophy of Mind

##### Group B:

- PHI 634 Ethics
- PHI 635 Social and Political Philosophy
- PHI 637 Aesthetics and Rhetoric

3. Three style seminars, one in each of the three contemporary modes of philosophizing: analytic, continental, and systematic. These seminars (PHI 650, 651, and 652) will explore the methods, presuppositions, and operational modes of the style involved. Advanced style seminars and an inter-style seminar will be offered regularly, one of which is strongly recommended.

4. Two interface seminars in interdisciplinary areas between philosophy and another discipline: natural science, social science, humanities. These seminars are usually team taught by philosophy faculty members knowledgeable about fields outside philosophy along with faculty members from the relevant disciplines.

5. A practicum in the teaching of philosophy, Supervised Teaching, along with additional teaching experience in the undergraduate program.

6. Two additional elected seminars.

*Note:* An overall average grade of B or better is required, with no more than six credits of C grades counting toward the degree.

#### **B. General Requirements**

1. To pass a milestone exam in the history of philosophy by the end of the second year. Failure to pass this history of philosophy exam by the end of the fourth semester constitutes grounds for dismissal from the program.

2. To have accepted a philosophical style essay.

3. To have accepted an interface essay.

The doctoral program director will guide students in planning their program of studies.

#### **C. Ph.D. Candidacy**

Official Ph.D. candidacy is attained when, in addition to the requirements listed above, a student fulfills the following competency requirements:

1. Competence in symbolic logic. Sufficient knowledge of concepts and notations of first-order logic for understanding and applying them to problems in philosophy. A grade of B or better in an undergraduate symbolic logic course is normally adequate evidence of competence.

2. Competence in a foreign language. This is shown by translating a previously untranslated philosophical article (or the equivalent) or by writing a research paper including a translation of substantial philosophical passages.

3. Competence to undertake a dissertation project. This is shown by (a) a prospectus (10-15 pages) outlining

projected study, expected findings, and relevant arguments and evidence (e.g., bibliography), and (b) an oral defense of the projected study before a faculty examining committee.

Upon the recommendation of the examining committee and the doctoral program director that the dissertation project be initiated, the student becomes a candidate for the Ph.D.

#### **D. Dissertation**

After advancement to candidacy, the student will concentrate on a dissertation (the written results of specialized study and research) under the supervision of a dissertation committee. After the dissertation is completed, it is read by a committee of four members, consisting of the director, two other members of the philosophy faculty, and one faculty member from outside the department who has specialized in related areas. Before final approval can be granted, the student must present the results of the dissertation research at an oral examination convened for that purpose by the department and open to interested faculty members and graduate students. If the dissertation defense is successful, the candidate is recommended to the university for the Doctor of Philosophy degree.

#### **M.A. Degree Requirement**

Doctoral students may be awarded an M.A. degree upon completion of items 1 through 4 of the Ph.D. seminar requirement, one additional elected seminar (for a total of 30 graduate credits of graded coursework), and two of the three projects listed in Section B, General Requirements. (This M.A. degree is quite distinct from the Master of Arts, Graduate Studies in Philosophical Perspectives described above.)

#### **Courses**

*Detailed course descriptions for both the master's and doctoral programs are available from the Philosophy Department Office each semester.*

#### **MASTER'S PROGRAM IN PHILOSOPHICAL PERSPECTIVES**

All courses are 3 credits unless otherwise noted.

**PHI 510, 511 Resources in the History of Philosophy I, II**

**PHI 515, 516 Resources in Contemporary Philosophy I, II**

**PHI 518, 519 Individual Thinkers in the History of Philosophy**

#### **I. Moral and Ethical Perspectives**

**PHI 521 Contemporary Moral Issues**

**PHI 522 Ethical Issues**

**PHI 523 Moral Theories of the Modern World**

**PHI 524 Guilt and Responsibility**

#### **II. Public Issues and Perspectives**

**PHI 532 Freedom, Consent, and Values**

**PHI 533 Community**

**PHI 534 Philosophy of Law**

**PHI 535 Political Philosophy**

**PHI 536 Marxism and Communism**

**PHI 537 Philosophy of Technology**

**PHI 538 Philosophy of Medicine**

**PHI 539 Perspectives on Feminism**

**PHI 540 Perspectives on the Environment**

#### **III. Perspectives on Individual Self and Human Development**

**PHI 551 Life Histories**

**PHI 552 Parents and Children**

**PHI 553 Philosophy of Education**

**PHI 554 Perspectives on Death and Dying**

#### **IV. Perspectives on Inquiry, Method, and the Sciences**

**PHI 561 Structure of Inquiry**

**PHI 562 Logic (Crosslisted with CEI 562)**

**PHI 563 Philosophy of Language**

**PHI 564 Perspectives on Communication**

#### **V. Perspectives on Philosophic Traditions and Historical Themes**

**PHI 571 American Philosophy**

**PHI 572 Oriental Philosophy**

**PHI 573 Philosophies of History**

**PHI 574 Myth**

**PHI 575 Philosophy of Religion (Crosslisted with CEI 579)**

#### **VI. Perspectives on Art**

**PHI 581 Philosophy of Literature**

**PHI 582 Philosophy of Art**

**PHI 590, 591 Directed Readings**  
*Variable credit*

**PHI 595, 596 Directed Research**  
*Variable credit*

Ordinarily, students working on their master's essay will register for this course.

#### **DOCTORAL PROGRAM IN PHILOSOPHY**

All courses are 3 credits unless otherwise noted.

#### **I. History Courses**

**PHI 600 Ancient Philosophy**

**PHI 601 Medieval Philosophy**

**PHI 602 Modern Philosophy**

#### **II. Area Courses**

**PHI 630 Philosophy of Science and Logic**

**PHI 631 Metaphysics and Systematic Philosophy**

PHI 632 Epistemology  
PHI 633 Philosophy of Mind  
PHI 634 Ethics  
PHI 635 Social and Political  
Philosophy  
PHI 637 Aesthetics and Rhetoric  
PHI 638 Oriental Philosophy

**III. Style Seminars**

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PHI 650 Analytic Philosophies  
PHI 651 Continental Philosophies  
PHI 652 Contemporary Systematic  
Philosophies

**IV. Advanced Style Seminars**

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PHI 660 Advanced Analytic Philosophies  
PHI 661 Advanced Continental  
Philosophies  
PHI 662 Advanced Systematic  
Philosophies

**V. Interdisciplinary Seminars**

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PHI 610 Interface Seminar:  
Philosophy—Natural Science

PHI 611 Interface Seminar:  
Philosophy—Social Science  
PHI 612 Interface Seminar:  
Philosophy—Humanities

**VI. Independent and Directed Studies**

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PHI 620 Advanced Problems in  
Philosophy

*Variable and repetitive credit*

PHI 621 Independent Study  
*Variable and repetitive credit*

PHI 622 Supervised Teaching  
*3 credits, repetitive*

PHI 623 Teaching Practicum  
*3 credits*

PHI 690 Dissertation  
*Variable and repetitive credit*

# Physics (PHY)

*Chairperson: Gene Sprouse  
Physics Building P-110 (516) 632-8100*

*Graduate Studies Director: Harold J. Metcalf  
Physics Building P-106 (516) 632-8065*

## **Degree Requirements Requirements for the M.A. Degree in Physics**

A. Satisfactory performance in a program of studies (30 graduate credits) approved by the department. Normally such a program would include graduate seminars, classical mechanics, electrodynamics, and quantum mechanics.

B. Minimum grade point average of 3.0 in all graduate courses taken at Stony Brook.

C. Passing of the master's examination.

## **Requirements for the M.A. in Teaching Physics**

The Master of Arts in Teaching Physics is a course of study leading to New York State provisional certification for teaching physics in secondary schools (grades 7-12). It also prepares the student for the examinations for permanent certification.

The M.A.T. program combines the state-required education courses with graduate study in physics. The physics courses are chosen in consultation with department advisors to match the student's background and interests. Some of these courses may be extensions of standard undergraduate courses, with special assignments to make them appropriate for graduate work and a career in teaching.

Work toward this degree ordinarily involves two semesters of coursework and one semester of supervised intern experience teaching physics in a secondary school. The curriculum consists of 36 credits with a minimum grade point average of 3.0.

1. Six credit hours in Foundations of Education and Adolescent Growth and Development.
2. Six credit hours in Introduction to Science Teaching and Science Teaching Methods.
3. Nine credit hours in Student Teaching and Seminar.
4. Twelve credit hours in appropriate physics courses.

5. Three credit hours of project work on a topic in physics associated with classroom teaching at the secondary level. This course also involves preparation of the master's thesis.

## **Requirements for the M.S. Degree, Graduate Studies in Scientific Instrumentation**

A candidate for the master's degree with concentration in instrumentation will be required to demonstrate a certain level of knowledge of physics (by written and/or oral examination), to spend at least one semester as a teaching assistant in an undergraduate laboratory, to take certain required and elective courses, and to complete both a major and minor project. The curriculum is designed to meet the needs of students learning about the design, construction, and testing of sophisticated instrument systems. The degree holder will not be a super technician but a professional scientist trained in both physics and measurement techniques.

A. A student shall demonstrate proficiency in undergraduate physics at the level of the courses PHY 335, 405, 431, and 472. This can be done 1) by acceptance by the Master's in Scientific Instrumentation Committee of courses taken as an undergraduate, 2) by written examination, or 3) by passing the courses appropriate to a student's deficiencies.

B. Thirty credits (minimum) of graduate courses (500 level or above), including a minor project and a master's thesis. This thesis must describe a major piece of work in scientific instrumentation, and must be in a form acceptable to the Graduate School. It need not be original research in the same sense as a Ph.D. thesis, but it should be the result of an effort consistent with a full year of full-time work. The thesis should present an improvement of the state of the art in some area, the development

of a sophisticated and/or automated apparatus, or some other significant laboratory project, and be defended before a committee of the faculty.

C. Teaching assistant in an undergraduate laboratory for at least one semester.

D. Students shall acquire those technical skills deemed necessary by their thesis supervisors. These must include, but are not limited to, machining capability and computer literacy.

Each student will be assigned an advisor and a committee of two additional faculty members, and will be required to meet frequently with them. It is expected that very frequent communication among all the faculty and students involved will foster spirit, expose problems, and generally contribute to success.

## **Requirements for the Ph.D. Degree**

A. Satisfactory completion of an approved program of courses, with a minimum cumulative grade point average of 3.0.

B. Completion of required courses: Each of the courses listed below must be passed with a grade of A or B.

1. Two semesters of PHY 599 Graduate Seminars. This course is normally taken during the first year of graduate study, with each student registering in Section 1 during one of the semesters and in Section 2 during the other.
2. PHY 515 Methods of Experimental Research. This course, given every semester, must be taken not later than the fourth semester of residence.
3. Two advanced courses, each in an area outside that of the student's thesis research, chosen from a list of courses approved for this purpose.

C. Passing of the preliminary examination, which consists of two parts: (a) a written comprehensive examination and (b) an oral examination on a broad range of topics relevant to the student's intended area of thesis research. The written examination, given at the beginning of each semester, must be passed no later than the

beginning of the fourth semester of graduate study. The oral examination must be passed before the end of the second academic year.

D. Acceptance of graduate student by an advisor for thesis work.

E. Advancement to candidacy for the Ph.D. The department's recommendation to the Graduate School for advancement to candidacy is based on the satisfactory completion of all requirements listed above.

F. Research, dissertation, and passing the dissertation examination.

G. Teaching experience at least equivalent to that obtained in a one-year appointment as a teaching assistant, usually carried out in the first year.

H. One year of residence.

## Courses

### PHY 501 Classical Mechanics

Lagrangian and Hamiltonian formulations, variational principles, Hamilton-Jacobi theory, mechanics of fields, special relativity. 3 credits

### PHY 503, 504 Methods of Mathematical Physics I, II

A selection of mathematical techniques useful for physicists. Topics will be selected from the following: asymptotic analysis, perturbation theory applied to linear and nonlinear systems, boundary layer techniques, chaotic systems, differential equations, special functions, boundary value problems, integral transforms, integral equations. This course should be taken only by entering graduate students who have a deficiency in this area.

3 credits each semester

### PHY 505, 506 Classical Electrodynamics

Electrostatics and magnetostatics with emphasis on the solution of boundary value problems through the use of eigenfunction expansions and Green's functions; dielectrics, magnetic materials, Maxwell's equations, electromagnetic waves, wave guides, diffraction, plasma physics, special relativity, relativistic particle kinematics and dynamics, energy loss and scattering of charged particles in matter, radiation, multipole fields, spin resonance, and superconductivity.

3 credits each semester

### PHY 511, 512 Quantum Mechanics I, II

Topics include basic quantum physics and mathematical apparatus; angular momentum; symmetries; semiclassical theory of radiation; Dirac theory; and numerous concrete applications to atoms, nuclei, etc.

3 credits each semester

### PHY 515, 516 Methods of Experimental Research

A course designed to expose all graduate students to the disciplines and techniques of experimental research. A number of historically important experiments are studied and performed with the aid of modern instrumentation. As they progress, students are encouraged to pursue independent projects in which there are no rigidly fixed formats or procedures. Primary emphasis is on the development of experimental skills and on professionally acceptable analysis and presentation of results, both in written and oral form. Projects are typically chosen from such fields as atomic and nuclear spectroscopy, particle physics, solid-state and low-temperature physics, optics, and electromagnetism. Two three-hour laboratory sessions per week.

3 credits each semester

### PHY 525 Current Research Instruments

In a series of distinct units, various members of the experimental research faculty will describe the nature of their work, explain the major principles of their laboratory instruments, discuss how these instrument systems function, and conduct tours of their laboratories showing the apparatus in action. The student will become familiar with most of the experimental research instrumentation in the department.

Fall, 3 credits

### PHY 540 Statistical Mechanics

Brief review of thermodynamics. Thermal equilibrium ensembles for classical and quantum systems. Applications to systems for which the Hamiltonian is separable. Approximate treatment of nonseparable Hamiltonians.

3 credits

### PHY 541 Advanced Statistical Mechanics

Topics will be selected from cluster expansions, elementary theory of quantum fluids, phase transitions, transfer matrix, Ising and ferroelectric models, and introduction to fluctuation and non-equilibrium phenomena.

3 credits

### PHY 551 Nuclear Physics I

Basic properties of nuclei and quarks; the structure of the nucleon; independent particle models; collective models; equation of state of nuclear matter; nuclei matter; quark matter phase transition; relevant experimental techniques.

3 credits

### PHY 552 Nuclear Physics II

Nuclear reactions from 1ev to relativistic energies, statistical models of the nucleus, thermodynamics of nuclear matter, and chaos in nuclear physics.

3 credits

### PHY 555, 556 Solid-State Physics I, II

The first part of the course is primarily devoted to single-particle properties of solids. Topics covered include symmetries of solids, energy band theory, transport properties, and phonons. It also includes an elementary discussion of cooperative phenomena, such as magnetism and superconductivity. The second semester addresses the collective properties of strongly interacting condensed matter systems.

3 credits each semester

### PHY 557 Elementary Particle Physics

Introduction to elementary particle physics. Symmetries and invariance in particle physics. Experiments in particle physics and experimental results. The properties of particles in terms of quarks and leptons and their interactions. An introduction to the electro-weak theory and models for strong interactions. Interactions at high energies. Interactions between particles and matter and their application in particle detectors. A case study of modern particle detectors.

3 credits

### PHY 565, 566 Quantum Electronics I, II

Quantum electronics is a synthesis of quantum physics and electrical engineering, and is introduced in two independent semesters. *PHY 565 Atomic Physics*: A description of simple atoms and molecules and their interaction with radiation includes atoms in strong and/or weak external fields, two-photon spectroscopy, super-radiance Rydberg states, lasers and laser spectroscopy, coherent transients, etc. *PHY 566 Optics and Information*: This course is an overview of transmission line theory, communication theory, and cybernetics, which (with quantum mechanics) are needed to understand modern optical technology and applications to pure and applied physics.

Prerequisites: PHY 505, 511

3 credits each semester

### PHY 580 Special Research Projects

Research under the direction of a faculty member. Not open to Ph.D. candidates.

Each semester, variable and repetitive credit

### PHY 581 Astrophysics

An introduction to some areas of astrophysics. Topics to be selected from stellar structure and evolution, stellar atmospheres, interstellar matter, planetary atmospheres, galactic dynamics, high-energy astrophysics and cosmology, laboratory astronomical techniques.

3 credits

### PHY 585 Special Study

Reading course in selected topics.

Each semester, variable and repetitive credit

### PHY 595 Master's Degree Thesis Research

Independent research for master's degree students. Open only to those approved by individual faculty for thesis work.

Each semester, 1-12 credits, variable and repetitive

### PHY 599 Graduate Seminars I, II

Special research topics centered on monographs, conference proceedings, or journal articles. Topics include solid-state physics, elementary particles, atomic physics and quantum electronics, and nuclear physics. Both semesters are required for all first-year graduate students.

1 credit each semester

### PHY 600 Practicum in Teaching

2 credits, repetitive

### PHY 610, 611 Quantum Field Theory I, II

Field quantization: interacting fields, S-matrix theory, Feynman diagrams, charge and mass renormalization, dispersion relations, general field theory.

3 credits each semester

### PHY 612 Theoretical Particle Physics

Applications of quantum field theory to interactions between elementary particles. Topics will be chosen from perturbative quantum chromodynamics, the standard electro-weak model, lattice field theory, grand unified models, supersymmetry, and current research problems.

3 credits

### PHY 620 Relativity

General theory of relativity, cosmology.

3 credits

## SEMINARS

Each semester several seminars for advanced graduate students will be offered. These courses are intended primarily for students doing research in the area, although other students may enroll with permission of the faculty seminar leaders. Each semester carries one credit, with repetitive credit permitted.

### PHY 670 Seminar in Theoretical Physics

### PHY 672 Seminar in Elementary Particle Physics

### PHY 674 Seminar in Nuclear Physics

### PHY 676 Seminar in Solid-State Physics

### PHY 678 Seminar in Quantum Electronics

## SPECIAL TOPICS COURSES

The subject matter of each special topics course varies from semester to semester, depending on the interests of students and staff. Advanced topics will be discussed, particularly those that are of current interest. Each course carries three credits, with repetitive credit permitted.

**PHY 680 Special Topics in Theoretical Physics**

**PHY 681 Special Topics in Statistical Mechanics**

**PHY 682 Special Topics in Solid-State Physics**

**PHY 683 Special Topics in Radiation Physics**

**PHY 684 Special Topics in Nuclear Physics**

**PHY 685 Special Topics in Mathematical Physics**

**PHY 686 Special Topics in Elementary Particles**

**PHY 688 Special Topics in Astrophysics**

**PHY 690 Special Topics in Quantum Electronics**

**PHY 698 Colloquium**

*1 credit*

**PHY 699 Dissertation Research**

Independent research for Ph.D. degree candidates. Open only to students who have advanced to candidacy.

*Each semester, variable and repetitive credit*

# Political Science (POL)

**Chairperson: Mark Schneider**

**Ward Melville Social and Behavioral Sciences Building S-711  
(516) 632-7660**

**Graduate Studies Director: John T. Scholz**

**Ward Melville Social and Behavioral Sciences Building N-727  
(516) 632-7650**

## Degree Requirements Requirements for the M.A. Degree

In addition to the minimum requirements of the Graduate School, the department requires all candidates to complete 30 credits of approved graduate coursework in which a grade of B or higher has been received.

## Requirements for the Ph.D. Degree in Political Science

Candidates must meet the general requirements for the Ph.D. degree set by the Graduate School. Departmental requirements are as follows:

### A. Core Courses

Students take three core courses:

1. POL 533 Administration and Public Policy
2. POL 550 American Government
3. POL 551 Political Psychology

### B. Methods

Students are expected to master the methods necessary to engage in scholarly work:

1. All students take a three-course sequence in mathematics, statistics, and research methods (POL 602, 603, 604).
2. American government and policy students are required to take at least one advanced methods course either in this department or in a cognate field (e.g., economics). The student's choice of advanced elective(s) is decided in conjunction with the student's advisor.
3. Political psychology students take POL 554, a graduate-level course in experimental design. They are also required to take an additional advanced methods course, chosen in conjunction with their advisor.

4. Students who have attended the ICPSR Summer Program in Quantitative Methods at the University of Michigan can have the advanced elective requirement waived.

### C. Electives

Students take a series of advanced seminars in their area of specialization. These seminars can be within the department or can be in cognate fields such as psychology, economics, or applied math. The course of study is selected by the student in consultation with his or her advisor and must be approved by the graduate studies director. The student usually takes between 15 and 18 courses before taking comprehensive examinations, normally following the student's third year.

### D. Teaching and Research Apprenticeship

To ensure that all students become proficient in teaching and research, students work with the faculty on an individual basis. Funded students participate in faculty research projects and assist in teaching courses. Advanced students then prepare and teach their own undergraduate classes.

### E. Evaluation

Graduate students in the Ph.D. program are formally evaluated in the middle of the spring semester, based on grades received in the program and on evaluations by faculty familiar with the student's work.

The evaluation committee's charge is to make one of the following three possible determinations with regard to the student's progress: (a) recommend continuation of graduate study toward the Ph.D., (b) recommend that the student be allowed to

continue toward a terminal M.A. but not to continue in the Ph.D. program, or (c) recommend that the student not be permitted to enroll in additional graduate courses in the department.

The evaluation also serves as the basis for the decision as to whether the student is to receive financial support during subsequent semesters of graduate work.

### F. Comprehensive Examinations

#### 1. Timing of Examinations

Students making normal progress toward the Ph.D. should anticipate taking comprehensive examinations following the third year of coursework. Examinations in three fields compose the doctoral comprehensive examinations.

#### 2. Examination Fields

The department's policy is to allow students to take exams only in those areas in which its faculty strengths allow in-depth training, including:

Methods  
American Politics  
Public Policy  
Political Psychology

All students are required to take the methods exam. Students then prepare two of the three other substantive areas for written examination.

#### 3. Preparation and Evaluation of Examinations

The graduate studies director appoints a committee (with a designated committee chairperson) responsible for each examination field. The committee prepares the written examination, providing sufficient options for questions on which students may write. The committee members read the student's examination and prepare an evaluation of that performance, which is reviewed by the Ph.D. committee.



## G. Dissertation

A preliminary dissertation proposal is developed during the third year as a part of preparation for the comprehensive examinations. Upon successful completion of the examinations, the student begins the formal process of preparing his or her dissertation.

The student, in consultation with his or her faculty advisor and the graduate studies director, selects a dissertation committee of four faculty members—three from the Department of Political Science and one with whom the student has worked from outside the department.

In consultation with the committee and with the guidance of the advisor, the student prepares a formal dissertation proposal. This proposal is formally presented to the committee at the beginning of the semester following the successful completion of the comprehensive examinations. If the dissertation committee rejects the proposal, a candidate is allowed to revise the proposal for a subsequent defense. If this second attempt also results in failure, the student's program is terminated.

Upon successful conclusion of research, the student defends the completed dissertation to the committee and the university community at large.

## Courses

The required courses for first-year students are given every year, while electives are generally offered every other year. Courses are open to qualified students from other programs with permission of the graduate studies director.

### REQUIRED COURSES

#### **POL 533 Foundations: Administration and Public Policy**

A systematic introduction to the principles of public administration and public policy, with an emphasis on the formulation of legislative and administrative decisions. A major part of the course is devoted to student projects that analyze the formulation of a governmental program or policy.  
3 credits

#### **POL 550 Foundations: American Politics**

A review of the basic political science literature on American politics, with emphasis on American political institutions.  
3 credits

#### **POL 551 Foundations: Political Psychology/Behavior**

A review and analysis of the political behavior literature, including such topics as attitude formation and change, belief systems, political socialization, demographic and small group influences on political beliefs and conduct, political leadership, electoral behavior, elite vs. mass politics, decision making, personality and politics, political conformity, and protest.  
3 credits

#### **POL 602 Mathematical Methods**

Introduces basic mathematical methods indispensable for understanding current research, including sets, functions and relations, number

system, structure spaces, calculus, and maximization. This course is aimed at a general audience. Strong mathematical background is not required.

3 credits

#### **POL 603 Applied Data Analysis I**

The application of statistical and mathematical models to the analysis of political data: introduction to the research process, including philosophy of science, research designs, measurement, and basic descriptive and inferential statistics.

3 credits

#### **POL 604 Applied Data Analysis II**

A continuation of POL 603 with emphasis on methodological assumptions and problems: correlation, analysis of variance, simple and multiple regression.

*Prerequisite:* POL 603 or equivalent  
3 credits

### **ELECTIVES: METHODOLOGY**

#### **POL 606 Time Series Analysis**

The use of time series to study the effects of "interventions" (policies, events) on a phenomenon observed over time, model the dynamic relationships between several time series such as unemployment and government popularity, infer causal effects, and make forecasts. ARIMA models provide the basic analytic tool, which also helps handle trends as well as seasonal and cyclical patterns.

#### **POL 607 The Social Survey in Contemporary Society**

An interdisciplinary course on the history, uses, design, and implementation of the social survey, a technique used increasingly in modern society to canvas public opinion. The main objective is to help students understand the strengths and limitations of the social survey by involving them in a local area survey.

3 credits

#### **POL 609 Advanced Research Design**

A practical application of topics in the philosophy of science to research design. Students will prepare their dissertation proposal as a part of this course.

*Prerequisite:* Permission of graduate studies director  
3 credits

#### **POL 676 Advanced Topics: Methods I**

A course reviewing the literature and methodology of specific areas of political science research. The course will relate directly to research applications and provide students with an opportunity to apply advanced research tools to selected substantive problems.

*Prerequisite:* Permission of graduate studies director  
3 credits, repetitive

#### **POL 677 Advanced Topics: Methods II**

A continuation of POL 676.  
3 credits

### **ELECTIVES: AMERICAN POLITICS**

#### **POL 612 Classics of American Politics**

Reading and discussion of a selection of the most frequently cited works in the field of American politics, with emphasis on relatively contemporary authors.

3 credits

#### **POL 613 Introduction to Public Choice**

Introduction to public choice theory with an emphasis on the collective consequences of rational individual actions. Main areas to be covered include equilibrium analysis; prisoner's dilemma; Mancur Olson's "logic" of collective action; Kenneth Arrow's general possibility theorem; voting methods, heresthetics, and democratic theory; spatial models of voting in small groups and in

mass elections. Empirical applications will focus primarily on American presidential elections.

*Prerequisites:* POL 602 and permission of instructor  
3 credits

#### **POL 614 American Judiciary**

A seminar on judicial process and behavior. Emphasis will be placed on the Supreme Court, but trial courts and other appellate courts will be examined as well. Topics will include constitutional interpretation and both legal and extra-legal models of decision making. Students should possess basic methodological skills.

3 credits

#### **POL 615 Legislative Process**

A seminar on the legislative process, focusing on current research on the United States Congress.

3 credits

#### **POL 616 Political Parties and Elections**

A seminar on parties, campaigns, and elections in the United States. Topics to be covered include party organization and leadership, nomination and general election campaigns, and the role of parties in government.

3 credits

#### **POL 617 Electoral Behavior**

Models of voting choices; key attitudes such as party identification, issue orientations, and ideology; the impact of group affiliations, economic conditions; campaign strategies of candidates; congressional vs. presidential elections; historical change, e.g., party realignments.

3 credits

#### **POL 618 American Political Ideology**

This course will examine American political ideology as it is reflected in public opinion, political debate, and public policy. The goal will be to understand the underlying bases of conflict and consensus in American politics and the ways in which they influence and constrain debate over public policy. The course will trace the development of political conflict in the United States and examine the basis of contemporary political debate.

*Prerequisites:* POL 550 and permission of instructor  
3 credits

#### **POL 673 Advanced Topics: American Politics I**

A seminar in American institutions and processes, focusing current research in such areas as Congress, the Supreme Court, presidency, political parties, or bureaucracy.

*Prerequisite:* POL 550  
3 credits, repetitive

#### **POL 674 Advanced Topics: American Politics II**

A continuation of POL 673.  
3 credits

### **ELECTIVES: PUBLIC POLICY**

#### **POL 530 Topics in Public Affairs**

Specially organized seminars are offered on topics of particular importance to students of public affairs. These courses are led by distinguished experts in those policy areas.  
3 credits

#### **POL 531 Topics in Public Affairs: Planning**

This course addresses the planning process as a decision-making tool in the implementation of public policy in housing, land-use, transportation, and environmental management. The course also investigates intergovernmental relations and the impact of citizen participation on policy changes. Crosslisted with CER 531.

3 credits

**POL 534 Intergovernmental Relations and Policy Delivery**

The examination of the formulation, implementation, and impact of intergovernmental policy. Several policies are examined in depth, including grant-in-aid programs, general revenue sharing, housing and community development, and employment programs. The historical, economic, and political foundations of intergovernmental policy delivery systems are examined. Crosslisted with CER 534.  
3 credits

**POL 535 Public Policy Analysis and Evaluation**

This course concentrates on the strategies and methods of public policy analysis and evaluation. Skills stressed in the course include developing a research strategy and design, choosing measures, analyzing data, and communicating results. Students develop a program evaluation of their own.

*Prerequisite:* POL 533 or permission of graduate studies director  
3 credits

**POL 543 Environmental Politics and Policy**

Federal environmental policies such as the National Environmental Policy Act, the Coastal Zone Management Act, and the Federal Pure Waters Management Act are examined. The policies, politics, and administrative activities of federal, state, and local levels are considered. Finally the interaction of the public sector, the private sector, and citizen groups in the implementation of environmental policy is discussed.

3 credits

**POL 620 Government Regulation of Business**

An examination of the scope of government regulation of business in the United States. The course compares alternative explanations for regulatory agency failures as well as explanations for why some regulatory agencies perform better than others. Finally, the course considers proposed reforms, such as clearer legislative standards and deregulation.

3 credits

**POL 621 Theories of Policy Making**

An introduction to theories of policy making, especially policy formulation, stressing reading and thinking about classics and acquiring skills necessary for theorizing, including mathematical modeling and formal theory. Laboratories focus on improving special skills (e.g., optimization) and theorizing about particular policy areas (e.g., pork barrel politics).

**POL 622 Bureaucracy and the Policy Process**

An examination of bureaucracy as part of the policy-making process. This course reviews theoretical explanations for the bureaucracy as a political institution and implications of its rapid growth since the New Deal. It also looks inside bureaucratic organizations, examining factors that influence the exercise of discretion and policy implementation.

3 credits

**POL 623 Urban Politics**

This course concentrates on urban and suburban growth, the decentralization of metropolitan areas, land-use policy, and reforming metropolitan policy making. Specific policy areas such as education, finance, and police are considered. Political phenomena, including parties and ethnic groups, are also discussed.

3 credits

**POL 624 Decision Making in Organizations**

A seminar on decision procedures in public and private organizations. The course begins with the rational choice model developed primarily in economics and policy analysis, then considers common problems of decision making arising from limited capabilities, conflicts among organization members, and uncertainties and ambiguity in the organization's environment. Readings are from several disciplines.

3 credits

**POL 670 Advanced Topics: Public Policy Analysis I**

An intensive examination of major substantive and methodological concerns involved in the investigation of the public policy process.

*Prerequisite:* Permission of graduate studies director

3 credits, repetitive

**POL 671 Advanced Topics: Public Policy Analysis II**

A continuation of POL 670.

3 credits

**ELECTIVES: POLITICAL PSYCHOLOGY****POL 554 Foundations II: Experimental Design and Methods**

An introduction to laboratory experimentation, with emphasis on experimental methods and design as well as on data analysis and interpretation. Students will become acquainted with the Political Science Department's Laboratory for Behavioral Research and the Media Research Laboratory, conducting experiments in these labs. In addition, students will be required to design their own research project.

3 credits

**POL 631 Political Cognition**

A survey of contemporary psychological models of information processing, with emphasis on experimental applications to the analysis of the content and structure of political concepts.

*Prerequisite:* POL 551

3 credits

**POL 632 Mass Communication and Political Persuasion**

In-depth examination of the role of mass media in the political process and the psychological dynamics of media influence. Effects of the media on public opinion and voting. Implications of media influence on democratic theory.

3 credits

**POL 633 Social Influence and Group Processes in Political Decision Making**

Review of contemporary theories of social influence processes and group decision making, with emphasis on applications to decision making in politics. Special focus on small-group methods and research applications.

3 credits

**POL 634 Behavioral Decision Theory**

Emphasizes psychological theories of judgment and choice and prediction of the errors that individual decision makers are likely to make. These ideas are applied to a variety of political contexts.

3 credits

**POL 678 Advanced Topics: Political Psychology/Behavior I**

Review of the literature and methods related to a topic or problem in contemporary political science, voting behavior, issue formation, interest groups, political economy, or personality.

*Prerequisite:* POL 550, 551

3 credits, repetitive

**POL 679 Advanced Topics: Political Psychology/Behavior II**

A continuation of POL 678.

3 credits, repetitive

**ELECTIVES: GENERAL****POL 536 The Politics of Local Economic Development**

This course examines the process of local economic development with an emphasis on the interaction of political and economic factors. It explores the extent to which local (as compared to state and federal) officials can influence business location decisions, the specific strategies often utilized, and the way they have changed over time. It will also consider the winners and losers from the "economic development game" with a focus on New York and Long Island.

Crosslisted with CER 536.

3 credits

**POL 544 Human Behavior as Rational Action**

The economic approach is applied to a wide range of human activities. Individuals interacting with one another are assumed to have stable preferences and exhibit maximizing behavior. The collective consequences of such individual rationality are inferred through the method of equilibrium analysis. Subtopics include the prisoner's dilemma, the logic of collective action, the evolution of cooperation, the paradox of voting, and the art of political manipulation.

Crosslisted with CEI 504.

3 credits

**POL 553 Foundations: Comparative/International**

Survey and evaluation of the major theoretical approaches, issues, and problems in comparative political analysis. The course examines such areas as political development, empirical democratic theory, or political socialization, along with a detailed examination of one or more selected non-American political systems.

3 credits

**POL 560 American Democracy: Its Critics and Defenders**

This course examines the components of American democratic government by considering the pros and cons of suggested reforms. Critics and defenders of the 200-year-old constitutional order (including Congress, president, Supreme Court) will be emphasized, as will arguments surrounding the role of political parties, pressure groups, and the bureaucracy. Most of the readings will be from contemporary authors and reference sources.

Crosslisted with CEI 560.

3 credits

**POL 580 Long Island: The Year 2000**

An assessment of what the future may hold for Long Island in the year 2000, by some of the business, government, and university leaders who may help shape the future. An examination of issues relating to the arts, education, employment, energy, environmental protection, housing, opportunities for minorities, recreation, transportation, and waste management. Consideration of the role of regional development plans. The course will include lectures, discussions, and opportunities for informal interaction with many of the speakers.

Crosslisted with CED 580.

3 credits

**POL 598 Thesis Registration**

1 credit, repetitive, grading S, U

**POL 599 Directed Study**

Individual studies under the guidance of a faculty member. Subject matter varies according to the needs of a student pursuing supervised research at the master's level.

1-6 credits, variable and repetitive

**POL 667 Political Elites**

A critical review of established and new theoretical approaches and methodological orientations to the study of political elites.

3 credits

**POL 675 Advanced Topics: Comparative Politics I**

Readings and research papers on topics in comparative politics. Particular attention is given to concepts and methods identified with the field.

*Prerequisite:* POL 553

*3 credits, repetitive*

**POL 680 Directed Study**

*Prerequisite:* Permission of instructor and graduate studies director

*1-6 credits, repetitive*

**POL 681 Directed Study**

*Prerequisite:* Permission of instructor and graduate studies director

*1-9 credits, repetitive, grading S, U*

**POL 690 Research Colloquium**

Students will participate in weekly departmental colloquia where they will serve as discussants of research reports presented by individual faculty members or outside investigators reporting on current research.

*Prerequisite:* Permission of graduate studies director

**POL 691 Research Practicum I**

A course actively involving students in an ongoing research project under the direction of a principal investigator. Students will participate in all stages of the research project and be required to prepare a research report on one aspect of the project.

*3 credits, grading S, U*

**POL 692 Research Practicum II**

A continuation of POL 691. Students actively participate in either a second research project, where they will again prepare a research report, or continue their participation in the same project, where they will then be assigned a subset of data for analysis or carry out a specific research aim of the project.

*Prerequisite:* POL 691

*3 credits, grading S, U, repetitive*

**POL 693 Practicum in Teaching**

*1-3 credits*

**POL 699 Doctoral Dissertation Research**

*Prerequisite:* Permission of graduate studies director

*1-9 credits, repetitive, grading S, U*

# Psychology

## (PSY)

**Chairperson: Edward S. Katkin**  
**Psychology B 175 (516) 632-7805**

**Graduate Studies Director: David V. Cross**  
**Psychology B 152 (516) 632-7814**

### Degree Requirements

The award of the Ph.D. signifies both a scholarly mastery of the field of psychology and the ability to conduct independent research. In addition to the Graduate School's degree requirements, students must satisfy the following requirements (as well as requirements of their area of studies):

#### A. Course Requirements

A student must maintain a graduate G.P.A. of at least 3.0 and successfully complete an approved program of study with a grade of at least B- in each required course. Two semesters of quantitative methods and three core courses selected from at least two areas outside the student's area of graduate studies are required. The core courses currently include Neuropsychology and Proseminar in Biopsychology (Biopsychology); Psychopathology (Clinical); Learning, Cognition and Memory, Sensation and Perception, and Measurement and Scaling (Cognitive/Experimental); Contemporary Issues in Social and Community Psychology (Social/Personality); and History of Psychology (General). In addition, two semesters of First-Year Lectures (no credit) and two semesters of a practicum in statistical computer applications are required. Some areas of the department have additional requirements. Following admission, students with graduate training elsewhere can petition to satisfy course requirements on the basis of their previous graduate work. Petition to waive requirements or to satisfy them on the basis of previous graduate work should be directed to the Psychology Graduate Office. Petitions concerning area requirements should be addressed to the student's area director.

#### B. First-Year Evaluation

Progress of each first-year graduate student is reviewed at the end of the academic year by the entire faculty. The purpose of this review is to allow the student to withdraw without an excessive investment of time when, in the opinion of the faculty,

the student would not pass the preliminary examination at the Ph.D. level or produce a suitable dissertation. Any student whose performance is below the standards established by the department for the Ph.D. may be dismissed or asked to withdraw. Under certain circumstances a student may be permitted to obtain a terminal Master of Arts degree after passing the general examination at the M.A. level, satisfactorily completing the required courses and 30 graduate credit hours of study, and writing a second-year research paper.

#### C. M.A. Degree in the Course of Doctoral Studies.

The department will recommend granting an M.A. degree to students who have successfully completed the second-year requirements, including the second-year research paper (which need not be presented in the form of a thesis), upon the recommendation of the faculty in the student's area of graduate studies.

#### D. Preliminary Examination

This examination should be completed by the end of the fifth semester of study and consists of two parts. The *general examination* includes the completion of certain courses (see item A) and a second-year review/research paper suitable for submission to a refereed journal. The second-year paper requirement must be satisfied prior to the *specialty examination*. The form of the specialty examination depends upon the student's area of graduate studies, but all areas require its completion before the end of the third year.

#### E. Advancement to Candidacy

Upon successful completion of the preliminary examination and requirements of the student's area of studies, a majority vote of the faculty of the student's area is required to recommend advancement to candidacy for the Ph.D.

#### F. Research and Teaching

Supervised teaching and research experience from the time of admission

through the fourth year is required. The program requires both research and instructional experience each semester, rather than having students serve *either* as teaching assistant *or* as research assistant. This requirement can be waived or modified for students holding fellowships, serving as full-time interns or as graduate instructors, or being supported by a research grant.

Two semesters of substantial direct instruction in classroom or laboratory is required. During these semesters, graduate students must receive teaching evaluations from their students.

#### G. Residence

Minimum residence of two years and the equivalent of three years of full-time graduate study are ordinarily required. Unless admitted as part-time students, residents must register for full-time study until advanced to candidacy. Full-time study is at least 12 credits during the first year of graduate study and nine thereafter.

#### H. Dissertation

The approval of the dissertation proposal and successful oral defense of the completed thesis are required.

### Courses

#### PSY 501 Analysis of Variance and Experimental Design

The design and analysis of factorial experiments having a single dependent variable. Topics include between- and within-subjects designs, mixed-factor designs, interactions, trend analysis, planned comparisons, and analysis of covariance. Emphasis on applications in psychological research. Required of all Ph.D. students in psychology.

*Prerequisite:* Undergraduate statistics

*Corequisite:* PSY 508

*Fall, 3 credits*

#### PSY 502 Correlation and Regression

Correlation, regression, multiple correlation, multiple regression, partial correlation, and introductions to some of the following topics: factor analysis, canonical correlation, structural equation modeling, relation of regression to analysis of variance, and general linear model. Required of all Ph.D. students in psychology.

*Prerequisite:* PSY 501

*Corequisite:* PSY 508

*Spring, 3 credits*

**PSY 503 Experimental Design**

Examination of properties of common experimental designs in psychology together with the study of appropriate statistical analyses. Topics include factorial, hierarchical, latin square, and incomplete designs. Statistical procedures include analysis of variance, linear contrasts, analysis of covariance, and selected post-hoc procedures. This is an advanced course in design and statistics.

*Prerequisite:* PSY 502  
*Fall or spring, 3 credits*

**PSY 504 First-Year Lectures**

Presentation and discussion of current research progress and interests. Required of all first-year Ph.D. students.

*Fall and spring, no credit*

**PSY 507 Distribution- and Scale-Free Statistics**

Statistical inference when the exact form of population distribution is not specified, or when interval scale measures are not available. In addition to tests based on ranks and concordance, the course considers alternate measures of association and monotone relations (isotonic regression), feasible randomization and bootstrap tests for metric data, and the Mantel approach.

*Fall or spring, alternate years, 3 credits*

**PSY 508 Introduction to Computer Applications in Statistics**

Computer protocol and introduction to statistical packages and necessary utility programs.

*Corequisite:* PSY 501 or 502  
*Fall and spring, 0-1 credits, repetitive*

**PSY 509 Practicum in Computer Applications**

Workshops and practical experience in computer applications. Provides computer access for courses that do not have their own accounts and for student projects to satisfy other degree requirements.

*Prerequisite:* Psychology doctoral student not advanced to candidacy; for Section 2 (statistical application), PSY 502 as a pre- or corequisite.  
*Section 1: fall and spring, no credit, repetitive*  
*Section 2: fall or spring, 1 credit*

**PSY 510 History of Psychology**

Intensive reading in the history of psychology from original sources. Emphasis will be on class discussion and relation to modern problems.

*Fall or spring, 3 credits*

**PSY 511 Learning**

A consideration of the basic principles of learning. Analysis of the leading theories of learning as well as areas of controversy and dispute.

*Fall, 3 credits*

**PSY 512 Cognition and Memory**

An introduction to research and theory related to human learning and information processing. A review of major historical contributions as well as critical review of contemporary developments.

*Spring, 3 credits*

**PSY 514 Sensation and Perception**

An introduction to the phenomena of sensation and perception and the methods by which they may be studied. Different theoretical frameworks will also be considered.

*Fall, 3 credits*

**PSY 517 Proseminar in Decision and Choice**

Survey of recent research in psychological decision theory, judgment and choice covering human and animal research, and economic theory of human behavior.

*Fall and spring, 3 credits*

**PSY 524 Cognitive Development**

The information in this course will integrate and expand some of the research and new methods available in the study of the complex human processes such as language, memory, and growth of logical thinking.

*Fall or spring, alternate years, 3 credits*

**PSY 533 Principles of Therapeutic Intervention**

A critical review of various therapeutic procedures, and an examination of their theoretical bases and empirical support. Special focus will be placed on those procedures having relevance for clinical behavior therapy.

*Prerequisite:* Clinical doctoral student

*Corequisite:* PSY 601

*Fall, 3 credits*

**PSY 534 Behavior Assessment: Theory, Research, and Practicum**

Techniques of psychological measurement and assessment as they relate both to theoretical formulations and to specific clinical problems.

*Prerequisites:* PSY 533, clinical doctoral student

*Corequisite:* PSY 601

*Spring, 3 credits*

**PSY 535 Advanced Research Methods**

Advanced research methods employed in clinical, personality, social, and behavioral research.

*Prerequisites:* PSY 501, 502, and clinical doctoral student

*Annually, 3 credits*

**PSY 537 Methods of Intervention: Child and Adolescent**

Strategies, methods, and techniques used in a broadly construed behavioral approach to working with children and adolescents in clinical, home, school, institutional, and community settings.

*Prerequisites:* PSY 538, clinical doctoral student

*Corequisite:* PSY 602

*Spring, 3 credits*

**PSY 538 Methods of Intervention: Adult**

Strategies, methods and techniques used in a broadly construed behavioral approach to working with adults in clinical, family, work, institutional, and community settings.

*Prerequisites:* PSY 534, clinical doctoral student

*Corequisite:* PSY 602

*Fall, 3 credits*

**PSY 540, 541 Proseminar in Developmental Psychology**

Survey of the facts and theories of human and animal development.

*Fall and spring, 3 credits each semester*

**PSY 545 Psychopathology**

Theory and research on abnormal behavior such as neuroses, schizophrenia, addiction, sexual dysfunction, and childhood problems. Coverage of models of deviance, assessment, diagnosis, and treatment approaches. Broad approach to topics with stress on behavioral theories and presentation of biological and psychodynamic points of view.

*Fall, 3 credits*

**PSY 546 Measurement and Scaling**

An historical introduction to the measurement of psychological variables and survey of contemporary scaling methods with an emphasis on psychophysical scaling and experimental applications.

*Fall or spring, alternate years, 3 credits*

**PSY 550, 551 Topics in Social Psychology**

Content varies as a function of staff and student interests. Recent topics include environmental psychology, society and health, aggression, politics of social psychology, research methods, attitude change, and social inequality.

*Fall and spring, variable and repetitive credit*

**PSY 555 Social Psychology**

A critical survey of salient aspects of current social and community psychology, including historical background and political-economic factors affecting these fields.

*Fall or spring, 3 credits*

**PSY 556 Social Psychology Research Seminar**

Required research seminar for all social psychology students who have not yet completed their specialty examination. Weekly research presentations and specialty oral examinations are given in this seminar. Social psychology students only.

*Fall and spring, 3 credits, repetitive*

**PSY 557 Personality**

The course deals with current topics in the field of personality research. Examples include the trait-state controversy (from Mischel through interactionism to aggregation), self-concept, emotion and affective expressivity, hypnotic susceptibility, genetic bases of individual differences.

*Fall, 3 credits*

**PSY 560 Neuropsychology**

The functions of the normal and pathological primate brain in behavior. Consideration of anatomical, electrophysiological (EEG), and pharmacological correlates of behavioral functions such as perception, attention, motivation, learning, memory, cognition, and language. The behavioral consequences of various forms of brain pathology will be discussed.

*Spring, 3 credits*

**PSY 561, 562 Seminar in Biopsychology**

Topics in biopsychology selected on the basis of the needs of the graduate program and research interests of the staff.

*Fall and spring, 3 credits*

**PSY 564 Neuropsychopharmacology**

The theme of the course is to discuss the mechanisms and actions of psychotropic drugs and transmitters at receptors, and how these processes cause changes in different facets of behavior. The application of this knowledge to the use of psychoactive drugs in man will be included in the discussion.

*Fall, 3 credits*

**PSY 566 Physiological Psychology Laboratory**

Training in modern and traditional neurophysiological methods used to study neural basis of behavior. Exercises emphasize electrophysiological recording techniques (such as single-unit microelectrode recording, topographic mapping of sensory and/or motor areas in cortex, and gross potential recording) in vertebrates and invertebrates, but also include microelectrode fabrication, electronic instrumentation, and mammalian brain dissection.

*Spring, alternate years, 3 credits*

**PSY 567 Proseminar in Biopsychology**

An in-depth critical review of the experimental literature concerning brain and behavior. Topics include cellular neurophysiology, motor control, sensory processing, and the neural basis of complex physiological processes.

*Fall or spring, alternate years, 3 credits*

**PSY 568 Human Electrophysiology**

Techniques for recording the electrophysiological activity of the human brain will be presented. Sensory and cognitive event-related potentials are discussed, as well as the application of these techniques to clinical questions. Individual reports on selected topics based on library research are required.

*Fall, 3 credits*

**PSY 569 Human Electrophysiology Lab**

Experience in a variety of human electrophysiological techniques, with emphasis on recording evoked potentials in auditory, visual, and somatosensory modalities. Individuals are responsible for conducting experiments on selected topics and submitting reports.

*Spring, 3 credits*

**PSY 571, 572 Comparative Behavior**

Comparative methods for the observation and measurement of animal behavior. Both naturalistic and laboratory methods will be discussed. This course will be taught in conjunction with PSY 573, 574.

*Fall and spring, 3 credits each semester*

**PSY 573, 574 Comparative Behavior Lab**

Detection response techniques, conditioning techniques, and habituation methods in the study of adaptive behavior are practiced using a wide variety of vertebrate and invertebrate species.

*Fall and spring, 3 credits each semester*

**PSY 575 Psychobiology of Primates**

An advanced general course in the behavior of Old World monkeys and apes. Emphasis is placed on social organization, communication, development, and learning, especially under naturalistic conditions; but beyond this, topics are selected to reflect the most current advances in the area.

*Prerequisite: Permission of instructor*

*Fall or spring, 3 credits*

**PSY 581, 582 Comparative Physiological Colloquium**

Colloquium presentations on current research problems by advanced students, staff, and visiting scientists. Lecture and seminar each week.

*Fall and spring, 0-3 credits each semester, repetitive*

**PSY 590 Theories of Child Development**

This course is oriented toward analyzing three classes of developmental theory (analytic, cognitive, and behavioral approaches) and relating the basic structure of each class of theory to current notions of philosophy and science.

*Spring, 3 credits*

**PSY 592 Proseminar in Applied Child and Family Research**

Designed for students associated with the concentration in applied child and family studies, to introduce conceptual and methodological issues in research on prevention and amelioration of problems experienced by children and families. Students and faculty define problems that require solution and the proseminar focuses on these problems. Students register for three credits during two semesters of active involvement in organizing presentations, otherwise for one credit.

*Fall and spring, 1 or 3 credits, repetitive*

**PSY 594 Psychology of Women**

Theoretical approaches to the psychology of women including Freud, Horney, Thompson, Horner, and Rossi. Women and the life cycle from adolescence to old age. Included are adolescent identity formation, female sexuality, marriage, childbirth, motherhood, and problems of middle and old age. Women in psychology textbooks—truth or fantasy? Women and psychopathology and psychotherapy. The psychology of the "new woman."

*Fall or spring, alternate years, 3 credits*

**PSY 595 Functional Analysis of Child Behavior**

A functional analysis of behavior excesses and behavior deficits in children, with particular emphasis on the interface between developmental and behavioral psychology.

*Fall or spring, alternate years, 3 credits*

**PSY 596 Deviant Development**

A critical review of contemporary research on factors that contribute to the development of deviations from the norm for cognitive, affective, and behavioral functions in infants, children, and adolescents. Antecedent conditions to be considered are genetic, constitutional, nutritional, pharmacological, and societal factors, as well as those dealing with the influence of parents, peers, and school.

*Fall or spring, alternate years, 3 credits*

**PSY 600 Teaching Methods and Practicum**

A working seminar for students teaching or assisting in some particular course(s), particularly PSY 103, 211, or 303, with emphasis on delineation of course objectives, the preparation and presentation of special materials or topics, and the evaluation of teaching methods.

*Prerequisites: Appointment as teaching assistant or graduate instructor and permission of instructor*

*Fall and spring, 1-3 credits, repetitive*

**PSY 601 First-Year Clinical Practicum**

Exposure to the application of clinical methods.

*Corequisite: PSY 533 or PSY 534*

*Fall and spring, 1 credit each semester*

**PSY 602 Second-Year Clinical Practicum**

Supervised experience in the application of clinical methods.

*Corequisite: PSY 537 or PSY 538*

*Fall and spring, 1 credit each semester*

**PSY 603 Advanced Clinical Practicum**

Supervised experience in clinical practice for advanced clinical students.

*Fall and spring, variable and repetitive credit*

**PSY 604 Clinical Psychology Internship**

Qualified clinical students carry supervised clinical responsibilities in settings approved by the faculty.

*Fall and spring, variable and repetitive credit*

**PSY 605 Orientation to Clinical Psychology**

Ethics, professional issues, and ongoing faculty research. Required of all first-year clinical students.

*Fall and spring, no credit*

**PSY 610, 620 Seminars in Selected Topics**

Topics selected on the basis of the needs of the graduate program and research interests of the staff.

*Prerequisite: Permission of instructor*

*Fall and spring, 1-3 credits, repetitive*

**PSY 621 Seminar in Teaching Methods**

Theory and pragmatics of good college teaching. Topics include lecturing, use of discussion, types of evaluation of students and teachers, factors affecting undergraduate learning, ethics, student-faculty relations, course administration, and audio-visual devices.

*Prerequisites: Matriculated psychology graduate student, permission of instructor*

*Fall or spring, 3 credits, repetitive*

**PSY 634 Behavioral Decision Theory**

Emphasizes psychological theories of judgment and choice and prediction of the errors that individual decision makers are likely to make. These ideas are applied to a variety of political contexts.

*3 credits*

**PSY 638 Psychophysiological Methods**

Covers organization of the human nervous system and its interaction with physiological response systems. Studies methods of recording and analyzing psychophysiological response measures. Examines the application of psychophysiological response measures and patterns to the study of individual attitudes and behavior.

*Crosslisted with POL 630.*

*Spring, 3 credits*

**PSY 696 Readings**

*Prerequisite: Permission of instructor*

*Variable and repetitive credit*

**PSY 698 Research**

*Prerequisite: Permission of instructor*

*Variable and repetitive credit*

**PSY 699 Doctoral Research**

*Prerequisite: Advancement to candidacy*

*Variable and repetitive credit*

# Center for Science, Mathematics, and Technology Education

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*Director: Lester G. Paldy  
Harriman Hall 202 (516) 632-7075*

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## **M.A. Degree in the Teaching of Science**

The Center provides the graduate courses in the teaching of science that are part of the curricula for the Master of Arts in Teaching Chemistry, Earth Science, and Physics. Students are referred to the departments of Chemistry, Earth and Space Sciences, and Physics for descriptions of these degree programs and admission procedures.

## **Courses**

### **SCI 510 Introduction to Science Teaching**

Strategies, techniques, and materials used in teaching secondary school sciences, lesson planning, and student evaluation. Observation of classroom activities in selected junior and senior high school science classrooms. Four hours of lecture/laboratory and six hours of school-based experience per week at a local junior high or middle school.

*Prerequisites:* Permission of the instructor; matriculation in a M.A.T. science program  
*Spring, 3 credits*

### **SCI 520 Science Instructional Strategies and Techniques**

This course emphasizes instructional strategies and techniques necessary to create and implement a responsive student-centered learning environment specific to science teaching. Emphasis on investigative and laboratory activities and safety. Curriculum unit development and essays on school reform are required. Four hours of lecture/laboratory and six hours of school-based experience at a local high school per week.

*Prerequisites:* Permission of the instructor; matriculation in a M.A.T. science program; satisfactory completion of SCI 510  
*Fall, 3 credits*

### **SCI 550 Supervised Teaching—Science**

Extensive school-based practice teaching for M.A.T. students under selected cooperating teachers. Students work with two certified science teachers each regular school day for the entire semester. Practice teaching is done at both the 7-9 grade level and the 10-12 grade level. There will be frequent consultation with university faculty members. Applications must be filed with the Center for Science, Mathematics, and Technology Education (CSMTE) one semester prior to student teaching. Grading is S/U. Credits may not be counted toward the 30 required for the M.A.T. Science degrees.

*Prerequisites:* Permission of CSMTE; matriculation in a M.A.T. science program  
*Spring, 6 credits*

### **SCI 554 Supervised Teaching of Science Seminar**

Seminar on problems encountered by student teachers and public school teachers at the secondary level. Study and analysis of many aspects of science teaching such as classroom management, school culture, and social issues affecting the schools and student performance.

*Prerequisites:* Permission of CSMTE; matriculation in a M.A.T. science program  
*Corequisite:* SCI 550  
*Spring, 3 credits*

### **SCI 560 Project Seminar in Science Education**

Students in this seminar prepare a project to satisfy requirements for the M.A.T. science programs.

*Prerequisites:* Permission of the center; matriculation in a M.A.T. science program  
*Fall and spring, 3 credits*

# Sociology

## (SOC)

**Chairperson: Mark Granovetter**

**Ward Melville Social and Behavioral Sciences Building S-409  
(516) 632-7720**

**Graduate Studies Director: Richard Williams**

**Ward Melville Social and Behavioral Sciences Building S-415  
(516) 632-7730**

### **Degree Requirements Requirements for the Ph.D. Degree in Sociology**

In addition to the minimum Graduate School requirements, the following are required:

#### **A. Residence**

Minimum residence is one year of full-time study. Students may be admitted to the Ph.D. program on a part-time basis, but these arrangements usually require that the students appear on campus during certain periods of the normal working day. Full-time study entails 12 or more graduate credit hours per semester for those students entering without prior graduate study or fewer than 24 graduate credit hours, and nine or more graduate credit hours per semester for those students entering with more than 24 graduate credit hours or with advanced standing provided by prior graduate work. Since a graduate traineeship is considered part of the academic program, credit hours will be given for teaching or research assistantships as well as supervised teaching. Under specific conditions credit may be given for individual research work outside formal courses but under the supervision of faculty members.

#### **B. Courses**

Course requirements for a Ph.D. in sociology include four designated courses, two in sociological theory and two in research methods, all taken in the first year of graduate study. Of an additional 10 required courses, one must provide additional methodological training and can be chosen by the student from a variety of suitable offerings specified by the department. Three of the remaining nine required courses may be taken outside the department, upon written approval from the department's graduate committee. These three courses must be completed with at least a B average.

During the first year of study full-time students who have fewer than 24 graduate credit hours take eight courses; full-time students who have 24 or more graduate credit hours from prior graduate study take six courses. These must include two two-course sequences, one in sociological theory (SOC 505 and 506) and one in statistics and research methods (SOC 501 and 502)—and two elective courses. For those holding graduate traineeships, a teaching assistantship under the supervision of a faculty member would consist of two of the eight courses (one each semester).

#### **C. M.A. Degree**

A student is awarded the M.A. degree as a sign of progress toward the Ph.D. To receive the M.A. a student must complete:

1. Two consecutive semesters of full-time study, achieving a 3.0 grade point average for 30 hours of graduate work.
2. One of the three papers required by the writing option (Section D, Option 2) for the Ph.D. program.

#### **D. Professional Competence Options**

Continuing doctoral students have two options for completing the first half of the doctoral program before moving on to work in a special field and on their dissertation.

**Option 1—Comprehensive Examination and M.A. Research Report:** In this rather traditional option, the adequacy of a student's general preparation is evaluated by means of a written comprehensive examination. This examination, to be taken between the beginning of the fifth semester and the beginning of the sixth semester of graduate study, must be passed at the standard set by the department for doctoral-level work. A student who fails to pass this examination at the required level, but whose performance

is satisfactory in all aspects, may be permitted to take a terminal M.A. by completing 30 credits of graduate coursework and submitting an acceptable research report. Upon passing the comprehensive examination, the student must submit a research report that demonstrates ability to analyze empirical data and to present findings clearly and systematically. Upon successful completion of all of the above requirements, along with completion of a minimum of 30 hours of graduate credit, the department will recommend to the vice provost for graduate studies that the student be awarded the M.A. degree as a sign of progress toward the Ph.D. Recipients of the terminal M.A. will not be granted permission to continue.

**Option 2—The Three Papers:** In this option, a student can meet M.A. requirements and proceed to the second half of doctoral work through the submission of three papers written under faculty supervision. These should normally be completed by the middle of the fourth academic year; each of the three papers is designed to allow students to demonstrate a different competence. Each paper should be more substantial than a seminar paper and less substantial than an M.A. thesis; two substantive areas must be represented in the three papers. The three papers are designed to demonstrate three kinds of skills:

1. Theory paper: An attempt to say something original, focused on theoretical questions, i.e., how they should be addressed or refined. Evaluating alternative theoretical positions in light of available evidence or data is an acceptable possibility for such a paper.
2. Empirical paper: Should include some justification for why this particular manipulation of data is necessary or desirable. Of the three papers,



this is the one that is intended to look most like a research report. A wide variety of methods is permitted.

3. Analytic review of the state of the art in some substantive area in sociology. This paper can take various forms, for example:
  - a. A review essay (see *Journal of Economic Literature* or *Psychological Review*).
  - b. An essay that outlines a field for use in teaching a graduate seminar.
  - c. A major research proposal.

Upon successful completion of all the above requirements, along with completion of 30 hours of graduate credit, the student may proceed to the advanced stage of his or her doctoral work.

#### **E. Teaching Requirement**

Graduate training includes supervised teaching experience. By the fall of their fourth year, students enroll in a teaching practicum to prepare them to teach their own course, under supervision, the following semester.

#### **F. Preliminary Examination**

This takes the form of an oral examination in the student's specialty to be given only after all the above requirements have been met. It is designed to appraise the depth of knowledge in the broad area from which the student has selected a dissertation topic. The content of this area is to be defined individually for each student. It consists of a generally recognized, broad subfield and must deal with related materials from other subfields.

#### **G. Advancement to Candidacy**

The department's recommendation that a student be advanced to candidacy for the Ph.D. is based on passing the preliminary examination and approval of a dissertation proposal.

#### **H. Doctoral Dissertation**

This must be an independent piece of research and scholarship representing an original contribution, the results of which are worthy of publication. Upon oral defense and acceptance of the dissertation, the department will recommend to the vice provost for graduate studies that the student be awarded the Ph.D. degree.

The progress of every student will be evaluated by the department at the end of the first full year of graduate study. Those whose performance and ability are clearly below the standard established by the department for the Ph.D. will be asked to withdraw before they have made a costly investment of time. If more than seven years have

elapsed since the student completed 24 hours of graduate courses in the department, the student's Ph.D. candidacy will lapse. After the first year, a progressively larger proportion of a student's time will be spent as a participant in research activities, under the supervision of faculty members. Ordinarily, a student with adequate preparation and involved in full-time study should be able to earn a Ph.D. within five to six years from the start of graduate work.

Students who arrive with an M.A. degree in sociology or with three semesters of work in the discipline will be expected to complete some of the requirements above more quickly than indicated.

### **Joint M.S.W. and Sociology Ph.D. Program**

The Sociology Department cooperates with the School of Social Welfare in offering a joint M.S.W./Ph.D. in Sociology for persons wanting to pursue research careers in social welfare. The two programs are articulated so that some of the requirements of each can be met by work done in the other. A student applying for the joint program must independently meet the admission requirements of each program and must pursue the PARS (Planning, Administration, and Research) concentration within the School of Social Welfare.

### **Courses**

#### **SOC 501, 502 Research Design and Statistics**

A review of the main statistical techniques used in sociological research. Discussion of and practical experience in the design of sociological research. These two courses must be taken in the same academic year.

3 credits each semester

#### **SOC 503 Multivariate Analysis of Social Data**

The general linear model and multivariate analysis, including dummy variable analysis, multiple covariance, multivariate analysis of variance, and factor analysis.

Prerequisite: SOC 502 or permission of instructor  
3 credits

#### **SOC 505, 506 Sociological Theory**

A review of the intellectual development of the discipline, its epistemological foundations, current major theoretical orientations, and newly developing perspectives.

3 credits each semester

#### **SOC 508 Experimental Methods**

The design, conduct, and analysis of laboratory and field experiments.

3 credits

#### **SOC 509 Field Work**

Practicum in field interviews and observations; problems of rapport, reliability, and validity.

3 credits

#### **SOC 511 Population Analysis**

A survey of demographic theory and research. Determinants and consequences of population size, growth rates, composition and spatial distribution, family formation, fertility, mortality, and migration.

Prerequisite: One course in statistics  
3 credits

#### **SOC 513 The Metropolitan Community**

Determinants and consequences of the growth of urban settlements. Their demographic composition and spatial structure. Problems in metropolitan community organization.

3 credits

#### **SOC 514 Sociological Methods**

An introduction to the logic of research and data analysis. Emphasis on concepts of association, elementary causal analysis, sampling, and problems of measurement. Applications to the interpretation of data encountered in the school curriculum and the mass media.

4 credits

#### **SOC 521 Social Interactions**

The study of interaction in formal and informal settings. The reciprocal influence among group structure, norms, and interactive processes. A prior course in social psychology is assumed.

3 credits

#### **SOC 522 Socialization and the Self**

Socialization as a continuous process throughout the life cycle. Social and cultural sources of identity. Self-other systems as a form of social control. A prior course in social psychology is assumed.

3 credits

#### **SOC 523 Sociology of Education**

Relationships between education and other institutions. Internal dynamics of the school and the classroom.

3 credits

#### **SOC 531 Stratification**

Causes and consequences of the unequal distribution of wealth, power, prestige, and other social values in different societies. Changes in the stratification system as a result of industrialization and revolution.

3 credits

#### **SOC 532 Complex Organizations**

Division of labor, communication, and decision making in large and formally administered organizations, such as industrial concerns, governmental agencies, political parties, trade unions, schools, hospitals, and prisons.

3 credits

#### **SOC 541 Conflict and Violence**

Conflict and violence as related to social change. Examination of community controversies, social movements, uprisings, and war.

3 credits

#### **SOC 542 Deviance**

Survey of recent research literature on various kinds of deviance (crime, delinquency, and morally stigmatized behavior). Controversial issues in theory and research methods.

3 credits

#### **SOC 545 Social Movements and Collective Behavior**

Unorganized collectives and their role in change. Studies of specific social movements and other collective behavior episodes.

3 credits

#### **SOC 546 Sociological Perspectives on American Society**

Analysis of American social structure. Political and economic institutions and their bearing on social problems. Students attend the lectures of CES 581 (consult Continuing Education bulletin) and a supplementary seminar.

4 credits

#### **SOC 549 Social Change**

The image of technological, generational, and cultural forces on social organization from historical and comparative perspectives.

3 credits

**SOC 556 Political Sociology**

The study of political institutions and of the politically relevant actions and attitudes of individuals and groups. Particular stress will be placed on the reciprocal relationship between social movements and political institutions.  
3 credits

**SOC 561 Sociology of Intellectual Life**

A comparative and historical analysis of the social conditions leading to the development of intellectual professionals.  
3 credits

**SOC 562 Sociology of the Arts**

The relations between social structure, social change, and the development of major art forms.  
3 credits

**SOC 563 Sociology of Science**

The relations between science and society; social influences on the choice of problems and methods; the social organization of scientific research.  
3 credits

**SOC 564 Communications**

The social organization of the communications industry; the effects of mass communication.  
3 credits

**SOC 571 Sociology of Health and Medicine**

Social factors in health and illness; the socialization of health practitioners; the social organization of hospitals, clinics, and other facilities.  
3 credits

**SOC 580/581 Practicum in Applied Sociology**

Sociological inquiry into aspects of American life and social problems, with emphasis on evaluation studies and policy planning in education, race relations, mass communications, deviance, environment, and community issues. During the spring semester students design a teaching unit or a research project on a topic of their own choice.  
4 credits

**SOC 590 Independent Study**

Intensive reading, under supervision of one or more instructors, of material not covered in the formal curriculum.  
*Variable and repetitive credit*

**SOC 591, 595 Special Seminars**

Topics to be arranged. The seminar will be built around actual research activities of students and faculty. The following topics have been covered: Microsociology; Advanced Topics in Marxist Theory; Sociology of Emotions; Historical Methods; Ethnic Relations; Biosociology; Comparative Stratification; Max Weber; Science of Sociology and Everyday Life; Methods of Behavioral Observation; Social Structure; Sociology of the Family; Cognitive Sociology; Sociology of Work; Economic Sociology; Sociology of Gender; Sociology of Culture; Development of Capitalism; Film as a Sociological Research Tool; The Three Faces of Social Psychology; A Structural Approach to Organizational Behavior; Professionals and Professionalism; Sociology of Modernity; Research Support in Sociology.  
1-3 credits each semester

**SOC 598 Research**

Execution of a research project under the supervision of one or more faculty members.  
*Variable and repetitive credit*

**SOC 603 Advanced Topics in Quantitative Analysis**

Mathematical and statistical methods in the analysis of quantitative data.  
*Prerequisites:* SOC 501 and 502 and 503  
3 credits

**SOC 604 Advanced Topics in Qualitative Analysis**

The use of personal documents, official records, field observations, and interviews.  
3 credits

**SOC 606 Sociological Theory Construction**

Modes of conceptualization and theory construction. Problems in developing a theory.  
*Prerequisite:* Permission of instructor  
3 credits

**SOC 691 Practicum for Teaching and Graduate Assistants**

Individualized supervision of initial (first two semesters) teaching assistance. Discussion, examination construction, student consultation, and grading. Register for section of supervising instructor.  
3 credits each semester

**SOC 692 Practicum in the Teaching of Sociology**

The exploration of teaching goals, processes, and outcomes. Practice lectures are videotaped and discussed; classroom visits; planning, outlining, selection of course material; writing of syllabus for Introductory Sociology section to be taught as SOC 693 in following semester.  
*Fall, 3 credits*

**SOC 693 Practicum for Graduate Teaching Interns**

Supervised teaching of a section of Sociology 103 using the outlines, materials, and techniques developed in SOC 692. Includes weekly meetings of all persons registered for SOC 693 and observation of classes by both faculty and fellow graduate students.  
*Prerequisite:* SOC 692  
*Spring, 3 credits*

**SOC 698 Dissertation Research**

*Variable and repetitive credit*

# Theatre Arts (THR, DRM)

*Chairperson: Farley Richmond*

*Graduate Studies Director: John Lutterbie*

*Staller Center 3046 (516) 632-7300*

## **Degree Requirements Requirements for the M.A. Degree in Theatre Arts**

In addition to the minimum Graduate School requirements, the following are required:

### **A. Courses**

Courses required for the degree are THR 500 Introduction to Graduate Studies, THR 510 Western Theatre History, THR 511 Asian Theatre History, THR 520 Western Dramatic Literature, and THR 521 Asian Dramatic Literature. In addition, students select from among a range of courses in consultation with the graduate studies director and a faculty committee. A minimum of 30 credits is required for graduation.

### **B. Examination**

Successful completion of a M.A. examination is required, normally at the end of the second semester of full-time residence.

### **C. Foreign Language**

Proficiency in a foreign language must be demonstrated by examination.

### **D. Teaching Experience**

Teaching for at least one semester at the university level is required of all graduate students.

### **E. Master's Research Paper**

The master's research paper must be successfully completed under the direction of a faculty advisor.

### **F. Residency Requirement**

This program is normally completed in one to two years of full-time residency. Students may be enrolled in the M.A. program on a full-time or part-time basis.

### **G. Time Limitations**

Depending on the student's first-time, matriculated enrollment in the Graduate School, full-time students must complete all degree requirements within three years, part-time students in five years.

## **Requirements for the M.F.A. Degree in Dramaturgy**

In addition to the minimum Graduate School requirements, the following are required:

### **A. Courses**

The following courses are required: THR 500 Introduction to Graduate Studies, THR 507 Introduction to Dramaturgy, THR 510 Western Theatre History, THR 511 Asian Theatre History, THR 520 Western Dramatic Literature, and THR 521 Asian Dramatic Literature. In addition, students select from among a range of courses in consultation with the graduate studies director and the graduate committee. A minimum of 60 credits is required for graduation.

Students must seek a balance between theoretical and practical coursework, based on prior background and experience.

### **B. Examination**

Successful completion of a M.F.A. examination is required, normally at the end of the second semester of full-time residency.

### **C. Projects**

Successful completion of the following projects are required: Literary Workshop (6 credits), M.F.A. Project (3 credits), and Professional Internship (6 credits).

### **D. Foreign Language**

Proficiency in a foreign language must be demonstrated by examination.

### **E. Teaching Experience**

Teaching for at least one semester at the university level is required of all graduate students.

### **F. Residence Requirement**

This program is normally completed in 3 years of full-time residency. The last semester is usually spent in a professional internship program.

### **G. Time Limitation**

The M.F.A. program is normally completed in three years. The time limit for completion of the M.F.A. program, given unusual circumstances, is six years.

## **Courses**

### **THR 500 Introduction to Graduate Study in Theatre Arts**

This course surveys the field of theatre scholarship, introducing students to research tools, research methods, critical writing, and scholarly values. Discussions include reference to basic texts in dramatic literature and representative research problems.

*Prerequisite:* Admission to graduate program

### **THR 507 Introduction to Dramaturgy**

A historical orientation to the theory and practice of dramaturgy in Europe and the United States.

*Fall or spring, 3 credits*

### **THR 510 Western Theatre History**

Theatre forms in the Western tradition, from ancient to modern. Course may be centered around a theme, and includes both basic survey materials and supplementary readings that provide a critical orientation. May be repeated once.

*Fall or spring, 3 credits*

### **THR 511 Non-Western Theatre History**

Theatre forms other than those in the Western tradition, including ritual drama, Asian classical forms, and recent developments. Course may be centered around a theme, and includes both survey materials and supplementary readings. May be repeated once.

*Fall or spring, 3 credits*

**THR 520 Western Dramatic Literature**

Course surveys forms of Western drama, with particular reference to theatrical performance. Focus will be on key periods and themes such as gender issues, political violence, death and dying, love, etc. May be repeated once.  
*Fall or spring, 3 credits*

**THR 521 Non-Western Dramatic Literature**

Course surveys major forms of Asian theatre—Sanskrit drama, Noh, Kabuki, Beijing Opera, and selected forms of folk and modern theatre—focusing on themes of gender, political and social issues, death and dying, love, etc. May be repeated once.  
*Fall or spring, 3 credits*

**THR 522 Alternative Theatre in New York (Formerly THR 509)**

A workshop seminar on contemporary American alternative performance forms beyond mainstream theatre. Emphasis on the development of critical perspectives and the writing skills to articulate them through seminar discussions and writing workshops relevant to performances seen on field trips to New York City. The course includes not only avant-garde venues like the Kitchen, P.S. 122, Dance Theatre Workshop, and La Mama, but also popular entertainments such as street fairs and parades.  
*Fall or spring, 3 credits*

**THR 523 Mainstream Theatre in New York (Formerly THR 510)**

A workshop seminar on mainstream American theatre. Emphasis will be placed on the trends prevalent in mainstream theatre. How cinema has influenced the play form in the latter half of the 20th century, and the drawbacks and the virtues of this influence. The study of the criticism of mainstream theatre through study of the criticism in newspapers and periodicals, as well as the honing of the student's skills in criticism of the various arts that comprise a theatrical event, relevant to performances seen on field trips to New York City.  
*Fall or spring, 3 credits*

**THR 525 Topics in Theatre and Drama**

Intensive studies of selected forms of theatre and drama from various countries and periods; designed to supplement rather than repeat areas of study already undertaken in the curriculum. Emphasis will be on presentation and performance. May be repeated.  
*Fall or spring, 3 credits*

**THR 530 Directed Reading in Theatre and Drama**

Students read and evaluate the literature on a topic of special academic interest under the supervision of a faculty member. May be repeated.  
*Prerequisite:* Permission of instructor  
*Fall and spring, 1-3 credits*

**THR 550 Teaching Seminar**

Supervised student teaching of undergraduate courses accompanied by a seminar in methods and strategies of teaching theatre arts at the university level.  
*Fall or spring, 3 credits*

**THR 560 Directing Theory and Practice (Formerly THR 601)**

Course surveys the field of directing—its history, formal principles, primary techniques, and contemporary practice. Students will develop course papers and/or projects in conjunction with readings and instruction.  
*Fall or spring, 3 credits*

**THR 570 Acting Theory and Practice (Formerly THR 502)**

Course surveys the field of acting—its history, formal principles, primary techniques, and contemporary practice. Students develop course papers and/or projects in conjunction with advanced readings and instruction.  
*Fall or spring, 3 credits*

**THR 580 Design Theory and Practice (Formerly THR 603)**

Course surveys principal design areas, providing information about aesthetic theory and methods of stage design. Students address design problems and analyze a topic in design theory in conjunction with readings and instruction.  
*Fall or spring, 3 credits*

**THR 590 M.A. Independent Research**

Independent study and research on special topics or problems for M.A. students. Development of material for research paper. May be repeated.  
*Fall and spring, 1-3 credits*

**THR 610 Playwriting Workshop**

Students write and discuss original plays, evaluate their work, study techniques of composition and formal organization, and develop strategies for audience communication. Advanced students may study techniques for revision and the development of material for performance. Some plays may be read or selected for department production.  
*Prerequisite:* Permission of instructor  
*Fall or spring, 3 credits*

**THR 620 Literary Production Workshop (Formerly THR 653)**

Students serve as dramaturgs for the production of a play, providing research support, studying editorial and interpretive techniques, attending rehearsals, and developing program materials for the audience. May be repeated.  
*Fall or spring, 3 credits*

**THR 625 Studies in Dramaturgy**

Students may explore topics such as translation and adaptation of material, play selection and artistic development, production dramaturgy, literary management, impact of dramaturgy on playwriting, etc. May be repeated.  
*Fall or spring, 3 credits*

**THR 630 Dramaturgy Colloquium**

Through interaction with theatre professionals, students develop independent projects around topics of common concern to the profession, and develop strategies for implementing alternate plans for improving and developing theatre. May be repeated.  
*Fall or spring, 3 credits*

**THR 655 M.F.A. Project**

The student will submit "Notes for a Theatre's Artistic Director" for a season of plays for a specific theatre and budget. Preparation for this includes research into repertoires, production values, and the community in which this company exists. All proposals for independent study must be submitted in writing and be approved by the faculty supervisor, graduate studies director, and graduate committee.  
*Prerequisite:* Successful completion of all work for the M.F.A. or permission of the graduate studies director  
*Fall or spring, 3 credits*

**THR 660 Acting Workshop**

Intensive advanced study in a particular acting technique, such as Kutiyattam, Suzuki, musical theatre, Brecht, etc. Will be offered in conjunction with departmental productions. May be repeated.  
*Prerequisite:* Permission of instructor  
*Fall or spring, 3 credits*

**THR 670 Directing Workshop**

Advanced training in directing, which may involve concentrated scene work, formal experiments in performance, work on period styles and problems, or preparation of performances for public showing. May be repeated once.  
*Prerequisite:* Permission of instructor  
*Fall or spring, 3 credits*

**THR 680 Theatre Design Workshop**

Advanced assignments in theatre design. May include design work on departmental productions. May be repeated once.  
*Prerequisite:* Permission of instructor  
*Fall or spring, 3 credits*

**THR 690 Professional Internship (Formerly THR 654)**

A full-term internship at a professional theatre. Students should submit an internship description in the first month of work, then a journal or evaluation of their work experience.  
*Prerequisite:* Permission of graduate studies director  
*Fall or spring, 6 credits*

**THR 691 Independent Project**

Special project allowing advanced individual work in an area of theatre study or practice. Must be scheduled by arrangement with instructor. Should result in an advanced paper or project report. May be repeated.  
*Prerequisite:* Permission of instructor  
*Fall or spring, 1-3 credits*

# Women's Studies

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*Director: Adrienne Munich*

*Ward Melville Social and Behavioral Sciences Building S-201*

*(516) 632-7690*

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## **Requirements for the Graduate Certificate in Women's Studies**

The Graduate Certificate Program in Women's Studies is designed to provide an interdisciplinary course of instruction for students already enrolled in a graduate degree-granting program that is normally considered full time. To earn the certificate, students must complete a minimum of 15 graduate credits in courses approved for the certificate program. Credits earned toward a graduate degree in another program or department may be applied toward the Graduate Certificate in Women's Studies. Students should consult with their home departments to determine whether credits earned for the certificate can be applied to the master's or doctoral degree.

## **Minimum Requirements for the Certificate**

A. One course in feminist theory (WNS 501 Feminist Theory, WNS 502 Feminist Theory and Literary Criticism, or WNS 503 Feminist Theory and Social Life).

B. An interdisciplinary research colloquium (WNS 599 Research Colloquium in Women's Studies). The research paper for this course will be evaluated by the instructor, who will normally be the director of Women's Studies, and a faculty member affiliated with Women's Studies who works in the student's area of interest.

C. The remaining nine credits may be chosen from the list of approved Women's Studies graduate courses. Three credits may be earned through a directed readings course supervised by a faculty member affiliated with Women's Studies. Another three credits may be earned in an appropriate course in the student's home department, subject to the approval of the director of Women's Studies.

## **Courses**

The Research Colloquium and at least one course in feminist theory will be offered on a yearly basis. At least two additional graduate courses in women's studies will be offered each semester, and new courses will become available as the program develops.

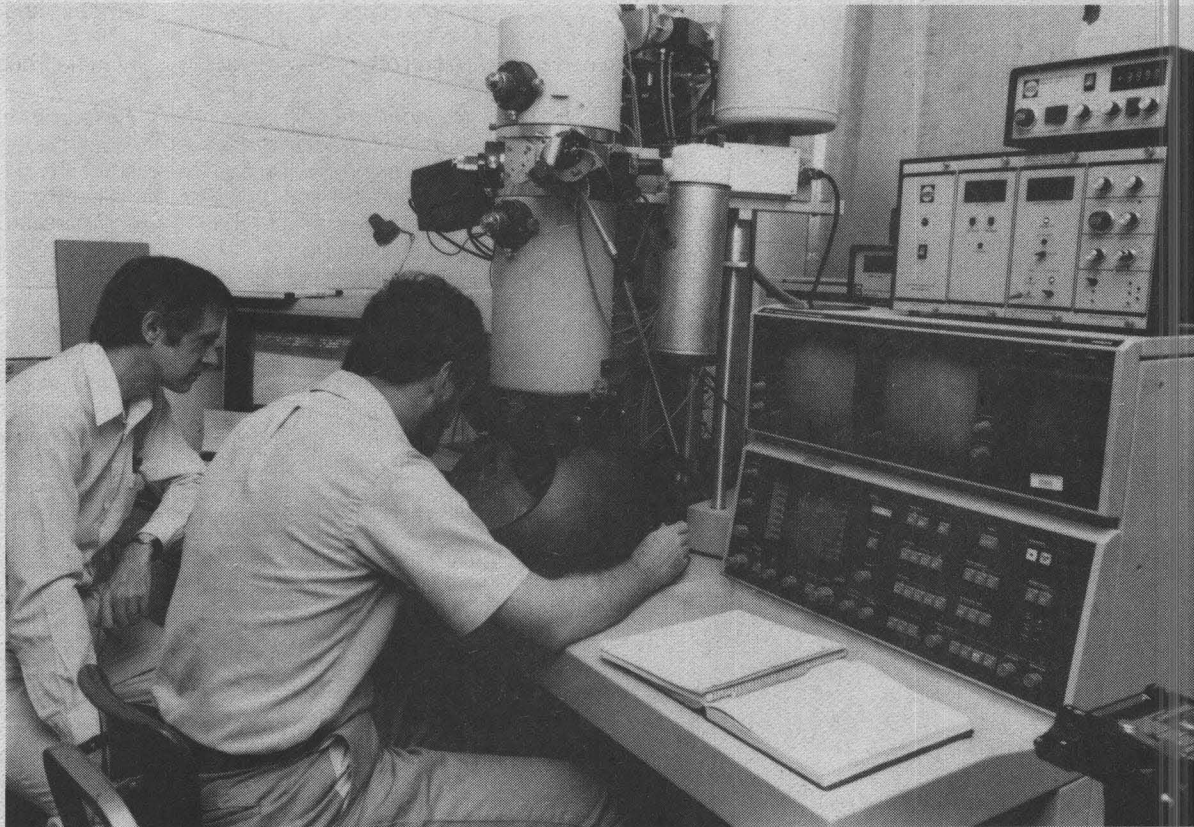
# College of Engineering and Applied Sciences

*Dean Stewart Harris  
Engineering 100 (516) 632-8380*

The College of Engineering and Applied Sciences consists of six academic departments: Applied Mathematics and Statistics, Computer Science, Electrical Engineering, Materials Science and Engineering, Mechanical Engineering, and Technology and Society. The latter offers a program leading to the Master of Science in Technological Systems Management; each of the other five departments offers programs leading to the Master of Science and Doctor of Philosophy degrees.

Each department has its own laboratories for teaching and research; in addition, collaborative research programs are carried out utilizing the facilities in the School of Basic Health Sciences, Division of Physical Sciences and Mathematics, Marine Sciences Research Center, Brookhaven National Laboratory, and other off-campus national and industrial laboratories. The graduate programs in the College of Engineering and Applied Sciences are designed to train both academically oriented students and students with professional goals in industrial and governmental occupations requiring an advanced degree.

The material that follows describes these programs and their supporting facilities in detail.



# Applied Mathematics and Statistics (AMS)

**Chairperson: James Glimm**  
**Mathematics Building P-137 (516) 632-8370**

**Graduate Studies Director: Woo Jong Kim**  
**Mathematics Building 1-122 (516) 632-8360**

## Degree Requirements

### Requirements for the M.S. Degree

In addition to the minimum Graduate School requirements, the following are required:

#### A. Course Requirements

The M.S. degree in the Department of Applied Mathematics and Statistics requires the satisfactory completion of a minimum of 30 graduate credits.

All credits in satisfaction of the degree must be at the graduate level. The department may impose additional requirements as described below. In addition, the average for all courses taken must be B or higher, and at least 18 credits of all courses taken must carry a grade of B or higher.

The student pursues a program of study planned in consultation with an academic advisor. The program and any subsequent modifications require approval by the graduate studies director.

#### Core Requirements for the M.S. Degree

1. Applied Mathematics
  - a. AMS 501 Differential Equations and Boundary Value Problems
  - b. AMS 503 Applications of Complex Analysis
  - c. AMS 504 Foundations of Applied Mathematics
  - d. AMS 505 Applied Linear Algebra
  - e. AMS 526 Numerical Analysis I
  - f. AMS 527 Numerical Analysis II
2. Operations Research
  - a. AMS 505 Applied Linear Algebra
  - b. AMS 507 Introduction to Probability
  - c. AMS 540 Linear Programming
  - d. AMS 550 Stochastic Models
  - e. AMS 554 Queuing Theory  
or  
AMS 553/CSE 530 Simulation and Modeling  
or  
AMS 542/CSE 548 Analysis of Algorithms
  - f. One course in statistics

#### 3. Statistics

- a. AMS 504 Foundations of Applied Mathematics
- b. AMS 505 Applied Linear Algebra
- c. AMS 507 Introduction to Probability
- d. AMS 570 Mathematical Statistics I
- e. AMS 572 Exploratory Data Analysis I
- f. AMS 575 Intership in Statistical Consulting
- g. AMS 578 Regression Theory
- h. AMS 582 Design of Experiments

#### Elective Requirements for the M.S. Degree

Any graduate-level AMS or other graduate-level courses in a related discipline approved by the graduate studies director may be used to satisfy the credit requirement beyond the core course requirement. In addition, six elective credits may be earned by completion of a master's thesis.

#### B. Final Recommendation

Upon the fulfillment of the above requirements the faculty of the graduate program will recommend to the vice provost for graduate studies that the Master of Science degree be conferred or will stipulate further requirements that the student must fulfill.

#### C. Time Limit

All requirements for the Master of Science degree must be completed within three years of the student's first registration as a full-time graduate student.

### Requirements for the Ph.D. Degree

#### A. Course Requirements

The course of study prescribed for the M.S. degree provides basic guidelines for doctoral study. The student pursues a program of study planned in consultation with an academic advisor. The program and any subsequent modifications require approval of the graduate studies director.

#### B. Qualifying Examination

A student must pass a qualifying examination to be allowed to continue toward the Ph.D. degree. The qualifying examination is given twice a year and is designed to test the student's preparation to do research in applied mathematics. Each student must demonstrate competency in algebra and analysis and in-depth knowledge of two areas of applied mathematics. The list of areas from which students may currently choose is as follows:

Differential Equations and Applied Analysis  
Numerical Methods and Computing  
Mathematical Programming  
Applied Probability  
Probability and Mathematical Statistics  
Applied Statistics  
Game Theory

#### C. Research Advisor

After completion of at least one year of full-time residence and prior to taking the preliminary examination, the student must select a research advisor who agrees to serve in that capacity.

#### D. Preliminary Examination

This is an oral examination administered by a committee and given to the student when he or she has developed a research plan for the dissertation. The plan should be acceptable to the student's research advisor.

#### E. Language Requirement

The student must demonstrate a reading ability in one of the following three languages: French, German, or Russian. Proficiency may be demonstrated in a number of ways; these methods are described in detail in the *Graduate Student Handbook* of the Department of Applied Mathematics and Statistics.

#### F. Advancement to Candidacy

After successfully completing all requirements for the degree other than the dissertation, the student is eligible to be

recommended for advancement to candidacy. This status is conferred by the vice provost for graduate studies upon recommendation from the departmental graduate studies director.

### G. Dissertation

The most important requirement of the Ph.D. degree is the completion of a dissertation, which must be an original scholarly investigation. The dissertation must represent a significant contribution to the scientific literature and its quality must be comparable with the publication standards of appropriate and reputable scholarly journals.

### H. Dissertation Defense

The student must defend the dissertation before the dissertation examining committee. On the basis of the recommendation of this committee, the Department of Applied Mathematics and Statistics will recommend acceptance or rejection of the dissertation to the vice provost for graduate studies. All requirements for the degree will have been satisfied upon successful defense of the dissertation.

### I. Minimum Residence

At least two consecutive semesters of full-time study are required.

### J. Time Limit

All requirements for the Ph.D. degree must be completed within seven years after the completion of 24 graduate credits in the program. The time limits for the qualifying and preliminary examinations and advancement to candidacy are described in the departmental *Graduate Student Handbook*.

## Courses

### AMS 500 Mathematical Modeling

The course consists of about eight generally unrelated case studies. Problems selected for both the physical and social sciences are employed to illustrate the process of model formulation and solution. Mathematical ideas and techniques are developed as needed to deal with the problems being studied. Realistic data and situations are employed whenever possible.

Fall, 3 credits

### AMS 501 Differential Equations and Boundary Value Problems I

Examples of initial and boundary value problems in which differential equations arise. Existence of solutions, systems of linear differential equations, and the fundamental solution matrix. Reduction to canonical forms and the matrix exponential. Sturm-Liouville theory and eigenfunction expansion. Green's functions.

Prerequisite: AMS 505

Recommended prerequisite: AMS 504  
Spring, 3 credits

### AMS 502 Differential Equations and Boundary Value Problems II

The initial and boundary value problems for the wave, the heat, and Laplace's equation illustrated by a number of examples in heat conduction, vibrations, and aerodynamics.

Transform techniques, separation of variables, conformal mapping, and approximation.

Prerequisite: AMS 501

3 credits

### AMS 503 Applications of Complex Analysis

A study of those concepts and techniques in complex function theory that are of interest for their applications. Pertinent material is selected from the following topics: harmonic functions, calculus of residues, conformal mapping, and the argument principle. Application is made to problems in heat conduction, potential theory, fluid dynamics, and feedback systems.

Spring, 3 credits

### AMS 504 Foundations of Applied Mathematics

An introductory course for the purpose of developing certain concepts and techniques that are fundamental in modern approaches to the solution of applied problems. An appropriate selection of topics is based on the concepts of metric spaces, convergence, continuity, compactness, and normed and Hilbert spaces. Included is an introduction to measure theory and integration.

Fall, 3 credits

### AMS 505 Applied Linear Algebra

Review of matrix operations. Elementary matrices and reduction of general matrices by elementary operations, canonical forms, and inverses. Applications to physical problems.

Fall, 3 credits

### AMS 506 Finite Structures

Problem solving in combinatorial analysis and graph theory using generating functions, recurrence relations, Polya's enumeration formula, graph coloring, and network flows.

3 credits

### AMS 507 Introduction to Probability

Sample spaces, conditional probability and independence, random variables and functions of random variables; binomial, Poisson, normal, and other special distributions; moment-generating functions; law of large numbers and central limit theorem; Markov chains. Applications to statistics.

3 credits

### AMS 508 Applied Mathematical Methods I

Linear algebra: linear vector spaces, inner products and norms, orthogonal projection and least-square approximation, linear transformations and matrices, eigenvalues and singular values, generalized inverses, Schur and Jordan decomposition, quadratic forms, and min-max principles.

Ordinary differential equations: Existence, uniqueness, continuation, linear systems, fundamental solutions, phase-plane analysis, two-point boundary value problems, series solutions, Sturm-Liouville theory for self-adjoint equations, Green's functions, and eigenfunction expansions.

Fall, 3 credits

### AMS 509 Applied Mathematical Methods II

Partial differential equations: Laplace's equation, Dirichlet principle, separation of variables, solutions of boundary value problems, wave equations, vibration of strings and membranes, Riemann's method, characteristics, shock waves, heat equation, Fourier transform.

Approximation of functions: Interpolation by polynomials and splines, numerical integration and differentiation, variational principles, finite element and boundary integral equation techniques, spectral methods.

Spring, 3 credits

### AMS 516 Special Functions of Applied Mathematics

A study of the more common higher mathematical functions required for the analytical solution of engineering and scientific problems. Topics include orthogonal sets of functions, recursion formulas, series solution of linear differential equations, Fourier-Bessel expansions, functional equations, application to boundary value, and initial value problems.

3 credits

### AMS 517 Ordinary Differential Equations

This course deals with theory and properties of ordinary differential equations that are of importance in the application of this subject. Among the topics covered are solutions of singular equations, boundary value problems, the Green's function method, and eigenvalue problems.

3 credits

### AMS 520 Mathematical Modeling in the Analysis of Public Systems

Review of models relating to the questions of the improvement in delivery of urban service systems (e.g., fire, police, health, sanitation, transit). Topics include optimal location and districting of public facilities, distribution networks, models of congestion and delay in municipal services, and optimal deployment of emergency vehicles.

3 credits

### AMS 521 Mathematical Models in Physiological Sciences

Mathematical models of blood flow and renal function. Numerical solution of the counter-current exchange models by utilizing information about the physiological structures in the solution process. Use of compartmental analysis, sparse matrix techniques, and generalized inverses.

3 credits

### AMS 523 Control Theory

Introduction to optimal control via the calculus of variations. Discussions of functional minimization from optimal control viewpoint. Introduction of state variable form for linear differential equations used to solve linear, quadratic cost, optimal control problem, and time-minimum control for some simple systems. Derivation of matrix Riccati equation. Presentation of linearization on nonlinear differential equations using perturbation techniques.

Prerequisite: AMS 501

3 credits

### AMS 524 Theory of Approximation

A survey of various solutions that present special problems in approximation theory. Topics covered include smoothing of data, least squares methods, Chebyshev approximation by rational functions, orthogonal functions. Hilbert space methods and general aspects of approximation in normed linear spaces.

3 credits

### AMS 526 Numerical Analysis I

Direct and indirect methods for solving simultaneous linear equations and matrix inversion, conditioning, and round-off errors. Computation of eigenvalues and eigenvectors.

Fall, 3 credits

### AMS 527 Numerical Analysis II

Numerical integration. Solution of ordinary differential equations. Different methods for partial differential equations; consistency convergence and stability. Numerical solution of integral equations. AMS 527 may be taken whether or not the student has completed AMS 526.

Spring, 3 credits



**AMS 528 Computational Methods in Partial Differential Equations**

An introduction to scientific computation, this course considers the basic numerical techniques designed to solve problems of physical and engineering interest. Both finite difference and finite element methods are covered for the three major classes of partial differential equations: parabolic, elliptic, and hyperbolic. Practical implementation will be discussed. The student will also be introduced to the important packages of scientific software algorithms.

*Prerequisite:* Elementary programming  
*Spring, 3 credits*

**AMS 531 Generalized Inverses and Sparse Matrices**

Moore-Penrose and various other types of generalized inverses; efficient methods for their computation. Condition numbers and scaling. Factored forms of inverses of large sparse matrices and their relationship to elimination and orthogonalization methods. Sparse matrices and graph theory. Applications to applied problems in linear programming.

*3 credits*

**AMS 540 Linear Programming**

Formulation of linear programming problems and solution by simplex method. Duality, sensitivity analysis, dual simplex algorithm, decomposition. Applications to the transportation problem, two-person games, assignment problem, and introduction to integer and nonlinear programming.

*Corequisite:* AMS 505

**AMS 542 Analysis of Algorithms**

Models of computation and associated time and space measures for complexity of algorithms in the various models. Techniques for designing efficient algorithms, including choice of data structures, recursion, divide and conquer, and dynamic programming. Asymptotic behavior lower bounds on complexity and correctness of algorithms for sorting, set manipulation, graph operations, matrix multiplication, fast Fourier transform, and pattern matching. Also covers nondeterminism, NP completeness, and intractability.

*Prerequisite:* CSE 521

*Recommended:* AMS 506  
*Spring, 3 credits*

**AMS 544 Integer Programming**

Discrete optimization, linear programming in which the variables are restricted to being integer-valued. Cutting plane methods, enumeration methods, and group theoretic methods. Special treatment of knapsack problem and cutting stock problems.

*Prerequisite:* AMS 540

*Fall, odd years, 3 credits*

**AMS 545 Graph Theory and Applications**

Basic structure of undirected and directed vector space analysis of graphs; applications.

*3 credits*

**AMS 546 Network Flows**

Theory of flows in capacity-constrained networks. Topics include maximum flow, feasibility criteria, scheduling problems, matching and covering problems, minimum-length paths, minimum-cost flows, and associated combinatorial problems.

*Prerequisite:* AMS 540 or permission of instructor  
*Spring, even years, 3 credits*

**AMS 547 Discrete Mathematics**

This course introduces such mathematical tools as summations, number theory, binomial coefficients, generating functions, recurrence relations, discrete probability, asymptotics, combinatorics, and graph theory for use in algorithmic and combinatorial analysis. Crosslisted with CSE 547.

*3 credits*

**AMS 548 Nonlinear Programming**

Necessary and sufficient conditions for unconstrained and constrained optima. The geometric background is developed using tangents and cones in finite dimensional spaces. Computational methods, including interior (penalty function), boundary (gradient projection), and exterior (cutting plane) approaches.

*Prerequisite:* AMS 540 or permission of instructor  
*Spring, 3 credits*

**AMS 549 Combinatorial Analysis**

Permutations, combinations, generating functions, linear recursions, matching theory, Ramsey's theorem, block designs, orthogonal Latin squares, finite geometries, extremal problems, chromatic numbers, probabilistic methods.

*3 credits*

**AMS 550 Operations Research: Stochastic Models**

Queuing problems under varying assumptions on input, service mechanism, and queue discipline. Basic ideas of inventory theory. Introduction to statistical decision theory. Monte Carlo methods.

*Prerequisite:* AMS 507 or equivalent  
*3 credits*

**AMS 552 Game Theory**

Elements of cooperative and noncooperative games. Matrix games, pure and mixed strategies, and equilibria. Solution concepts such as core, stable sets, and bargaining sets. Voting games, the Shaply and Banzhaf power indices.

*3 credits*

**AMS 553 Simulation and Modeling**

A comprehensive course in formulation, implementation, and application of simulation models. Topics include data structures, simulation languages, statistical analysis, pseudo-random number generation, and design of simulation experiments. Students apply simulation modeling methods to problems of their own design. Crosslisted with CSE 529.

*Prerequisite:* CSE 201 or equivalent; AMS 310 or 507 or equivalent; or permission of instructor  
*Spring, 3 credits*

**AMS 554 Queuing Theory**

Introduction to the mathematical aspects of congestion. Birth and death processes. Queues with service priorities and bulk-service queues. Analysis of transient- and steady-state behavior. Estimation of parameters. Applications to engineering, economic, and other systems.

*Prerequisite:* AMS 507

*Fall, even years, 3 credits*

**AMS 556 Dynamic Programming**

Stochastic and deterministic multistage optimization problems. Stochastic path problems. Principle of optimality. Recursive and functional equations. Method of successive approximations and policy iteration. Applications to maintenance, inspection, and replacement problems.

*Prerequisite:* AMS 550 or AMS 558  
*3 credits*

**AMS 557 Inventory Theory**

Nature of inventory systems. Design and control. Continuous and periodic review policies. Economic order quantities and the optimality of policies.

*Prerequisite:* AMS 507

*Fall, odd years, 3 credits*

**AMS 558 Stochastic Processes**

Review of probability theory. Poisson processes. Renewal theory. Markov processes. Applications to queues, statistics, and other problems of engineering and social sciences.

*Prerequisites:* AMS 504; AMS 507 or equivalent  
*Spring, 3 credits*

**AMS 562 Numerical Hydrology**

Numerical solution methods for the equations of incompressible flow in porous media with special emphasis on groundwater flow. Finite difference and finite element methods for steady-state and transient flows—boundary conditions, range of validity and stability of the numerical schemes, numerical artifacts. The approach is hands on, with example problems being computed.

*Prerequisite:* AMS 526 or permission of instructor  
*3 credits*

**AMS 563 Computational Fluid Dynamics**

Finite difference methods and relaxation methods for solving incompressible flow equations. Methods of characteristics, finite difference methods using explicit artificial viscosities and implicit artificial damping for solving the compressible flow equations. Numerical treatment of shocks. Various mighty hydrodynamic codes.

*Prerequisite:* Permission of instructor  
*3 credits*

**AMS 564 Systems of Hyperbolic Conservation Laws and Shock Waves**

Development of elementary theory of discontinuous solutions to nonlinear systems of conservation laws. This theory includes the theory of characteristics, the analysis of shock and rarefaction waves, material and slip surfaces, and the interaction of nonlinear waves. A key part consists of the solution of the Riemann problem for systems of hyperbolic laws. Applications of this theory include analysis of supersonic flows, interaction of nonlinear waves, and design of modern numerical methods in compressible hydrodynamics.

*Spring, 3 credits*

**AMS 565 Wave Propagation I**

Theory of propagation of vector and scalar waves in bounded and unbounded regions. Equivalence theorems of field theory. Development of methods of geometrical optics. Propagation in homogeneous and anisotropic media. Green's function for boundary value problems.

*3 credits*

**AMS 568 Optimization Techniques for Engineering Design**

Theory and application of numerical optimization techniques. Single- and multi-variable constrained and unconstrained functions. Direct and indirect approaches. The course addresses many of the practical aspects of using numerical optimization in engineering design.

*3 credits*

**AMS 569 Probability Theory I**

Probability spaces and sigma-algebras. Random variables as measurable mappings. Borel-Cantelli lemmas. Expectation using simple functions. Monotone and dominated convergence theorems. Inequalities. Stochastic convergence. Characteristic functions. Laws of large numbers and the central limit theorem.

*Prerequisite:* AMS 504 or equivalent  
*3 credits*

**AMS 570 Mathematical Statistics I: Estimation**

Sampling distribution of means and variances; introduction to moment calculations and order statistics. Theory of maximum likelihood estimates, Pitman estimates, and sufficient statistics. Parametric confidence intervals and fiducial intervals. Cramer-Rao bounds. Fisher's information matrix, other bounds on variance of estimators.

*Prerequisite:* AMS 312 or equivalent  
*3 credits*

**AMS 571 Mathematical Statistics II: Hypothesis Testing**

Decision problems, Neyman-Pearson lemma, likelihood ratio tests, uniformly most powerful tests, unbiased tests, invariant tests, sequential

tests, nonparametric tests. Introduction to tests on contingency tables and multivariate data. Bayesian approaches and introduction to current research problems.

*Prerequisite:* AMS 570 or equivalent  
3 credits

#### **AMS 572 Data Analysis I**

Introduction to basic statistical procedures. Survey of elementary statistical procedures such as the t-test and chi-square test. Procedures to verify that assumptions are satisfied. Extensions of simple procedures to more complex situations and introduction to one-way analysis of variance. Basic exploratory data analysis procedures such as stem and leaf plots, straightening regression lines, and techniques to establish equal variance.

*Prerequisite:* AMS 312 or permission of instructor

Fall, 3 credits

#### **AMS 573 Design and Analysis of Categorical Data**

Measuring the strength of association between pairs of categorical variables. Methods for evaluating classification procedures and inter-rater agreement. Analysis of the associations among three or more categorical variables using log linear models. Logistic regression.

*Prerequisite:* AMS 572

Spring, 3 credits

#### **AMS 575 Internship in Statistical Consulting**

Directed quantitative research problem in conjunction with currently existing research programs outside the department. Students specializing in a particular area work on a problem from that area; others work on problems related to their interests, if possible. Efficient and effective use of computers. Each student gives at least one informal lecture to his or her colleagues on a research problem and its statistical aspects.

*Prerequisite:* Permission of instructor

3 credits

#### **AMS 576 Statistical Methods for Social Scientists**

This course is an introduction to statistical thinking in the social sciences. The course covers statistical variability, standard scores, regression correlation, sampling notions, estimation, confidence intervals, significance testing, conditional probability, and Bayesian manipulations.

*Prerequisite:* AMS 310 or permission of instructor

3 credits

#### **AMS 577 Multivariate Analysis**

The multivariate distribution. Estimation of the mean vector and covariance matrix of the multivariate normal. Discriminant analysis. Canonical correlation. Principal components. Factor analysis. Cluster analysis.

*Prerequisites:* AMS 572 and AMS 578

3 credits

#### **AMS 578 Regression Theory**

Classical least-squares theory for regression including the Gauss-Markov theorem and classical normal statistical theory. An introduction to stepwise regression, procedures, and exploratory data analysis techniques. Analysis of variance problems as a subject of regression. Brief discussions of robustness of estimation and robustness of design.

*Prerequisite:* AMS 572 or equivalent

3 credits

#### **AMS 580 Reliability Theory**

Monotone failure rates, renewal theory, availability theory, classes of life distributions, coherent structures and systems, general stochastic models for failure, maintenance policies, redundancy optimization.

*Prerequisite:* AMS 535 or equivalent

3 credits

#### **AMS 581 Analysis of Variance**

Analysis of models with fixed effects. The Gauss-Markov theorem; construction of confidence ellipsoids and tests with Gaussian observations. Problems of multiple tests of hypotheses. One-way, two-way, and higher-way layouts. Analysis of incomplete designs such as Latin squares, incomplete blocks, and nested designs. Analysis of covariance problems.

*Prerequisite:* AMS 570 or equivalent

3 credits

#### **AMS 582 Design of Experiments**

Discussion of the accuracy of experiments, partitioning sums of squares, randomized designs, factorial experiments, Latin squares, confounding and fractional replication, response surface experiments, and incomplete block designs.

*Prerequisite:* AMS 572 or equivalent

3 credits

#### **AMS 584 Sequential Methods**

Sequential decision problems in statistics. Two-armed bandit, selection by relative rank, and other examples. Optimal stopping and sequential analysis. Empirical Bayes and compound decision problems. Fixed-width confidence intervals, confidence sequences, and tests of power. Adaptive least squares and stochastic approximation.

*Prerequisite:* AMS 570

3 credits

#### **AMS 585 Sampling Techniques**

Properties of simple random sampling, application to estimating proportions and sample sizes that give predetermined accuracy. Stratified random samples, Neyman allocation. Ratio and regression estimates, accuracy and bias, systematic sampling, cluster sampling, two-stage sampling.

*Prerequisite:* AMS 312 or equivalent

Fall, 3 credits

#### **AMS 586 Time Series**

Analysis in the frequency domain. Periodograms, approximate tests, relation to regression theory. Pre-whitening and digital filters. Common data windows. Fast Fourier transforms. Complex demodulation, Gibbs' phenomenon issues. Time-domain analysis.

*Prerequisites:* AMS 507 and AMS 570

3 credits

#### **AMS 587 Nonparametric Statistics**

This course covers the applied nonparametric statistical procedures—one-sample Wilcoxon tests, two-sample Wilcoxon tests, runs test, Kruskal-Wallis test, Kendall's tau, Spearman's rho, Hodges-Lehman estimation, Friedman analysis of variance on ranks. The course gives the theoretical underpinnings to these procedures, showing how existing techniques may be extended and new techniques developed. An excursion into the new problems of multivariate nonparametric inference is made.

*Prerequisites:* AMS 312 and AMS 572 or equivalents

Fall, 3 credits

#### **AMS 588 Biostatistics**

Statistical techniques for planning and analyzing medical studies. Planning and conducting clinical trials and retrospective and prospective epidemiological studies. Analysis of survival times including singly censored and doubly censored data. Quantitative and quantal bioassays, two-stage assays, routine bioassays. Quality control for medical studies.

*Prerequisite:* AMS 572 or permission of instructor

Fall, 3 credits

#### **AMS 589 Quantitative Genetics**

Definition of relevant terminology. Statistical and genetic models for inheritance of quantitative traits. Estimation of effects of selection, dominance polygenes, epistasis, environment. Linkage studies, threshold characteristics.

*Spring, odd years, 3 credits*

#### **AMS 599 Research**

*Variable and repetitive credit*

#### **AMS 605 Probability Theory II**

Advanced probability. Conditional sigma-fields, stochastic processes, Brownian motion, Markov property, weak convergence, infinitely divisible distributions, martingales, stochastic integrals, stochastic differential equations, stochastic approximation.

*Prerequisite:* AMS 569 or permission of instructor

3 credits

#### **AMS 611 Theory of Partial Differential Equations and Their Applications**

Theorem of Cauchy and Kowalesky; classification of partial differential equations in general; characteristics; potential theory and elliptic equations; hyperbolic equations and propagation of discontinuities; parabolic equations; various methods of solving partial differential equations; applications to problems in electromagnetics, solid mechanics, plasma physics.

*Prerequisite:* AMS 502

3 credits

#### **AMS 615 Nonlinear Differential Equations**

Existence, uniqueness, and continuity theorems. Approximate solutions by method of iteration. Study of autonomous systems. Phase-plane analysis, periodic solutions. Singular points, cycles, limit cycles. Theory of bifurcation. Stability theory, Liapunov functions. Analytical and geometrical investigations of second-order equations such as van der Pol's and Lienard's equations.

*Prerequisite:* AMS 501

3 credits

#### **AMS 620 Theory and Applications of Large-Scale Networks**

A rigorous treatment of mathematical techniques used to answer many practical questions arising in the study and design of large-scale networks. Emphasis on the development of algorithms. Several lectures devoted to specific applications to computer networks to be used throughout the course.

*Prerequisite:* AMS 540 or equivalent

3 credits

#### **AMS 621 Numerical Solutions of Partial Differential Equations**

Variational form of the problem, Ritz Galerkins, collocation, and mixed methods; triangular, rectangular (2-D), and tetrahedral (3-D) elements; accuracy, convergence, stability; solutions of linear, nonlinear steady-state, and dynamic problems; implicit, explicit time integration; equivalence of finite-element and finite-difference methods.

*Prerequisite:* AMS 502 or equivalent

3 credits

#### **AMS 627 Theory of Integral Equations and Their Applications**

Integral equations with degenerate kernels, equations of the second kind, iterative solutions, contraction mapping principle, Fredholm theory, spectral theory for symmetric kernels. Volterra equations of the first and second kind, equations with weakly singular kernels, simultaneous systems, applications.

*Prerequisites:* AMS 504 and AMS 505

3 credits

**AMS 628 Applications of Functional Analysis**

Introduction to such topics as unbounded operators and the closed-graph theorem, convexity, weak convergence in Hilbert space, and degree theory. Applications to monotone operators and the stability of nonlinear systems, to Schwartz distributions and passive linear systems, and to the solution of nonlinear equations.  
3 credits

**AMS 641 Special Topics in Mathematical Programming**

The course is designed for second- and third-year graduate students with a strong foundation in linear algebra and analysis who wish to pursue research in applied mathematics. Varying topics from nonlinear programming and optimization, applied graph theory, and applied combinatorics may be offered concurrently.

*Prerequisites:* AMS 540 and permission of instructor  
3 credits, repetitive

**AMS 644 Special Topics in Applied Probability**

The course is designed for second- and third-year graduate students with a background in probability and stochastic modeling who wish to pursue research in applications of the probability theory. Several topics may be taught concurrently in different sections.  
Fall, 3 credits, repetitive

**AMS 651 Nonlinear Analysis and Optimization**

Iterative methods for solving nonlinear operator equations. Frechet differentials. The Newton-Raphson method in function space and nonlinear boundary value problems. The Courant penalty concept and constrained optimization. General multiplier rules. Variable metric gradient projection for nonlinear least-square methods, with applications.  
3 credits

**AMS 652 Special Topics in Game Theory**

The course is designed for second- and third-year graduate students who wish to specialize in the mathematical theory of games.

*Prerequisites:* AMS 552 and permission of instructor  
3 credits, repetitive

**AMS 670 Special Topics in Probability and Mathematical Statistics**

The course is designed for second- and third-year graduate students with a strong foundation in analysis and statistics who wish to pursue research in mathematical statistics. Several topics may be taught concurrently in different sections.

*Prerequisites:* AMS 569, AMS 570  
3 credits, repetitive

**AMS 675 Special Topics in Applied Statistics**

The course is designed for second- and third-year students with a strong foundation in statistical analysis who wish to pursue research in applied statistics.

*Prerequisites:* AMS 507, AMS 572  
3 credits, repetitive

**AMS 690 Special Topics in Differential Equations and Applied Analysis**

The course is designed for second- and third-year graduate students with a strong foundation in analysis who wish to pursue research in applied mathematics. Several topics may be taught concurrently in different sections.

*Prerequisites:* AMS 501, AMS 504  
3 credits, repetitive

**AMS 691 Topics in Applied Mathematics**

Varying topics selected from the list below if sufficient interest is shown. Several topics may be taught concurrently in different sections.

Advanced Operational Methods in Applied Mathematics

Approximate Methods in Boundary Value

Problems in Applied Mathematics

Control Theory and Optimization

Foundations of Passive Systems Theory

Game Theory

Mixed Boundary Value Problems in Elasticity

Partial Differential Equations

Quantitative Genetics

Stochastic Modeling

3 credits, repetitive

**AMS 695 Special Topics in Numerical Analysis and Scientific Computing**

The course is designed for second- and third-year graduate students with a strong foundation in applied linear algebra and numerical analysis who wish to pursue research in applied mathematics. Several topics may be taught concurrently in different sections.

*Prerequisites:* AMS 505, AMS 526  
3 credits, repetitive

**AMS 698 Practicum in Teaching**

3 credits, repetitive

**AMS 699 Dissertation Research**

Variable and repetitive credit

# Computer Science (CSE)

**Chairperson: Philip M. Lewis**  
Computer Science Building 1400 (516) 632-8426

**Graduate Studies Director: Herbert Gelernter**  
Computer Science Building 1400 (516) 632-8462

## Degree Requirements

Students in the M.S. degree program choose between two options, the M.S. with thesis and the M.S. without thesis. The course requirements depend on the option chosen.

### A. Residence

There is no residence requirement.

### B. Language requirement

There is no language requirement.

### C. Proficiency requirements

Demonstration of proficiency in automata theory (e.g., CSE 303), compilers (e.g., CSE 304), and operating systems (e.g., CSE 306) at the undergraduate or graduate level, and in finite mathematics (e.g., AMS 301) and digital systems (e.g., ESE 318) at the undergraduate level.

### D. Course requirements

Satisfactory completion of 30 graduate credits as follows:

1. M.S. without thesis
  - a. Core courses (CSE 502, 520, 526, and 548) (14 credits)
  - b. Laboratory in Computer Science (CSE 523, 524) (5 credits)
  - c. Eleven credits of approved graduate-level elective courses, excluding CSE 599.
2. M.S. with thesis
  - a. Core courses (CSE 502, 520, 526, and 548) (14 credits)
  - b. Eight credits of approved graduate-level elective courses, excluding CSE 523, 524
  - c. CSE 599 Research (8 credits).
3. In either option, CSE 587 Independent Study in Computer Science may be used to fulfill at most one of the proficiency requirements for automata theory, compilers, or operating systems, with an advisor's approval.

### E. Grade Point Average

A cumulative graduate grade point average of 3.0/4.0 or higher is required.

### F. Thesis requirements

1. M.S. without thesis: Students enrolled in this option must complete an M.S. project approved by the faculty.
2. M.S. with thesis: A student choosing the thesis option must select a research advisor as soon as possible who agrees to serve in that capacity. The advisor will supervise the student's studies and advise the student on his or her choice of courses. The thesis must be approved by a departmental faculty committee of no less than three members, appointed by the graduate studies director. At the discretion of the committee, the student may be required to present a seminar on the topic of his or her thesis.

### G. M.S. degree requirements for Ph.D.-bound students

1. A student enrolled in the Ph.D. program may satisfy the requirements for the M.S. degree by passing the Ph.D. qualifying examination and completing 30 graduate credits of coursework (excluding CSE 599, 698, and 699) with a cumulative graduate grade point average of 3.0/4.0 or higher.
2. Ph.D. students who elect to terminate with an M.S. degree prior to passing the Ph.D. qualifying examination must satisfy all requirements for the M.S. degree with thesis.

## Requirements for the Ph.D. Degree

### A. Residence

Two consecutive semesters of full-time graduate study.

### B. Qualifying Examination and Research Proficiency Examination

Students must satisfactorily pass a qualifying examination to demonstrate their ability to undertake the course of study leading to the Ph.D. degree. The examination is given in January of each year. The student must take the examination within four semesters of admission to the graduate program (i.e., during the second year of residence). For further information please request the *Graduate Student Handbook* from the department.

Students who perform satisfactorily on the qualifying examination are required to demonstrate their ability to undertake creative research by preparing an oral presentation to the faculty (research proficiency examination) within nine months after passing the qualifying examination.

### C. Course Requirements

The faculty of the Department of Computer Science has decided that the student seeking the Ph.D. degree shall initially pursue a relatively heavy and controlled program of courses. The first-year program of courses below will be followed by the majority of students in the Ph.D. program. Students with exceptional strengths or weaknesses follow appropriately modified programs, worked out in consultation with their advisors. In the following model program of courses, it is assumed that the student has taken a course in either digital systems or modern algebra before entering. *Students in the Ph.D. program may not take CSE 523, 524, which are traditionally master's level courses.*

#### First Year

##### Fall semester

- |  |           |
|--|-----------|
| 1. CSE 520 Techniques of Software Design               | 4 credits |
| 2. CSE 541 Theoretical Foundations of Computer Science | 3 credits |

- 3. CSE 534 Advanced Operating Systems or  
CSE 547 Discrete Mathematics 3 credits
- 4. MAT 313 Abstract Algebra or  
ESE 318 Digital Systems Design or  
CSE 502 Computer Architecture

#### Spring Semester

- 1. CSE 526 Principles of Programming Languages 3 credits
- 2. CSE 543 Computability and Undecidability 3 credits
- 3. CSE 548 Analysis of Algorithms 3 credits
- 4. CSE 503 VLSI Design or  
CSE 535 Asynchronous Systems

In general, the second-year program is more variable than the first-year program, reflecting to a large degree the research interests of the students. During the fall semester of the second year the student will enroll in those courses recommended as preparation for the qualifying examination that he or she was unable to take during the first year. In addition, students must take at least 6 credits of 600-level courses (not including CSE 698 or CSE 699) to complete the degree requirements.

#### D. Grade Point Average

A cumulative graduate grade point average of 3.0/4.0 or higher is required. In addition, a student must receive a passing grade in all graduate courses.

#### E. Preliminary Examination

Upon the approval of the student's research advisor, the student will take a preliminary examination. The purpose of the preliminary examination is to ascertain the breadth and depth of the student's preparation to undertake a significant original research investigation. The preliminary examination must be scheduled within 18 months of the time the student passes the research proficiency examination. Failure to pass the preliminary exam at that time without a formal extension is considered evidence of unsatisfactory progress toward the Ph.D. degree.

#### F. Advancement to Candidacy

After the student has completed all requirements for the degree other than the dissertation, he or she is eligible to be recommended for advancement to candidacy. This status is conferred by the vice provost for graduate studies upon recommendation of the department.

#### G. Dissertation

An important requirement of the Ph.D. program is the completion of a dissertation, which must be an original scholarly investigation. The dissertation shall represent a significant contribution to the scientific

literature, and its quality shall be compatible with the publication standards of appropriate reputable scholarly journals.

#### H. Approval and Defense of Dissertation

The dissertation must be orally defended before a dissertation examination committee, and the candidate must obtain approval of the dissertation from this committee. The committee must have a minimum of four members (at least two of which are faculty members from the department), including the research advisor(s), at least one person from outside the department, and a committee chairperson. (Neither the research advisor nor an outside member may serve as the chairperson.) The oral defense of the dissertation is open to all interested faculty members and graduate students. The final draft of the dissertation must be submitted to the committee no later than three weeks prior to the date of the defense.

#### I. Time Limit

The candidate must satisfy all requirements for the Ph.D. degree within seven years after completing 24 credit hours of graduate courses in the Department of Computer Science at Stony Brook. In rare instances, the vice provost will entertain a petition to extend this time limit, provided it bears the endorsement of the chairperson of the department. The vice provost or the department may require evidence that the student is still properly prepared for the completion of work. In particular, the student may be required to pass the preliminary examination again in order to be permitted to continue work.

## Courses

### CSE 502 Computer Architecture

Register transfer language, arithmetic algorithms for integer and floating-point formats. Control unit design, hard-wired and microprogrammed control, instruction set design. Memory devices: organization and management. I/O processing, program controlled I/O, interrupts, direct memory access I/O. Performance measurement. Multi-processor systems, parallel processing, computer networks. Students will perform design exercises using a high-level computer simulation language.

*Prerequisite:* ESE 318  
4 credits

### CSE 503 VLSI Design

The course covers the Mead-Conway method for the design of large-scale integrated silicon chips and is supported by a suite of software design tools available in Berkeley UNIX. These cover symbolic layout, design rule check, cell libraries, and logic simulation. The students team up in pairs in the second half of the semester to generate IC designs which, if pursued through successful simulation, are then submitted for fabrication.

*Prerequisites:* CSE 502 and ESE 318  
4 credits

### CSE 505 Computing with Logic

The course will explore logic-based computing and logic programming. It includes an introduction to programming in logic, covering basic techniques for solving problems in a logic programming system. Particular attention will be paid to user interface issues and how a logic system can provide a useful computing environment. The course covers implementation issues, emphasizing how a logic programming system generalizes both traditional programming language systems and traditional data base systems.

*Prerequisites:* Undergraduate courses in compilers and data structures  
3 credits

### CSE 507 LISP and Functional Programming

Introduction to the theory and practice of LISP and functional programming. Includes an introduction to programming in LISP and other functional languages. The course covers some of the following topics: lambda calculus, programming environments, implementation of functional language processors.

*Prerequisite:* CSE 304 or equivalent  
3 credits

### CSE 513 Advanced VLSI Design

The purpose of the course is to follow up the introductory design course (CSE 503) by providing interested students from that course the opportunity to continue with a significant VLSI design project. The first part of the course will be devoted to the exploration of possible projects. Interaction with other research groups in the department will be encouraged, for example, by offering some guest lectures. This will culminate in the selection of one or possibly two large projects on which the group will collaborate. By approximately one month into the course, it is expected that the chips fabricated from the previous semester will arrive. These are divided among the seminar students for testing, using the simulation command files from the previous semester. The remainder of the semester is devoted to completing the new designs through high-level simulation, layout, and low-level simulation.

*Prerequisite:* CSE 503  
3 credits

### CSE 520 Techniques of Software Design

Topics relevant to software design and development, especially those relating to the commercial/industrial programming environment. Includes system and module construction and decomposition methodologies (top down, bottom up, hierarchical), structured programming concepts, maintainability, reliability, program and system documentation (design specs, implementation specs, user manual), management of software ("Mythical Man Month," etc.), and psychology of computer programming and programmers.

*Prerequisite:* CSE 201 or equivalent  
4 credits

### CSE 522 Advanced Topics in Compiler Design

Advanced topics in the design and implementation of compilers and interpreters. Topics drawn from intermediate code languages, code generation for advanced language constructs, global program improvement techniques requiring flow analysis such as constant propagation and dead code elimination, loop optimization, local program improvement techniques such as peephole optimization, tail recursion elimination, table-driven final code generation techniques, runtime environments, and register allocation. Non-Algol-like languages may also be covered, including data base query and functional

languages; applicative, object-oriented, and logic programming languages; compilers for interactive program development systems.

*Prerequisite:* CSE 304 or equivalent  
3 credits

### **CSE 523 Laboratory in Computer Science I**

A significant programming problem or digital system design will be undertaken. The laboratory project will extend over two consecutive semesters and will be completed in CSE 524. Before the deadline date designated by the course instructor (usually coinciding with the add/drop deadline for that semester), the student will prepare a one- to two-page description of the work he or she expects to complete during each semester of the course sequence. The description will be reviewed and approved by the student's project sponsor, signed by both student and sponsor, and reside in the student's file. Performance in completing the course requirements will be evaluated with reference to the implied promise contained in the proposed project description. Both student and sponsor will have made commitments to one another in signing the proposal. Amendments to the project description are permitted; these must be approved by both the faculty sponsor and the course instructor.

*Prerequisite:* CSE graduate student status or permission of instructor  
2 credits

### **CSE 524 Laboratory in Computer Science II**

Continuation of the project in programming or digital system design undertaken in CSE 523. Results are to reflect all aspects of large-scale problem solving including cost analysis, design, testing, and documentation. A final report documenting requirements, design, implementation, and testing details is required, and when appropriate a user's manual must be written.

*Prerequisite:* CSE 523  
3 credits

### **CSE 525 Operating Systems**

Review of batch processing systems. Discussion of topics such as virtual memory, protection, interprocess communication, and directory structures in the context of several modern operating systems. Sequential processes, asynchronous operation, and modularization of systems.

*Prerequisites:* CSE 120 and CSE 201 or equivalents  
4 credits

### **CSE 526 Principles of Programming Languages**

Analysis of concepts in programming language concepts and design, with emphasis on abstraction mechanisms. Topics studied include denotational semantics, imperative and functional languages, object-oriented programming, procedure call and parameter passing mechanisms, generic and polymorphic definitions, abstract data types, concurrent and distributed programming primitives, and efficiency issues. Several representative languages (such as ALGOL 60, Pascal, ALGOL 68, Euclid, CLU, SMALLTALK, LISP, FP, ADA) are studied in detail with emphasis given to design issues and interactions of features. Background in compiler construction and programming experience in a high-level language is required.

*Prerequisite:* CSE 303 or equivalent  
*Pre- or corequisite:* CSE 304 or equivalent  
3 credits

### **CSE 527 Introduction to Image Analysis**

Survey of methods used for the analysis of images by computer, including computer vision and pattern recognition. Topics covered are image formation, image segmentation and edge detection, binary images and shape analysis,

shape from shading, motion field and optical flow, surface inference, and classification techniques.

*Prerequisite:* B.S. degree in computer science, engineering or the mathematical and physical sciences  
3 credits

### **CSE 528 Computer Graphics**

This course emphasizes a hands-on approach to the use of computer graphics. The topics covered include models, picture description, and interaction; windowing, clipping, panning, and zooming; geometrical transformations in 2D and 3D; algorithms for raster displays (scan-line conversion, polygon fill, polygon clipping, etc.); hidden line and hidden surface removal, shading models; user interaction. The students will implement a substantial application program for one of the graphic terminals available in the department.

*Prerequisite:* Undergraduate course in data structures  
3 credits

### **CSE 529 Simulation and Modeling**

A comprehensive course in formulation, implementation, and application of simulation models. Topics include data structures, simulation languages, statistical analysis, pseudo-random number generation and design of simulation experiments. Students apply simulation modeling methods to problems of their own design. Crosslisted with AMS 553.

*Prerequisites:* CSE 201 or equivalent, and AMS 310 or 507 or equivalent; or permission of instructor  
3 credits

### **CSE 532 Theory of Data Base Systems**

Storage and retrieval from large, well-structured data bases. Relational model, deductive, and object-oriented data bases; query processing, concurrency control; data base security and integrity. The emphasis is on the more theoretical aspects of the topic.

*Prerequisite:* CSE 303 or permission of instructor  
3 credits

### **CSE 533 Computer Network Communication Protocols**

This is a survey of network communication software and hardware techniques, especially the ISO reference model of layered protocols. Topics include connectivity and delay analysis, data transmission techniques, pipelined window protocols, virtual circuits and datagrams, routing, congestion control, local area network access, process-to-process message transport, inter-network gateways, encryption, and distributed application protocols.

*Prerequisite:* Course in operating systems or permission of instructor  
3 credits

### **CSE 534 Advanced Operating Systems**

This is a survey of modern operating system techniques, especially those needed for distributed operating systems. Topics include network topologies, interprocess communication, failure detection and system recovery, local kernel functions, global network services, location transparency, large network constraints, distributed control algorithms (synchronization, configuration, deadlock detection, and searches), and existing distributed operating systems.

*Prerequisite:* Undergraduate course in operating systems or permission of instructor  
3 credits

### **CSE 535 Asynchronous Systems**

Discusses asynchronous systems, their description using concurrent and distributed programming languages, and their verification. Topics include concurrent programming using shared

memory and message passing, formal semantics of communication, and reliability and concurrency control in distributed data base systems.

*Prerequisite:* Undergraduate course in operating systems  
3 credits

### **CSE 537 Artificial Intelligence**

A comprehensive introduction to the problems of artificial intelligence and the techniques for attacking them. Topics include problem representation, problem-solving methods, search, pattern recognition, natural language processing, learning, expert systems, and AI programming languages and techniques. The course will emphasize both theoretical methods and practical implementations.

3 credits

### **CSE 538 Natural Language Processing**

A survey of computational approaches to natural language processing issues in phonology, morphology, syntax, semantics, and pragmatics. Topics to be discussed include natural language parsing algorithms, generation algorithms, and knowledge representations. Models for speech recognition systems, story understanding systems, and natural language front-ends to data bases and other application programs will be investigated.

*Prerequisite:* CSE 537  
3 credits

### **CSE 539 Expert Systems**

Characteristics of some existing expert consultation and problem-solving systems. Techniques, tools, and languages for designing and building such systems. Knowledge representation. Problems of knowledge base construction and maintenance, extracting the "expertise" from the experts. Students will participate in a class project in which an expert knowledge-based consultation system for a specific problem domain will be specified and built.

*Prerequisite:* Permission of instructor  
3 credits

### **CSE 541 Theoretical Foundations of Computer Science**

First-order predicate calculus. Proof theory. Introduction to model theory. Application of logic to program verification (Hoare's axiomatic method, structural induction, fixed-point semantics). Nonclassical logic systems useful in computer applications (temporal logic, dynamic logic, many-sorted logic, intuitionistic logic).

*Prerequisite:* CSE 303 or permission of instructor  
3 credits

### **CSE 543 Computability and Undecidability**

Automata theory (with more emphasis on Turing machines, less on regular and context-free languages) and the halting problem. Introduction to recursive function theory. Models of computation and associated time and space measures for complexity of algorithms in the various models.

*Prerequisite:* CSE 303 or permission of instructor  
3 credits

### **CSE 544 Theory of Computational Complexity**

Machine-based polynomial complexity theory, including nondeterministic computation, probabilistic computation, time and space tradeoff, and complexity hierarchy; applications to related areas such as combinatorial algorithms and cryptography.

*Prerequisite:* CSE 543 or CSE 548 or permission of instructor  
3 credits

### **CSE 545 Mechanical Inferences**

Refutational and deductive theorem proving: resolution, paramodulation, and natural deduction systems. Techniques for providing partial

correctness and termination of programs. Inductive theorem proving. Term rewriting systems. Deductive synthesis of programs.

*Prerequisite:* CSE 541 or permission of instructor  
3 credits

#### **CSE 546 Analysis and Synthesis of Computer Communication Networks**

Analysis of message queuing and buffering in computer networks. Survey of OSI layered architecture. Network topological design. Introduction to local, metropolitan, and wide-area networks. Circuit and packet switching techniques. High-speed and lightwave network concepts: Synchronous Optical Network (SONet), Fibert Distributed Data Interface (FDDI), Distributed Queue Dual Bus (DQDB-QPSX), Integrated Services Digital Networks (ISDN), Broadband-ISDN, Asynchronous Transfer Mode (ATM). Crosslisted with ESE 546.

3 credits

#### **CSE 547 Discrete Mathematics**

This course introduces such mathematical tools as summations, number theory, binomial coefficients, generating functions, recurrence relations, discrete probability, asymptotics, combinatorics, and graph theory for use in algorithmic and combinatorial analysis. Crosslisted with AMS 547.

3 credits

#### **CSE 548 Analysis of Algorithms**

Techniques for designing efficient algorithms, including choice of data structures, recursion, branch and bound, divide and conquer, and dynamic programming. Complexity analysis of searching, sorting, matrix multiplication, and graph algorithms. Standard NP-complete problems and polynomial transformation techniques. Some computing will be required. Crosslisted with AMS 542.

*Prerequisite:* Some familiarity with data structures  
*Recommended:* CSE 547

3 credits

#### **CSE 549 Formal Foundations for VLSI Design**

A study of the algorithms related to VLSI design. Among topics covered: area/time tradeoffs, layout algorithms, networks of processors, systolic algorithms.

*Prerequisites:* CSE 503 and CSE 548, or permission of instructor

3 credits

#### **CSE 551 Program Semantics and Verification**

Formal approaches to defining semantics of programming languages: denotational, operational, axiomatic, and transformational semantics. Formal systems for program verification. Logics of program, type theory, lambda calculus. Further topics selected from term rewriting approach to proving properties of data types, and semantics and verification of languages with concurrent and parallel constructs.

*Prerequisite:* CSE 541

3 credits

#### **CSE 587 Independent Study in Computer Science**

Independent study in computer science pursued under the supervision of a faculty member. In order to register for independent study, an approved form describing the syllabus to be followed and the work to be completed must be submitted to the department not later than the designated add/drop deadline for that semester. Prior permission of the graduate studies director is required if and only if the course is to be counted toward the fulfillment of degree requirements.

1-4 credits, variable and repetitive

#### **CSE 599 Research**

An M.S. student or Ph.D. student who has not yet passed his or her qualifying examination who wishes to enroll in CSE 599 for any number of credits must prepare a one- to two-page description of the work he or she expects to complete in order to earn those credits. The description must be reviewed and approved by the student's research faculty sponsor, signed by both student and sponsor, and reside in the student's file. Performance in CSE 599 will be evaluated with reference to the implied promise contained in the proposed work description. Both student and sponsor will have made commitments to one another in signing the agreement. The magnitude of the proposal must be consistent with the number of credits to be granted upon completion of the project. The proposal must be approved and submitted to the department no later than the designated add/drop deadline for that semester. Amendments to the proposal are permitted; these must be approved by the faculty sponsor and the graduate studies director. A special category of CSE 599 registration is recognized for maintenance of matriculation; a student may justify a single credit of CSE 599 for this purpose only if that is his or her total course load for the semester.

Variable and repetitive credit

#### **CSE 600 Topics in Modern Computer Science**

A survey of current computer science research areas and issues. This course comprises lectures by faculty members and visitors, selected readings, and introductory-level research problems. Possible topics include approximation algorithms for intractable problems, probabilistic algorithms, distributed systems, system design, expert systems, robotics, networks, VLSI, and multiprocessor computers.

*Prerequisite:* Permission of instructor

3 credits

#### **CSE 621 Seminar in Programming Languages**

3 credits, repetitive

#### **CSE 622 Seminar in Operating Systems**

3 credits, repetitive

#### **CSE 627 Seminar in Image Analysis**

1 credit, repetitive

#### **CSE 628 Seminar in Computer Graphics**

1 credit, repetitive

#### **CSE 630 Seminar in Artificial Intelligence**

3 credits, repetitive

#### **CSE 631 Seminar in Data Base Systems**

3 credits, repetitive

#### **CSE 645 Seminar in Theory of Computation**

3 credits, repetitive

#### **CSE 648 Seminar in Analysis of Algorithms**

3 credits, repetitive

#### **CSE 662 Mathematical Techniques for the Analysis of Algorithms**

Course includes advanced topics in combinatorics, the analysis of sorting and hashing algorithms, and an introduction to probabilistic analysis, asymptotic analysis, and Mellin transforms. Also covered are techniques for solving recurrence equations and Greene's calculus on labeled formal languages.

*Prerequisite:* CSE 548

*Recommended:* Some skills in mathematical analysis

3 credits

#### **CSE 663 Modern Developments in Algorithms and Complexity**

Course covers probabilistic estimation techniques, the Hungarian method, and approximation algorithms. Also covers probabilistic algorithms, including primality testing, the theory of pseudo-random number generation, and an introduction to cryptography.

*Prerequisite:* CSE 548

*Recommended:* Some knowledge of probability and number theory

3 credits

#### **CSE 681 Special Topics in Programming Languages**

3 credits, repetitive

#### **CSE 682 Special Topics in Computer System Design**

3 credits, repetitive

#### **CSE 683 Special Topics in Computer Applications**

3 credits, repetitive

#### **CSE 684 Special Topics in Computer Architecture**

3 credits, repetitive

#### **CSE 685 Special Topics in Artificial Intelligence**

3 credits, repetitive

#### **CSE 686 Special Topics in Theory of Computation**

3 credits, repetitive

#### **CSE 687 Special Topics in Computer Graphics**

3 credits, repetitive

#### **CSE 698 Practicum in Teaching**

Variable and repetitive credit

#### **CSE 699 Dissertation Research**

Variable and repetitive credit

# Electrical Engineering (ESE)

**Chairperson: Kenneth L. Short**  
Light Engineering Building 273 (516) 632-8420

**Graduate Studies Director: Velio A. Marsocci**  
Light Engineering Building 209 (516) 632-8395/8400

## Degree Requirements Requirements for the M.S. Degree

The M.S. degree in the Department of Electrical Engineering requires the satisfactory completion of a minimum of 30 graduate credits. These requirements may be satisfied by either one of the two following options:

### I. M.S. Non-Thesis Option

A. At least 30 graduate credits with a grade point average of 3.0 or better. Among these 30 credits, up to six credits may be ESE 597, ESE 599, ESE 691, ESE 698, or ESE 699. All non-EE courses must receive *prior* approval from the graduate studies director.

B. Minimum of eight regular courses with at least a 3.0 grade point average. Of these eight, at least five regular courses must be in the Department of Electrical Engineering. At least three of these five regular courses must be selected from the following five choices: (a) ESE 502, (b) ESE 503, (c) ESE 511, (d) ESE 520, and (e) either ESE 545 or ESE 580.

C. ESE 597, ESE 599, ESE 698, and ESE 699 are not counted as regular courses in item B. Courses that permit repetitive credit, such as research seminars or special topics, can be counted only once (3 or 4 credits) for item B. However, ESE 670 may be counted only once for regular course credit toward the M.S. degree, and ESE 698 may be counted only once (3 credits) for credit toward the M.S. degree.

D. Up to six transfer credits may be applied toward the degree with the approval of the program committee.

### II. M.S. Thesis Option

A. At least 30 graduate credits with a grade point average of 3.0 or better. At least six credits of ESE 599. No more than a total of 12 credits may be taken from ESE 597, ESE 599, and ESE 698. All non-EE courses must receive prior approval from the graduate studies director.

B. Minimum of six regular courses with at least a 3.0 grade point average. Of these six, at least four regular courses must be in the Department of Electrical Engineering. At least three of these four regular courses must be selected from the following five choices: (a) ESE 502, (b) ESE 503, (c) ESE 511, (d) ESE 520, and (e) either ESE 545 or ESE 580.

C. ESE 597, ESE 599, ESE 698 and ESE 699 are not counted as regular courses in item B. Courses that permit repetitive credit, such as research seminars or special topics, can be counted only once (3 or 4 credits) for item B. However, ESE 670 may be counted only once for regular course credit toward the M.S. degree, and ESE 698 may be counted only once (3 credits) for credit toward the M.S. degree.

D. Up to six transfer credits may be applied toward the degree with the approval of the program committee.

E. Satisfactory completion of a thesis.

## Requirements for the Ph.D. Degree

### A. Qualifying Examination

A student must pass a written qualifying examination.

### B. Course Requirements

1. A minimum of six regular courses beyond the M.S. degree or 14 regular courses beyond the baccalaureate degree. The choice must have the prior approval of the designated faculty academic advisor. The courses ESE 506, ESE 507, ESE 597, ESE 598, ESE 599, ESE 698, and ESE 699 are not counted as regular courses. Courses presented under the title ESE 670 Topics in Electrical Engineering that have different subject matters, and are offered as formal lecture courses, are considered as different regular courses but may not be counted more than once as a regular course

for credit toward the M.S. degree, and not more than twice, in total, for all graduate degrees awarded by the Department of Electrical Engineering.

2. The student must satisfy the stipulations of a plan of study which must be filed with the graduate program committee within six months after the student passes the qualifying examination. The study plan, which will include the six regular courses as required in item 1, will be developed under the aegis of the designated faculty advisor (who may or may not be the eventual thesis advisor). Modification of the study plan may be made by the preliminary examination committee and at any later time by the thesis advisor. An up-to-date plan must always be placed on file with the graduate program committee each time a modification is made.

### C. Preliminary Examination

A student must pass the preliminary examination within 36 months after passing the qualifying examination. Both a thesis topic and the thesis background area are emphasized.

### D. Advancement to Candidacy

After successfully completing all requirements for the degree other than the dissertation, the student is eligible to be recommended for advancement to candidacy. This status is conferred by the vice provost for graduate studies upon recommendation from the chairperson of the department.

### E. Dissertation

The most important requirement for the Ph.D. degree is the completion of a dissertation, which must be an original scholarly investigation. The dissertation must represent a significant contribution to the scientific literature, and its quality must be compatible with the publication standards of appropriate and reputable scholarly journals.



## F. Dissertation Defense

The student must defend the dissertation before an examining committee. On the basis of the recommendation of this committee, the dean of engineering and applied sciences will recommend acceptance or rejection of the dissertation to the vice provost for graduate studies. All requirements for the degree will have been satisfied upon the successful defense of the dissertation.

## G. Residency Requirement

A one-year residency is required.

## H. Time Limit

All requirements for the Ph.D. degree must be completed within seven years after completing 24 hours of graduate courses in the department.

## Courses

### ESE 501 Graduate Laboratory in Electrical Sciences

Intended to familiarize the student with the use of research laboratory equipment, basic measurement techniques, and integration into an overall experimental project. Each student will select at least three experimental projects from the following areas to be supervised by the faculty: applied optics, microwave electronics, wave propagation, and solid-state electronics. The student must set up the experimental system, measure the necessary parameters, and perform the required experiments in order to complete the project.

Fall, 3 credits

### ESE 502 Linear Systems

Mathematical descriptions and correspondences between continuous-time and discrete-time linear systems. State variable and input-output formulation and the use of Laplace and z-transforms in analysis. Controllability, observability, minimal realization, and structural canonical forms. Assignment of system nodes, Rx state variable feedback, and the design of observers. Stability criteria and the Routh-Hurwitz test for asymptotic stability.

Fall, 3 credits

### ESE 503 Stochastic Systems

Basic probability concepts and application. Probabilistic bounds, characteristic functions, and multivariate distributions. Central limit theorem, normal random variables. Stochastic processes in communications, control, and other signal processing systems. Stationarity, ergodicity, correlation functions, spectral densities, and transmission properties. Optimum linear filtering, estimation, and prediction.

Fall, 3 credits

### ESE 504 Congestion and Delay in Communications and Computer Systems

Traffic congestion, queuing, and delay in communication and computer systems. Important channel and queuing models. Message and circuit switching. Protocol analysis. Multiple access techniques. Blocking. Time-shared and multiprocessor computer models. Numerical algorithms: mean value analysis, convolution algorithm.

Prerequisite: ESE 503 or permission of instructor  
Spring, 3 credits

### ESE 508 Analytical Foundations of Systems Theory

An exposition of the basic analytical tools for graduate study in systems, circuits, control, and signal processing. Sets and mappings, finite-

dimensional linear spaces, metric spaces, Banach spaces, Hilbert spaces. The theory will be developed and exemplified in the context of systems applications such as nonlinear circuits, infinite networks, feedback control, signal restoration via projections, and optimal signal modeling.

Spring, 3 credits

### ESE 510 Fundamentals of Physical Electronics

Lagrangian and Hamiltonian formulation of mechanics. Classical and quantum statistics. Schrodinger's and Heisenberg's representation of quantum mechanics; perturbation theory. Solid-state theory, crystal structure, simple band structure, effective mass theorem, properties of semiconductors. Transport theory, derivation and application of Boltzmann transport theory. Semiconductor devices.

Fall, 3 credits

### ESE 511 Solid-State Electronics I

A study of the electron transport processes in solids leading to the analysis and design of solid-state devices. Electrical and thermal conductivities; scattering mechanism; diffusion, galvanomagnetic, thermomagnetic, and thermoelectric effects. Hall effect and magnetoresistive devices. Conductivity in thin films. Ferroelectrics, piezoelectrics, theory of magnetism and of magnetic devices.

Fall, 3 credits

### ESE 512 Solid-State Electronics II

Resonance phenomena in solids; applications to microwave devices and to measurements of electronic parameters, optical properties of solids, direct and indirect transitions, luminescence, photoelectric devices, photomagnetic effects. Elements of superconductivity, the macroscopic and microscopic theories, tunneling effects.

Spring, 3 credits

### ESE 514 Semiconductor Electronics

This course provides an introduction to the physics, design, and fabrication techniques for planar MOSFET devices and LSI and VLSI integrated circuits. Topics include the following: surface field effect, MOS capacitors and transistors, threshold voltage as a function of oxide thickness, doping concentration, interface charge density and substrate bias, characteristics of MOS devices under different operating conditions for both low and high frequencies, equivalent circuits and device parameters and their dependence on different processing techniques. The latest technological developments to achieve high-speed and high-density LSI circuits will also be discussed.

Prerequisite: ESE 511

Fall, 3 credits

### ESE 515 Quantum Electronics I

Physics of microwave and optical lasers. Topics include introduction to laser concepts; quantum theory; classical radiation theory; resonance phenomena in two-level systems; Bloch equations—Kramers-Kronig relation, density matrix; rate equation and amplification; CO<sub>2</sub> lasers; discharge lasers; semiconductor lasers.

Fall, 3 credits

### ESE 516, 517 Integrated Electronic Devices and Circuits I and II

Theory and applications: elements of semiconductor electronics, methods of fabrication, bipolar junction transistors, FET, MOS transistors, diodes, capacitors, and resistors. Design techniques for linear digital integrated electronic components and circuits. Discussion of computer-aided design, MSI, and LSI.

Fall, spring, 3 credits each semester

### ESE 518 Quantum Electronics II

Interaction of simple quantum systems with complex systems; semiclassical laser oscillation theory; stochastic theory of fluctuations. Brillouin scattering. Raman effect; spontaneous emission; interaction theory; quantum theory of laser oscillation; coupled Green's function relations. Quantized nonlinear optics; quantum noise; photon scattering.

Spring, 3 credits

### ESE 520 Electronics II—Fundamentals of Electromagnetics

Electro- and magnetostatics; Maxwell's equations; vector and scalar potentials; vector and tensor transformation properties. Lorentz transformation; derivation of Maxwell's equations from Coulomb's law and Lorentz transformation. Boundary value problems; Green's function, guided waves, traveling wave, and charged particle interactions. Radiation.

Spring, 3 credits

### ESE 521 Applied Electromagnetic Theory

Advanced boundary value problems in electromagnetic and microacoustic wave propagation, guided wave, and radiation. Topics include variation and perturbation methods applied to cavity, waveguide discontinuity radiation from waveguide aperture and equivalent source theorem, mode theory of guided wave around the earth, microwave acoustic waveguide transducers.

Fall, 3 credits

### ESE 522 Lightwave Communications

This course covers the essential components of a modern optical fiber communication system. Following a brief review of optical sources and characterization of optical fiber waveguides the remainder of the course examines the incoherent optical system currently in use. A complete analysis of optical receivers, modulation techniques, and optical receiver design is tackled. Finally, future coherent optical systems are examined.

Prerequisite: ESE 319

Fall, 3 credits

### ESE 523 Integrated and Fiber Optics

The course includes the following topics: thin-film dielectric optical waveguides and modes, dielectric fibers, semiconductor planar waveguides, input and output couplers, groove reflectors, resonators and filters, modulators and detectors, semiconductor junction lasers and thin-film feedback lasers, fabrication techniques of thin-film guides and devices; optical communication system consideration and requirements.

Fall, 3 credits

### ESE 524 Microwave Acoustics

Continuum acoustic field equations. Wave equation, boundary conditions, and Poynting vector. Waves in isotropic elastic media: plane-wave modes, reflection and refraction phenomena, bulk-acoustic-wave (BAW) waveguides, surface acoustic waves (SAW). Plane and guided waves in piezoelectric media. BAW transduction and applications: delay-line and resonator structures, the Mason equivalent circuit, monolithic crystal filters, IM CON dispersive delay lines, acoustic microscopes, SAW transduction and applications: the interdigital transducer, band-pass filters, dispersive filters, convolvers, tapped delay lines, resonators.

Prerequisite: ESE 319

Fall, 3 credits

### ESE 525 Electromagnetic Methods in Geophysical Exploration

The theory and methods of exploring the structure of the earth and searching for oil and mineral resources by using electric, electromagnetic, and magnetotelluric techniques: resistivity methods, electromagnetic induction, magnetotelluric principles, electromagnetic transients,

induced polarization, sounding techniques, well logging, computational problems, inverse problems.

*Prerequisite or corequisite:* ESE 520 or equivalent

Fall, 3 credits

### **ESE 526 Introduction to Integrated Circuits Technology**

This course introduces the basic technologies employed to fabricate advanced integrated circuits. These include epitaxy, diffusion, oxidation, chemical vapor deposition, ion implantation lithography and etching. The significance of the variation of these steps is discussed with respect to its effect on device performance. The electrical and geometric design rules are examined together with the integration of these fabrication techniques to reveal the relationship between circuit design and the fabrication process.

*Prerequisite:* ESE 514

Fall, 3 credits

### **ESE 527 Circuit Theory and Applications**

Foundation of design procedures for electric circuits. Fundamental concepts, graph theory, network equations, network functions, state equations, network synthesis, scattering parameters, nonlinear circuits.

Fall, 3 credits

### **ESE 529 Electrical Network Theory**

Paradoxes and conundrums: infinite networks viewed classically. Infinite-power regimes. Finite-power regimes. Existence and uniqueness via contraction mappings, fixed-point theorems, and modular sequence spaces. Connections at infinity and transfinite networks. Infinite grids. Operator networks. Exterior problems and computational techniques. Application to VLSI design, geophysical exploration, electromagnetic and acoustic waves, random walks on infinite graphs, and infinite Markov chains.

Spring, 3 credits

### **ESE 530 Computer-Aided Design**

The course presents techniques for analyzing linear and nonlinear dynamic electronic circuits using the computer. Some of the topics covered include network graph theory, generalized nodal and hybrid analysis, companion modeling, Newton's method in  $n$ -dimensions and numerical integration.

*Prerequisite:* B.S. in electrical engineering

Spring, 3 credits

### **ESE 531 Detection and Estimation Theory**

Hypothesis testing and parameter estimation. Series representation of random processes. Detection and estimation of known signals in white and nonwhite Gaussian noise. Detection of signals with unknown parameters.

*Prerequisite:* ESE 503 or permission of instructor

Spring, 3 credits

### **ESE 532 Theory of Digital Communication**

Optimum receivers, efficient signaling, comparison classes of signaling schemes. Channel capacity theorem, bounds on optimum system performance, encoding for error reduction, and the fading channel. Source coding and some coding algorithms.

*Prerequisite:* ESE 503

Fall, 3 credits

### **ESE 533 Satellite Communication Engineering**

Historical perspective, economics, orbital mechanics, synchronous satellites, transponders, multiaccess earth terminals, frequency division multiple access, time division multiplexing, time division multiple access, PSK, carrier-phase tracking, filter distortion, bit sync, timing systems, delay-lock tracking.

*Prerequisite:* ESE 503 or equivalent

Spring, 3 credits

### **ESE 535 Information Theory and Reliable Communications**

Source and channel models. Measure of information and source coding theorems. Mutual information, channel capacity, and channel coding theorems. Block codes. Convolutional codes. Research topics.

Fall, 3 credits

### **ESE 541 Discrete Time Systems**

Analysis and synthesis of discrete time systems and discrete time-controlled continuous systems. Topics include Z-transform and state variable representations of discrete time systems, controllability, and observability. Stability criterion. Synthesis methods. Dynamite programming and optimum control. Sampled spectral densities and correlation sequence. Optimum filtering and control of random processes.

*Prerequisite:* ESE 502

Spring, 3 credits

### **ESE 542 Stability Theory and Application**

Definition and application of stability criteria in both linear and nonlinear systems. Topics include equilibrium points, limit cycles, describing function analysis, construction of Lyapunov functions, the Popov circle criterion, and perturbation methods. Application of stability theory to design of nonlinear control systems.

Spring, 3 credits

### **ESE 543 Optimal Control**

Topics include parameter optimization, Lagrange multipliers, and numerical techniques such as steepest descent. Newton's method and conjugate gradients. In the area of trajectory optimization, the Hamilton-Jacobi equations. Pontryagin maximum principle and dynamic programming are applied to the quadratic regulator, minimum time, minimum fuel, and other linear and nonlinear control problems. Control in restricted phase space.

Fall, 3 credits

### **ESE 544 Optimal Filtering and Data Reconstruction**

Effects of stochastic noise and inexact measurement on the performance of control and communication systems. Topics include matching filter, coherent detection, optimal estimation, prediction, and smoothing of data using the Weiner-Hopf and Kalman-Bucy methods. The separation principle in optimal control of stochastic systems.

Spring, 3 credits

### **ESE 545 Computer Architecture**

Covers multiprocessors, stack-organized computers, pipeline computers, microprocessors, and computer networks. Topics including microprogramming, computer design language, hierarchical memory management systems, machine algorithm for high-speed arithmetic, hardware dynamic loader, microprogrammed control. Input/output organization, virtual memory, and virtual machine are discussed. May not be taken in addition to CSE 502 for credit.

*Prerequisite:* ESE 318

Spring, 4 credits

### **ESE/CSE 546 Analysis and Synthesis of Computer Communication Networks**

Analysis of message queuing and buffering in computer networks. Survey of OSI-layered architecture. Network topological design. Introduction to local, metropolitan, and wide-area networks. Circuit and packet switching techniques. High-speed and lightwave network concepts: synchronous optical network (SONet), fiber distributed data interface (FDDI), distributed queue dual bus (DQDB-QPSX), integrated services digital networks (ISDN), broadband-ISDN, asynchronous transfer mode (ATM).

Fall, 3 credits

### **ESE 547 Digital Signal Processing**

The course covers three aspects of digital signal processing: digital filter, fast Fourier transform (FFT), and error analysis. Topics include review of analog filters and design of infinite impulse filters; algorithm and implementation of FFT; application of FFT; effects and analysis of quantization errors.

Fall, 3 credits

### **ESE 549 Fault Diagnosis of Digital Systems**

This course is designed to acquaint students with fault diagnosis of logic circuits. Both combinatorial and sequential circuits are considered. Concepts of faults and fault models are presented. Emphasis is given to test generation, test selection, fault detection, fault location, fault location within a module, and fault correction.

*Prerequisite:* ESE 318 or equivalent

Spring, 3 credits

### **ESE 551 Switching Theory and Sequential Machines**

Survey of classical analysis and synthesis of combination and sequential switching circuits, followed by related topics of current interest such as error diagnosis and fail soft circuits, use of large-scale integration, logic arrays, automated local design.

*Prerequisite:* ESE 318 or equivalent

Fall, 3 credits

### **ESE 554 Introduction to VLSI Systems**

The course provides sufficient basic information about integrated devices, circuits, digital and analog sample-data subsystems, and system architecture to enable the student to span the range of abstraction from the underlying physics to complete VLSI systems. The course presents basic procedures for designing and implementing digital and analog integrated systems, including a structured design methodology, use of stick diagramming, use of symbolic layout language, and use of a scalable set of design rules. Also examined are the effects of scaling down the dimensions of devices and systems, as will occur with future improvements in fabrication technology.

*Prerequisite:* B.S. in electrical engineering or computer science

Fall, 3 credits

### **ESE 555 VLSI Circuit Design**

As a continuation of ESE 554, this course provides students with the opportunity to design a VLSI chip in its entirety: from systems specification to detailed cell layout. Students will use advanced computer design automation tools. Layouts will be edited using colorgraphic computer terminals, and designs will be submitted for fabrication and testing.

*Prerequisite:* ESE 554

Spring, 3 credits

### **ESE 556 Nonlinear Discrete-Time Systems**

Analysis of various classes of nonlinear discrete-time systems, theory and applications of nonlinear ordinary difference equations, closed-form solutions, fixed-points, limit cycles, asymptotic expansions, local and global stability, bifurcations, chaos, strange attractors; a selection of applications in electrical engineering, economics, and biology.

Spring, 3 credits

### **ESE 557 Digital Signal Processing II: Advanced Topics**

A number of different topics in digital signal processing will be covered, depending on class and current research interest. Areas to be covered

include the following: parametric signal modeling, spectral estimation, multirate processing, advanced FFT and convolution algorithms, adaptive signal processing, multidimensional signal processing, advanced filter design, dedicated signal processing chips, and signal processing for inverse problems. Students will be expected to read and present current research literature. *Prerequisite:* ESE 547 or permission of instructor  
*Spring, 3 credits*

#### **ESE 558 Digital Image Processing I**

The material in this offering will constitute a first course introduction to the field of digital image processing. Image generation, electro-optical sensor characteristics, vision, and color perception/matching will be discussed with respect to image processing requirements followed by image sampling techniques, 2-D Nyquist theorem, aliasing effects, and scalar/vector quantization techniques. Linear image processing techniques will be treated from finite and infinite dimensional vector space approaches and will include Fourier, Haar, singular-value decomposition, Karhunen-Loeve transforms and their fast counterparts. Application of these techniques to image enhancement/restoration will follow and will include histogram equalization, deblurring, Weiner filtering, and pseudo-inverse restoration. *Prerequisite:* Linear systems/problem theory  
*Fall, 3 credits*

#### **ESE 559 Digital Image Processing II**

The course material will proceed directly from DIP-I, starting with image reconstruction from projections. After the basic projection, theorems are developed and computerized axial tomography techniques will be examined in detail including forward and inverse random transformations, convolution, back projection, and Fourier reconstruction; nuclear magnetic resonance imaging and positron emission tomography will be similarly covered. Surer resolution concepts will be developed and applied to a variety of remote sensing applications as well as digital image coding for efficient transmission of digital TV imagery. *Prerequisite:* ESE 558  
*Spring, 3 credits*

#### **ESE 560 Optical Information Processing I**

The course is designed to give the student a firm background in the fundamentals of optical information processing techniques. It is assumed that the student is familiar with Fourier transforms and complex algebra, and is conversant with the principles of linear system theory. The course begins with a mathematical introduction to linear system theory and Fourier transformation. The body of the course is concerned with the scalar treatment of diffraction and its application to the study of optical imaging techniques and coherent and incoherent optical processors. *Prerequisite:* Bachelor's degree in physical sciences  
*Spring, 4 credits*

#### **ESE 563 Fundamentals of Robotics I**

This course covers homogenous transformations of coordinates, kinematic and dynamic equations of robots with their associated solutions; control and programming of robots. *Prerequisite:* Permission of instructor  
*Fall, 3 credits*

#### **ESE 564 Fundamentals of Robotics II**

This course advances ESE 563, with more emphasis on kinematic and dynamic equations, as well as advancing control strategy. In addition it covers the following topics: vision, sensory processing, collision-free trajectory plannings. *Prerequisite:* Permission of instructor  
*Spring, 3 credits*

#### **ESE 570 Bioelectronics**

Origin of bioelectric events; ion transport in cells; membrane potentials; neural action potentials and muscular activity; cortical and cardiac potentials. Detection and measurement of bioelectric signals; impedance measurements used to detect endocrine activity, perspiration, and blood flow; impedance cardiography; vector cardiography; characteristics of transducers and tissue interface; special requirements for the amplification of transducer signals.  
*Fall, 3 credits*

#### **ESE 572 Electronic Instrumentation and Operational Amplifier**

Design specification for electronic instruments; signal domains, bioelectric signals, modeling, measurement of pollution in air and in water, media-electrode interfaces, electrodes, sensors/transducers. Signal conditioning, instrument amplifiers, preamplifiers, operational amplifiers. Data processing, conversion, microprocessors, signal transmission; output systems, storage, display recording. Instrument packages for measurement monitoring, analyzing.  
*Spring, 3 credits*

#### **ESE 574 The Design of Artificial Organs**

The physiology, anatomy, and pathology of the heart, lungs, and kidneys is presented to enable the student to determine the technical constraint on the design of counterparts. The role of the engineer in the conceptual process is described and constraint imposed on the design by surgical, material, and other technical aspects is discussed.  
*Fall, 3 credits*

#### **ESE 580, 581 Microprocessor-Based Systems Engineering I and II**

This course is a study of methodologies and techniques for the engineering design of microprocessor-based systems. Emphasis is placed on the design of reliable industrial quality systems. Diagnostic features are included in these designs. Steps in the design cycle are considered. Specifically, requirement definitions, systematic design implementation, testing, debugging, documentation, and maintenance are covered. Laboratory demonstrations of design techniques are included in this course. The students also obtain laboratory experience in the use of microprocessors, the development of systems, circuit emulation, and the use of signature and logic analyzers.  
*Fall, spring, 4 credits, each semester*

#### **ESE 585 Applications of Artificial Intelligence to Signal Processing**

Principles of artificial intelligence with applications to signal processing and robotics; topics include stochastic pattern recognition, decision functions, mathematical programming, predicate calculus, and applications of expert systems. *Prerequisite:* ESE 503  
*3 credits*

#### **ESE 588 Pattern Recognition**

Basic concepts of pattern recognition techniques are introduced, including statistical pattern recognition, syntactic pattern recognition, and graph matching. Topics on Bayes decision theory, parametric and nonparametric techniques, clustering techniques, formal languages, parsing algorithms, and graph-matching algorithms are covered. *Prerequisite:* Stochastic processes and data structures  
*Spring, 3 credits*

#### **ESE 596 Internship in Bioengineering**

Student will work with physicians in hospital or other clinical facility, and will gain experience in clinical instrumentation diagnosis and in treatment of diseases. *Prerequisite:* Physiology background  
*Fall, spring, 3 credits, repetitive*

#### **ESE 597 Practicum in Engineering**

Discussion and case studies of practical problems in engineering designed specially for part-time graduate students, relating to their current professional activity. Registrants must have the prior approval of the graduate studies director. The grade will be assigned, and credit granted, upon submission of a written report or seminar presentation of the work performed.  
*Fall, spring, variable and repetitive credit*

#### **ESE 599 Research**

*Fall, spring, variable and repetitive credit, grading S, U*

#### **ESE 610 Seminar in Solid-State Electronics**

Current research in solid-state devices and circuits and computer-aided network design.  
*Fall, spring, 3 credits*

#### **ESE 630 Seminar in Communication Theory**

*Fall, spring, 3 credits*

#### **ESE 640 Seminar in Systems Theory**

Recent and current research work in systems theory.  
*Fall, spring, 3 credits*

#### **ESE 650 Advanced Topics in Digital Systems**

Topics of special interest in the area of digital systems.  
*Fall, spring, 3 credits*

#### **ESE 660 Seminar in Biomedical Systems Engineering**

This seminar will treat topics of current interest in bioengineering. Modeling and simulations of physiological systems, such as cardiovascular, respiratory, renal, and endocrine systems. Instrumentation systems including automatic chemical assaying, electric probes, ultrasonic tracer methods, and radiation techniques. Application of computers in biomedicine. *Prerequisites:* ESE 310, ESE 370 or equivalent  
*Fall, spring, 3 credits*

#### **ESE 670 Topics in Electrical Sciences**

Varying topics selected from current research topics. This course is designed to give the necessary flexibility to students and faculty to introduce new material into the curriculum before it has attracted sufficient interest to be made part of the regular course material. Topics include biomedical engineering, circuit theory, controls, electronics circuits, digital systems and electronics, switching theory and sequential machines, digital signal processing, digital communications, computer architecture, networks, systems theory, solid-state electronics, integrated electronics, quantum electronics and lasers, communication theory, wave propagation, integrated optics, optical communications and information processing, instrumentation, and VLSI computer design and processing.  
*Fall, spring, variable and repetitive credit*

#### **ESE 691 Seminar in Electrical Engineering**

This course is designed to expose students to the broadest possible range of the current activities in electrical engineering. Speakers from both on and off campus discuss topics of current interest in electrical engineering.  
*Fall, spring, 1 credit, repetitive, grading S, U*

#### **ESE 698 Practicum in Teaching**

*Fall, spring, variable and repetitive credit, grading S, U*

#### **ESE 699 Dissertation Research**

*Fall, spring, variable and repetitive credit, grading S, U*

# Materials Science and Engineering (ESM)

*Chairperson: Raymond F. Egerton*  
*Engineering Building 314 (516) 632-8484*

*Graduate Studies Director: Franklin F.Y. Wang*  
*Engineering Building 105 (516) 632-8482*

## **Degree Requirements** **Requirements for the** **M.S. Degree**

In addition to the minimum requirements of the Graduate School, the requirements for the M.S. degree in the Department of Materials Science and Engineering can be satisfied by either one of the two following options:

### **1. M.S. Non-Thesis Option**

- A. The election of this option must be made by the student when *applying* for admission to the department.
- B. A minimum of 30 graduate credits with a grade point average of 3.0 or better is required to graduate. Eighteen of these credits must be graduate course credits offered by the department, excluding ESM 599, 697, 698, and 699.
- C. No qualifying examination will be required of students in this degree option.
- D. Transfer to another degree option in the department can only be made after *completion* of this degree. A new admission application to the department is required for the petition to transfer.
- E. A student in this degree option is considered a terminating student.

### **2. M.S. Thesis Option**

- A. **Qualifying Examination**  
Students must satisfactorily pass a qualifying examination, which covers undergraduate work in materials science, chemistry, physics, and applied mathematics.
- B. **Course Requirements**
  1. The satisfactory completion of a minimum of 30 graduate credits, 6

of which must be for M.S. research and 15 of which must be for graduate courses accepted by the department as part of the graduate core program.

2. The average grade for all credits, excluding ESM 599, ESM 698, and ESM 699, must be B or better.

### **C. Thesis**

For the student who elects to complete a thesis for the M.S. degree, the thesis must be approved by three faculty members, at least two of whom are members of the Department of Materials Science and Engineering, including the research advisor.

### **D. Final Recommendation**

Upon the fulfillment of the above requirements the faculty of the graduate program will recommend to the vice provost for graduate studies, through the graduate studies committee, that the Master of Science degree be conferred or will stipulate further requirements that the student must fulfill.

### **E. Time Limit**

1. All requirements for the master's degree must be completed within three years of the student's first registration as a matriculated full-time graduate student.
2. For matriculated part-time students, the degree must be completed within five years.
3. In rare instances, the vice provost for graduate studies will entertain a petition bearing the endorsement of the chairperson of the department for an extension of this time limit. In such instances, the student may be required to repeat certain examinations or present evidence that he or she is still prepared for the thesis or the final examination.

## **Requirements for the** **Ph.D. Degree**

### **A. Qualifying Examination**

Students must satisfactorily pass the qualifying examination to enter into the Ph.D. program.

### **B. Plan of Work**

Before completion of one year of full-time residence, the student must have selected a research advisor who agrees to serve in that capacity. The student will then prepare a plan of further coursework. This must receive the approval of the student's advisor and of the graduate committee.

### **C. Preliminary Examination**

This is an oral examination designed to test the student's ability to utilize his or her materials science background to carry out research in a chosen field of study, and to make clear written and oral presentations of research. At least 10 days prior to the examination, the candidate should submit a research proposal (10-15 pages) to the examiners that places the research in context and outlines a scenario for its completion.

The examination committee will consist of four members: the research advisor, two faculty members of the Materials Science and Engineering Department, and one member from outside the MSE Department. Full-time students entering the program with a baccalaureate degree must take the preliminary examination before the end of their fifth semester. If a second examination is required, it must be completed by the tenth week of the sixth semester.

### **D. Advancement to Candidacy**

After the student has successfully completed all requirements for the degree, other than the dissertation, he or she is eligible to be recommended for advancement to

candidacy. This status is conferred by the vice provost for graduate studies upon recommendation of the chairperson and the graduate studies director.

### **E. Dissertation**

The most important requirement of the Ph.D. degree is the completion of a dissertation, which must be an original scholarly investigation. The dissertation shall represent a significant contribution to the scientific literature and its quality shall be compatible with the publication standards of appropriate and reputable scholarly journals.

### **F. Defense**

The candidate shall defend the dissertation before an examining committee consisting of four members, including the research advisor, two members of the Materials Science and Engineering Department, and one member from outside the department.

### **G. Residency**

Two consecutive semesters of full-time study are required.

### **H. Time Limit**

All requirements for the Ph.D. degree must be completed within seven years after completing 24 credit hours of graduate courses in the department, exclusive of research credit.

## **Industrial Cooperative Ph.D. Program**

A special Ph.D. degree program is offered by the Department of Materials Science and Engineering for interested part-time students. All who are interested can obtain the specifics of the program by addressing their inquiries to the department.

## **Courses**

### **ESM 503 Electron Diffraction**

A quantitative discussion of electron diffraction, as a means of micro-characterization of materials and as a basis for understanding image contrast in the transmission electron microscope. Topics covered include atomic, kinematical, and dynamical scattering; indexing diffraction patterns; convergent-beam diffraction.  
*Spring, 3 credits*

### **ESM 504 Production Processes**

A study of manufacturing processes used in the semiconductor industries. Topics include single crystal growth, compound formation, zone refining, epitaxial growth, doping techniques, thin film techniques, thick film techniques, passivations, isolations, lead bonding techniques, cleaning and etching, and failure analysis; discrete devices and integrated circuit devices; various modern concepts in IC processing.  
*Fall, 3 credits*

### **ESM 505 Diffraction Techniques and the Structure of Solids**

The structure of solids can be studied using X-ray, neutron, and electron diffraction techniques. Topics covered are coherent and incoherent scattering of radiation, structure of crystalline and amorphous solids, stereographic projection and crystal orientation determination, the concept of reciprocal vector space. Laboratory work in X-ray diffraction is also included.  
*Fall, 3 credits*

### **ESM 506 Mechanical Properties of Engineering Materials**

A unified approach for all solid materials will be used with regard to the correlation between microstructure and their macroscopic mechanical properties. The course deals with various testing techniques for delineating mechanical properties of materials, considering elasticity, anelasticity, plasticity, dislocation theory, cohesive strength, fracture, and surface wear. Attention is given to strengthening mechanisms for solids, metals, ceramics, and polymers.  
*Fall, 3 credits*

### **ESM 509 Thermodynamics of Solids**

Current knowledge regarding the thermodynamic properties of condensed phases is discussed. The thermodynamic treatment of ideal, regular, and real solutions is reviewed. Estimation of reaction-free energies and equilibria in condensed phase reactions such as diffusion, oxidation, and phase transformations; thermodynamic analysis of phase equilibrium diagrams.  
*Fall, 3 credits*

### **ESM 510 Kinetic Processes in Solids**

Atomistic rate processes in solids with emphasis on diffusion in crystals. Theory of diffusion and experimental techniques; role played by a broad class of crystalline imperfections. Topics include annealing of deformed materials, kinetics of defect interactions, thermally controlled deformation, kinetics of nucleation and growth, solidification, and precipitation.  
*Spring, 3 credits*

### **ESM 511 Solid-State Electronics**

A study of the electronic processes in solids leading to the analysis and design of materials and devices. Crystal structures, binding, electrical and thermal conductivities, diffusion, galvanomagnetic, thermomagnetic, and thermoelectric effects. Hall effect and magnetoresistance. Conductivity in thin films.  
*Fall, 3 credits*

### **ESM 512 Dielectric and Magnetic Properties of Materials**

The physical origin and manifestation of the dielectric and magnetic properties of materials are treated in relation to structure. Topics include the atomic origin of electric and magnetic susceptibilities, optical properties, piezoelectricity, ferroelectricity, ferromagnetics, and magnetic properties of alloys, ferrites, and garnets.  
*Spring, 3 credits*

### **ESM 515 Phase Transformations**

A review of the processes by which structures are changed in the solid state. Classical nucleation theory including homogeneous and heterogeneous mechanisms. Diffusion and diffusionless growth mechanisms. Transformation kinetics.  
*Spring, 3 credits*

### **ESM 538 Engineering Ceramics**

The characterization of ceramics is reviewed with special reference to advanced engineering ceramics, bulk high-temperature superconductors, and ceramic magnets. Typical microstructures and thermal, mechanical, and electrical properties are compared. These properties are related to the various methods of processing.  
*Spring, 3 credits*

### **ESM 599 Research**

*Variable and repetitive credit*

### **ESM 600 Seminar in Surface Science**

Discussions and reading on current problems in surface physics, chemistry, and crystallography.  
*Spring, 3 credits*

### **ESM 602 Seminar in Plasticity and Fracture**

Intended for advanced students, especially those doing research in the area. Topics: detailed description of defects and their relations to mechanical structure; dislocation theory; plasticity and yield criteria; creep and fatigue; microscopic theory of fracture including ductile and brittle behavior and the relationship of plastic flow to cleavage.

*Prerequisite:* ESM 506

*Fall, 3 credits*

### **ESM 604 Seminar in Ultrasonic Methods and Internal Friction in Solids**

Review of advanced measurement techniques in the field of ultrasonics coupled with quantitative descriptions of experimental variables related to the sample microstructure. Applications to optical, electrical, and mechanical properties will be discussed. Use of ultrasonics for nondestructive evaluation will be considered.

*Prerequisite:* ESM 506

*Spring, 3 credits*

### **ESM 605 Advanced Diffraction Techniques**

Advanced topics in diffraction theory including the dynamical theory in perfect and imperfect crystals and its applications in imaging methods. Other topics from the following list will be pursued if time is available: EXAFS/EXELFS/SEXAES; LEED/RHEED; small-angle scattering; Kossel line and electron channeling patterns; convergent beam diffraction; phonon scattering; glancing incidence X-ray diffraction; diffraction from defect structures; colored symmetry; holography.

*Prerequisites:* ESM 505 or permission of instructor  
*Fall, 3 credits*

### **ESM 606 Seminar in Optical Properties of Material**

A survey of modern optical materials and their characterization. The properties of both glasses and crystalline materials are related to physical origin. Electro-optic, elasto-optic, and magneto-optic properties and their interrelations are related to applications in technology including laser systems, displays, and spectroscopy.

*Fall, 3 credits*

### **ESM 607 Imperfections in Crystals**

The characteristics of point defects in metals, semiconductors, and ionic solids are described, and the thermodynamics of point defects is developed. Dislocation theory is introduced and the structures of internal boundaries are described. Finally, interactions between lattice imperfections are discussed, with emphasis on plasticity and fractures.

*Spring, 3 credits*

### **ESM 608 Seminar in Catalysis**

Introduction to homogeneous and heterogeneous catalysis. Geometric factors in catalysis. The kinetics of heterogeneous catalysis. Electronic factors in catalysis: metals, semiconductors, and surface species. Preparation and properties of metal surfaces. Porosity. Typical industrial processes, e.g., Fischer-Tropsch, ammonia synthesis, ammonia oxidation, etc.

*Fall, 3 credits*

### **ESM 610 Seminar in Reactions in Inorganic Solids**

Crystal growth and the nature of defects in inorganic solids. Crystallography and nucleation phenomena in selected inorganic single crystals. Theories of isothermal decomposition kinetics. Measurement of decomposition rates. Radiation effects and nature of radiation damage in inorganic solids. Photodecomposition and the underlying theories of photolysis.

*Fall, 3 credits*

**ESM 612 Seminar in Advanced Thermodynamics of Solids**

The fundamentals of the thermodynamics of irreversible processes are presented and the theory applied to thermal diffusion, thermoelectric transport, and other coupled processes in solids. Thermodynamics of multicomponent phase equilibria. Diffusion, oxidation, and other rate processes in ternary and higher-order systems.

*Prerequisite:* ESM 509

*Spring, 3 credits*

**ESM 613 Seminar in Materials and Environment**

Interactions between materials and their environments including corrosion, oxidation, absorption, and adsorption reactions. The influence of these reactions on the properties of materials, the design of materials resistant to these phenomena, alternative methods of protection, and the utilization of these reactions in promoting breakdown and deterioration of materials.

*Spring, 3 credits*

**ESM 614 Seminar in Diffusion in Solids**

Diffusion in solids is considered in detail, including solution of the transport equations for volume, grain boundary, and surface diffusion. Kirkendall effect and other diffusion phenomena, atomic mechanisms of diffusion, correlation effects, etc. Next, the theory of processes in which diffusion plays an important role is considered, such as ionic conduction, oxidation of metals, and the sintering of solids.

*Spring, 3 credits*

**ESM 615 Seminar in Phase Transformations**

The theory of phase transformations in solids is considered. Kinetics and mechanisms of nucleation and growth and martensitic transformations. Melting and solidification, precipitation from solid solution, polymorphic transformations, eutectic and eutectoid reactions, second-order transitions, recrystallization, and other transformations in solids.

*Fall, 3 credits*

**ESM 696 Special Problems in Materials Science**

Supervised reading and discussion of selected publications in particular fields of materials science. This course is designed primarily for advanced graduate students who are, or expect to be, involved in research in these areas, although other students may enroll with permission of the instructor.

*3 credits, repetitive*

**ESM 697 Materials Science Colloquium**

A weekly series of lectures and discussions by visitors, local faculty, and students presenting current research results.

*1 credit, repetitive*

**ESM 698 Practicum in Teaching**

*3 credits, repetitive*

**ESM 699 Research**

*Variable and repetitive credit*

# Mechanical Engineering (ESC)

**Chairperson: Edward E. O'Brien**  
Light Engineering Building 113

**Graduate Studies Director: James Tasi**  
Light Engineering Building 113

**Coordinator of Atmospheric Sciences Program: Sultan Hameed**  
Light Engineering Building 167

## Academic Advisor

Students are strongly encouraged to choose an advisor in their areas of specialization as soon as possible. This will benefit the student in course selection, research, and other areas of academic importance. Students receiving financial aid and students in the Ph.D. program must select an advisor before the start of their second semester.

## Academic Standing

An average in all coursework of B or higher is a minimum requirement for satisfactory status in the graduate program. In the doctoral program, a 3.5 grade point average is expected, exclusive of thesis credits ESC 599, ESC 698, and ESC 699.

## Degree Requirements Requirements for the M.S. Degree

A minimum of 30 credits, exclusive of ESC 698 Practicum in Teaching, is required for the M.S. degree.

### A. Course Requirements

1. *M.S. with thesis*: 21 approved graduate course credits with an accepted thesis registered as nine credits of ESC 599. No more than three credits of ESC 696 may be applied toward the approved graduate course credit requirements.
2. *M.S. without thesis*: 30 approved graduate credits. No credit for ESC 599 Master's Thesis is approved for fulfilling this requirement. No more than six credits of ESC 696 may be applied toward the approved graduate course credit requirements.

3. Physics 503 Methods of Mathematical Physics I is a *requirement* for every student enrolled in the graduate program. The graduate studies director may waive this requirement if the student has taken an equivalent course elsewhere.
4. Satisfactory participation in ESC 565 Departmental Research Seminar is *mandatory* for all first-year graduate students.
5. A minimum of 18 graduate credits (including ESC 599) must be taken in the Department of Mechanical Engineering. Except for Physics 503, all courses taken outside the department must have the *prior* approval of the student's advisor and the graduate studies director.

### B. Transfer Credits

A maximum of 12 graduate credits may be transferred from other departments toward the M.S. degree. These may include up to six credits from other institutions. All requests for transfer of credits require the approval of the graduate studies director.

### C. Thesis Requirements

A student choosing the thesis option must select a research advisor. Upon completion, the thesis must be defended in an oral examination before a departmental faculty committee of at least three members. A *student choosing the thesis option may not switch to the non-thesis option without permission of the graduate program committee.*

## Requirements for the Ph.D. Degree

### A. Course Requirements

Fifteen approved graduate credits beyond the M.S. degree requirement, excluding credit for ESC 699 and ESC 698. Physics 503 Mathematical Physics I is a requirement

that the graduate studies director may waive if the student has taken an equivalent course elsewhere. Enrollment in ESC 565 Departmental Research Seminar is mandatory for every first-year graduate student in the department. The student's advisor may impose additional course requirements.

### B. Transfer Credits

A student who has entered the Ph.D. program with an M.S. degree from another institution may transfer up to 12 credits; a student with a master's degree from Stony Brook may transfer up to six credits toward the Ph.D. degree. Credits used to obtain any prior degrees are not eligible for transfer. Requests for transfer of credits must be submitted to the graduate studies director.

### C. Major and Minor Requirements

The student must specialize in one of the four areas within the department:

1. Thermal Sciences and Fluid Mechanics
2. Solid Mechanics
3. Mechanical Design
4. Atmospheric Sciences

Students who specialize in area 2, 3, or 4 must select a minor from one of the following academic disciplines:

1. Fluid Mechanics
2. Heat Transfer
3. Combustion and Propulsion
4. Statistical Mechanics
5. Solid Mechanics
6. Atmospheric Sciences
7. Mechanical Design
8. Disciplines outside the department approved by the student's advisor and the graduate studies director.

Three 3-credit courses with a grade of at least B in each satisfies the minor requirement. Material from these courses will not appear on the qualifying examination.

The Thermal Sciences and Fluid Mechanics area is composed of three subdisciplines:

1. Fluid Mechanics
2. Heat Transfer
3. Thermodynamics

There is no minor requirement in this area. The written qualifying examination will test basic knowledge in all three subdisciplines.

#### D. Written Qualifying Examinations

Written examinations in each area of specialization are offered once every year in January. Students who enter the graduate program with a master's degree from another university must take the examination the first time it is offered following one academic year in residence. Students without a master's degree or students enrolled in the master's/doctoral program at Stony Brook must take the qualifying examination within 14 months after completing 30 graduate credits. Only under extraordinary conditions, and by a written petition to the graduate program committee, may this examination be deferred.

#### E. Preliminary Oral Examination

Within one year after passing the written qualifying examination or within one year after the student's master's thesis is accepted (whichever occurs later), the student is required to submit a dissertation proposal and register for three credits of ESC 699. Part-time Ph.D. students are required to appear in the preliminary oral exam within two years of passing the written qualifying exam. The examination committee consists of three department faculty members and one member from outside the department. Three of four members of the examination committee must approve the student's performance in order for the student to be admitted to candidacy for the Ph.D. degree. The examination committee may grant a provisional approval of the dissertation proposal, subject to the completion of additional work. Provisional approval shall not make the student eligible for advancement to candidacy.

#### F. Advancement to Candidacy

A student will be advanced to candidacy for the Ph.D. degree when all formal coursework has been completed and all the requirements listed under previous paragraphs have been satisfied. *These requirements must be completed within one calendar year after passing the written qualifying examination.*

#### G. Research and Dissertation

The dissertation will be examined by a committee of four members, three from the Department of Mechanical Engineering and one from outside the department. The

graduate studies director, in consultation with the dissertation advisor, selects the committee members.

The official recommendation for the appointment of the dissertation committee is made to the vice provost for graduate studies when the candidate's dissertation is near completion. Dissertation defenses are open to both the dissertation examining committee and the faculty. The final decision is rendered by a majority vote of the dissertation committee.

The dissertation is to be distributed to the committee members at least three weeks before the dissertation defense; one copy is to be kept in the departmental office for examination by the faculty.

## Courses

### ESC 501 Convective Heat Transfer and Heat Exchange

Examination of the heat transfer characteristics of external and internal flows (laminar and turbulent) with free and forced convection. Study of the operation and design of a variety of heat exchanger types including shell and tube, regenerator, finned plate, etc.

*Prerequisite:* Graduate student standing in the department  
*Spring, 3 credits*

### ESC 502 Conduction and Radiation Heat Transfer

Heat conduction and conservation law; intensity of radiation, black body radiation, and Kirchoff's law; analysis of heat conduction problems; analysis of radiative exchange between surfaces and radiative transport through absorbing, emitting, and scattering media.

*Prerequisite:* Graduate student standing in the department.  
*Fall, 3 credits*

### ESC 503 Computation of Fluid Flow and Heat Transfer

Introduction of a general purpose computation method for numerical solution of problems in heat transfer, fluid flow, and related processes.  
*Fall, alternate years, 3 credits (not offered in 1991/92)*

### ESC 511 Advanced Fluid Mechanics: Perfect Fluids

Lagrangian and Eulerian frames. Dynamical equations of momentum and energy transfer. Two-dimensional dynamics of incompressible and basotropic perfect fluids and of the compressible perfect gas. Conformal mapping applied to two-dimensional fluid dynamics. Jets and cavities. Surface waves, internal waves. Perfect shear flows.

*Fall, alternate years, 3 credits (not offered in 1990/91)*

### ESC 512 Advanced Fluid Mechanics: Viscous Fluids

The role of viscosity in the dynamics of fluid flow. The Navier-Stokes equations, low Reynolds number behavior including lubrication theory, percolation through porous media, and flow due to moving bodies. High Reynolds number behavior including steady, unsteady, and detached boundary layers, jets, free shear layers, and wakes. Phenomenological theories of turbulent shear flows are introduced.

*Spring, 3 credits*

### ESC 514 Advanced Fluid Mechanics: Introduction to Turbulence

Introductory concepts and statistical descriptions. Kinematics of random velocity fields. Equations of motion and their interpretation. Exper-

imental techniques: isotropic turbulence and the closure problem. Transport processes in a turbulent medium. Turbulent jets, wakes, and boundary layers.

*Fall, alternate years, 3 credits (not offered in 1991/92)*

### ESC 521 Thermodynamics

This course begins with a review of the fundamental concepts and laws of classical thermodynamics and with a short introduction to statistical thermodynamics. Then the thermodynamic theory of equilibrium states and phase transitions is treated, followed by the thermodynamic theory of processes and cycles of simple and composite systems, including heat engines. Special topics may include irreversible thermodynamics, kinetic theory, and other topics of current interest.  
*Fall, alternate years, 3 credits (not offered in 1991/92)*

### ESC 523 Atmospheric Molecular Processes

Review of electromagnetic theory of scattering and spectroscopy in a manner appropriate for studies of planetary atmospheric phenomena involving gaseous molecules. A major portion is devoted to quantitative spectroscopic aspects of absorption of infrared radiation by planetary atmospheric gases. Spectral line shapes and band models.

*Fall, alternate years, 3 credits (not offered in 1991/92)*

### ESC 525 Mechanical Systems Design

The formulation of design problems frequently encountered in mechanical systems as optimization problems. Theory and application of methods of mathematical programming for the solution of optimum design problems. Procedures for attacking a new design problem, formulation of design concepts into analyzable models, applications of interactive computer software, and related topics will also be emphasized.

*Prerequisite:* Permission of instructor  
*Fall, alternate years, 3 credits (not offered in 1991/92)*

### ESC 528 Introduction to Experimental Stress Analysis

Elementary theory of elasticity, electrical, and mechanical strain gauges; introduction to photoelasticity and moiré method. Brittle coating and analog methods. Application of different methods to the study of static and dynamic problems. Laboratory participation is an integral part of the course.

*Fall, 3 credits*

### ESC 536 Mechanics of Solids

A unified introduction to the fundamental principles, equations, and notation used in finite deformation of solids, with emphasis on the physical aspects of the subject. Cartesian tensor representation of stress, principal values, finite strain, and deformation. Conservation of mass, momentum, and energy. Formulation of stress-strain relations in elasticity, and compatibility relations. The use of general orthogonal coordinate systems in the equations governing solids. Principles of virtual displacement and virtual work.

*Fall, 3 credits*

### ESC 537 Experimental Fluid Mechanics I: Measurement Techniques

Fundamentals of measurements and instrumentation. Operating principles and performance characteristics of instruments for measurements of physical quantities such as velocity, pressure, and temperature. Introduction to hot-wire anemometry and laser-Doppler velocimetry along with current optical measuring techniques. Application of flow-visualization techniques to liquid and gas flows. Laboratory demonstrations.

*Spring, alternate years, 3 credits (not offered in 1991/92)*



**ESC 538 Experimental Fluid Mechanics II: Data Acquisition and Processing**

Fundamentals and application of analog and digital data collection techniques. Fast-rate data acquisition systems and storage. Introduction to analysis of random variables with special applications to turbulent flows. Numerous examples of modern signal processing techniques as applied to various areas of fluid mechanics.

*Spring, alternate years, 3 credits (not offered in 1990/91)*

**ESC 539 Finite Element Methods in Structural Analyses**

Theory of finite element methods and their application to structural analysis problems. Matrix operations, force and displacement methods. Derivation of matrices for bars, beams, shear panels, membranes, plates, and solids. Use of these elements to model actual structural problems. Weighted residual techniques and extension of the finite element method into other areas such as heat flow and fluid flow. Laboratory sessions introduce use of the computer in solving finite element problems. Programs for the solution of force and displacement method problems are configured. A computer project consisting of the solution and evaluation of a structural problem is required.

*Fall, 3 credits*

**ESC 541 Elasticity**

Formulation of boundary value problems. Compatibility equations and reciprocal theorem. Fundamental solutions for two- and three-dimensional domains. Potential function formulations. Use of integral transforms and complex variable approaches. Two-dimensional problems for anisotropic elasticity. Formulation and solution of problems in thermoelasticity.

*Prerequisite: ESC 536  
Spring, 3 credits*

**ESC 543 Plasticity**

Stress and deformation of solids: yield criteria and flow rules for plasticity deforming solids; the notion of a stable inelastic material; static and dynamic analysis of plastic bodies under mechanical and thermal loadings; use of load bounding theorems and the calculation of collapse loads of structures; the theory of the slip-line field.

*Corequisite: ESC 541  
Fall, alternate years, 3 credits (not offered in 1991/92)*

**ESC 544 Atmospheric Radiation**

Discussion of the compositions and radiative components of planetary atmospheres. Black-body and gaseous radiation with emphasis upon the respective roles of electromagnetic theory and quantum statistics. Derivation of the equation of transfer and radiative exchange integrals, with application to energy transfer processes within the atmospheres of Earth and other planets.

*Fall, alternate years, 3 credits (not offered in 1991/92)*

**ESC 545 Theoretical Meteorology I**

Quantitative introduction to atmospheric thermodynamics, cloud physics, and radiative transfer; topics include the structure, stability, and energy balance of the atmosphere, and the formation of clouds and precipitation.

*Fall, 3 credits*

**ESC 546 Theoretical Meteorology II**

Introduction to those elements of fluid dynamics and thermodynamics essential to understanding the large- and small-scale motions of the thermal atmosphere.

*Spring, 3 credits*

**ESC 547 Planetary Aeronomy**

This course will focus on the chemical and thermal structures of planetary atmospheres, especially upper atmospheres. We will discuss the ways that solar energy is absorbed and how it relates to the composition (both neutral and

ionic), temperatures, and airglow features. We will also look into the escape of species from the top of the atmosphere and atmospheric evolution.

*Prerequisite: Permission of instructor  
Spring, alternate years, 3 credits (not offered in 1991/92)*

**ESC 549 Composition of the Atmosphere**

A survey of current knowledge regarding the compositions of the troposphere and the stratosphere. Global distributions, sources, sinks, and chemical reactions of trace gases such as carbon dioxide, carbon monoxide, methane, hydrogen, nitrogen oxides, ozone, and chlorofluorocarbons will be discussed. Changes in atmospheric composition arising from natural and anthropogenic causes will also be covered.

*Prerequisite: Permission of instructor  
Spring, alternate years, 3 credits (not offered in 1991/92)*

**ESC 552 Analysis of Composite Solids**

The course is concerned with the analysis of layered composite materials subject to mechanical loads. Cartesian tensor calculus is used. Homogeneous anisotropic media are studied first. The effect of layering is then analyzed. Applications to plates and shell are studied and analytical methods of solution are given. Numerical analysis of composite solids is also considered using finite difference and finite element methods.

*Prerequisite: ESC 536  
Spring, alternate years, 3 credits (not offered in 1990/91)*

**ESC 554 Vibrations and Wave Propagation in Solids**

Lagrange's equations of motion for discrete systems. Solutions of problems with finite degrees of freedom, normal coordinates. Elastic wave propagation in infinite and bounded continuous media. Transient wave propagation using transform analysis. Asymptotic methods of integration.

*Prerequisite: ESC 536  
Spring, alternate years, 3 credits (not offered in 1991/92)*

**ESC 560 Advanced Control Systems**

Analytical methods applied to the design of multivariable linear control systems. Introduction to linear system theory: linearization, solution of linear matrix differential equations, stability, controllability, observability, transformations to canonical forms. Formulation of control objectives. Deterministic state observer. Full-state feedback control based on pole assignment and linear quadratic optimization theory. Linear systems with stochastic inputs and measurement noise. The response of linear systems to random input; stochastic state estimator (Kalman filter); separation principle of stochastic control and estimation; system robustness.

*Fall, alternate years, 3 credits (not offered in 1990/91)*

**ESC 565 Departmental Research Seminar**

Meetings at which first-year graduate students learn about the research activities of the departmental faculty.

*Prerequisite: First-year graduate student  
Fall, no credit*

**ESC 567 Kinematic Analysis and Synthesis of Mechanisms**

Introduction, mechanism structure, basic concepts of mechanisms, canonical representation of motion. Kinematic analysis, algebraic method, vector-loop method, complex number method, spherical and spatial polygon method, matrix method, dual-number quaternion method, screw coordinate method, line coordinate method, motor algebra method, type synthesis, number

synthesis, coupler curves, curvature theory path generation, finite displacement theory, rigid body guidance, function generation, computer-aided mechanisms analysis and synthesis.

*Prerequisite: Permission of instructor  
Fall, alternate years (not offered in 1991/92)*

**ESC 568 Advanced Dynamics**

Newtonian and Lagrangian mechanics of rigid bodies; kinematics, inertia tensor, principle of momentum, principle of virtual work, potential and kinetic energy, equations of motion, extraction of information from the equations of motion, and application to engineering problems.

*Fall, alternate years, 3 credits (not offered in 1990/91)*

**ESC 570 Introduction to Probabilistic Methods for Engineering**

Introduction to probability; probability space and random variables; functions of random variables; sequences of random variables; stochastic processes; correlation and power spectrum of stationary processes; harmonic analysis of stochastic processes; Markov chains and Markov processes. Applications to engineering problems.

*Spring, alternate years, 3 credits (not offered in 1990/91)*

**ESC 571 Analysis and Design of Robotic Manipulators**

Introduction to robot manipulators from the mechanical viewpoint, emphasizing fundamentals of various mechanisms and design considerations. Kinematics on 2-D and 3-D manipulators; statics and dynamics; motion planning; control fundamentals; algorithms development; computer-graphics simulation of manipulators; current applications.

*Prerequisite: Permission of instructor  
Spring, alternate years, 3 credits (not offered in 1991/92)*

**ESC 599 Research**

*Variable and repetitive credit*

**ESC 601 Nonlinear Mechanics**

Phase plane analysis of binary systems. Autonomous and nonautonomous systems. Stability theory. Liapunov functions and functionals. Bifurcation theory and critical phenomena. Limit cycles and oscillations. Generalized Volterra and van der Pol equations. Perturbation theory and asymptotic process of Krylov and Bogoliubov. Problems in chemical kinetics and dynamic systems.

*3 credits*

**ESC 623 Internal Combustion Engines**

Thermodynamic principles of power production. Internal combustion for propulsion applications. Piston-cylinder engines, fuel-air cycle analysis, air flow and volumetric efficiency, mixing and ignition, flames and knocking phenomena. Compound engines. Principles of turbomachinery. Combustors. Gas turbine engines. Regenerative gas turbine engines. Concept of gasifier. Novel gas turbine engines with turbo-charged gasifiers. Turbojet and ramjet for aircraft.

*3 credits*

**ESC 630, 631, 632, 633 Special Topics Courses**

The subject matter of each special topics course varies from semester to semester, depending on the interests of students and staff. Advanced topics and specialized topics will be discussed, particularly those of current interest.

ESC 630 Special Topics in Fluid Mechanics

ESC 631 Special Topics in Heat Transfer

ESC 632 Special Topics in Statistical Mechanics

ESC 633 Special Topics in Thermodynamics

*3 credits, repetitive*

**ESC 641 Fracture Mechanics**

The mechanics of brittle and ductile fracture in engineering materials are studied. Major subjects are linear elastic fracture, elastic-plastic fracture,

and fatigue crack analysis. Topics also include stress intensity factor, energy release rate, J-integral, HRR-field, stability of crack growth, dynamic fracture, creep fracture, interface and three-dimensional cracks, and other topics associated with current engineering applications.

*Prerequisite:* ESC 536

*Corequisite:* ESC 541

*Spring, alternate years, 3 credits (not offered in 1990/91)*

**ESC 671 Optical Methods for Experimental Stress Analysis**

Theory and applications of moiré methods (in-plane, shadow, reflection, projection, and refraction moiré techniques) for measuring static and dynamic deformation of 2-D and 3-D models, bending of plates and shells, and temperature distribution or refraction index change in fluids. Other topics: holographic interferometry, laser speckle interferometry, and current research activities of the field.

*Spring, 3 credits*

**ESC 681 Planetary Atmospheres**

A survey of current knowledge about the compositions, structures, and dynamics of the atmospheres of planets in our solar system. Models for upper and lower regions and probable evolutionary histories will be discussed. Emphasis will be placed on the most recent results obtained from spacecraft and ground-based observations. Student participation is encouraged. Crosslisted with AST 611.

*3 credits*

**ESC 694 Graduate Seminar in Atmospheric Sciences**

Discussion of special research topics centered on monographs, conference proceedings, or journal articles. Topics include climate change, atmospheric chemistry, radiation transfer, and planetary atmospheres. This course is intended primarily for students who have passed the written qualifying examination in atmospheric sciences, although other students may enroll with permission of faculty seminar leader.

*Prerequisite:* Department permission

*Fall, 1 credit, repetitive*

**ESC 696 Special Problems in Mechanics**

Conducted jointly by graduate students and one or more members of the faculty.

*1-6 credits, repetitive*

**ESC 698 Practicum in Teaching**

*0-3 credits, repetitive*

**ESC 699 Dissertation Research**

*Variable and repetitive credit*

# Technology and Society (EST)

**Chairperson: Thomas T. Liao**  
 Engineering Building E-210 (516) 632-8770

**Graduate Studies Director: Randolph H. Cope**  
 Engineering Building E-210 (516) 632-8770

## Degree Requirements

Refer to the chart below for course requirements specific to each of the three concentrations. In general, students are expected to complete two core courses for six credits, five required courses specific to the concentration for 15 credits, and three eligible electives for nine credits.

## Courses

### EMP 501 Behavioral and Organizational Aspects of Management

This course provides an understanding of the management process by analyzing organizational behavior. Topics include behavior in two-person situations, factors influencing attitudes and changes in organizational behavior, group influence on behavior, formal and informal organizational structures, conflict and conflict resolutions, and the dynamics of planned change.

*Fall, 3 credits*

### EMP 502 Management Accounting and Financial Decision Analysis

Fundamentals of managerial accounting with emphasis on cost accounting terms, concepts, ratio and break-even analysis, financial structure, cost analysis, opportunity costs and return calculations, replacement of assets, portfolio theory.

*Fall, 3 credits*

### EMP 503 Legal and Regulatory Aspects of Management

This course provides a survey of business and regulatory law. Topics include contracts, sales, and forms of business organizations. An overview is provided of antitrust, environmental, and civil rights legislation and their impact on business.

*3 credits*

### EMP 504 Quantitative Methods in Management

A rapid introduction to the application of modern mathematical concepts and techniques in management science. Algebraic operations, mathematical functions and their graphical representation, and model formulation are reviewed. Topics covered include the following: mathematics of interest, annuity, and mortgage; algebraic and graphic methods of linear programming; PERT, CPM, and other network models; and inventory theory. Simple management-oriented examples are used to introduce mathematical formulations and extensions to more general problems. The computer laboratory is used to give students experience with PC software packages that solve problems in all course topics. Interpretation of computer outputs is also stressed.

*Prerequisite: MAT 120 or equivalent*

*Fall, 3 credits*

### EMP 506 Production and Operations Management

This course deals with the design, planning, and organization of resources to develop and manufacture new products or to bring new services on line. The factors affecting product and process design, project planning, facility location and layout, operations scheduling, job analysis, inventory control, material requirements planning, and quality control will be identified and related through analytical and modeling techniques.

*3 credits*

### EMP 507 Research and Special Topics in Industrial Management

An individual study course for students investigating special topics relating to industrial management.

*Fall and spring, 1-3 credits*

## M.S. Program in Technological Systems Management

*(See course titles and descriptions below)*

### Core Courses

(6 credits)  
 EST 581  
 EST 582

### Note:

Entering students are presumed to have essential communications, computer, and mathematical skills. Otherwise prerequisite study in these areas will be required.

### Industrial Management Concentration

Required Courses  
 (15 credits chosen from the following)

EMP 501  
 EMP 502  
 EMP 504  
 EMP 506  
 EMP 509  
 EMP 517

### Educational Computing Concentration

Required Courses  
 (15 credits)

EST 565  
 EST 570  
 EST 571  
 EST 583  
 EST 590

### Environmental and Waste Management

Required Courses  
 (15 credits)

EST 593  
 EST 594  
 EST 595  
 EST 596 or EST 597  
 EST 599 or EST 590

### Suggested Electives (9 credits)

#### DTS Courses\*

EMP 503  
 EST 520  
 CEN 580  
 EST 587  
 EST 588  
 EST 589

### Suggested Electives (9 credits)

#### DTS Courses\*

EST 520  
 CEN 580  
 EST 585  
 EST 587  
 EST 588  
 EST 589  
 EST 591

### Suggested Electives (9 credits)

#### DTS Courses\*

EMP 501  
 EST 520  
 CEN 580  
 EST 583  
 EST 588  
 EST 591  
 EST 592

\*See other department listings for additional possible electives

**EMP 509 Management Information Systems**

The flow of data in industrial and governmental organizations. How information is stored, analyzed, and disseminated for various management tasks. The physical and logical organization of computer data processing systems. Principles of file processing, data base management, and information systems design.  
*Spring, 3 credits*

**EMP 517 Quality Management**

Quality is now being recognized as of strategic importance for manufacturing and service organizations. This course will provide an opportunity for the students to explore numerous aspects of the quality system approach to management, rather than statistical quality control techniques. Special attention will be given to tailoring the subject material to the actual situations existing in the students' organizations. Development of specific policies, objectives, and goals will take place, accompanied by the tools necessary to measure their accomplishment and impact.  
*Spring, 3 credits*

**EST 520 Computer Applications and Problem Solving**

A problem-solving course for managers that uses applications software to address such managerial problems as planning, forecasting, and MIS requirements. The major applications software packages used are Lotus 1-2-3 and DBASE III+. Students will learn to create spreadsheets and data files, making use of the features in the software that optimize solutions to business problems.  
*Fall and spring, 3 credits*

**EST 565 Personal Computers in Learning Environments**

This course will provide exposure to and experience with several of the personal microcomputers. These machines, with a cost range of \$800 to \$2,000, are appearing in schools and other learning environments. The course covers basic specifications and characteristics of several machines, an introduction to the commercial programs available for these machines, and how to use them in the classrooms. It is expected that at the end of the course the students will be able to develop a working program that could be used in a classroom.  
*Prerequisite: EST 583*  
*Spring, 3 credits*

**EST 570 Design of Computer Courseware**

The purpose of this course is to develop in the student the capability to develop computer courseware modules in the student's discipline. Existing courseware modules will be described to illustrate the structure requirements of such modules. After each exposure, each student will select topics for courseware development from his or her discipline and will concentrate on module development under the individual guidance of the instructor. Students will implement the programs in microcomputers in the Laboratory for Personal Computers in Education.  
*Prerequisite: EST 565 or permission of instructor*  
*Spring, 3 credits*

**EST 571 Computer-Based Educational Technologies**

This course emphasizes the design and evaluation of computer-based educational technology systems. The uses of personal computers, intelligent video disks, games, and other devices in education are examined. Students will learn state-of-the-art technology, contemporary uses, strategies for matching these technologies to the needs and characteristics of learners, ways of introducing these systems into learning environments, and the evaluation of their effectiveness.  
*Prerequisite: EST 565 or permission of instructor*  
*Spring, 3 credits*

**CEN 580 Socio-Technological Problems**

A series of case studies of current socio-technological problems encompassing such areas as health service delivery, water supply, population, emergency medical care, auto safety, noise pollution, and the energy crisis. The problem in each case is studied historically and alternatives are developed in the areas of education, legislation, and technology with consideration of the corresponding technological, economic, and social consequences.  
*Fall and spring, 3 credits*

**EST 581 Methods of Socio-Technological Decision Making**

Application of decision-making techniques to analyze problems involving technology, particularly its social impacts. Areas of study include decision making under uncertainty, decision making in a passive vs. active environment, sequential decisions, estimating payoffs, forecasting, and technology assessment. These systems-analysis techniques are used to formulate and solve a variety of socio-technological problems.  
*Fall, 3 credits*

**EST 582 Systems Approach to Human-Machine Systems**

Applications of systems concepts (input-output, feedback, stability, information analysis) to the analysis of dynamic systems involving technology and society. Areas of study include automatic compensation of systems through use of feedback; stability and instability of urban systems, transportation, epidemics, and economics; and machines and systems for human use, including communication and prosthetics.  
*Spring, 3 credits*

**EST 583 Computer Literacy**

Students will develop a basic understanding of digital computers—how they work and their applications. Emphasis will be placed on applications and the social implications of the use of computers in education, business, artificial intelligence and robotics, medicine, and government. Actual experience with the computer will include introduction to programming, algorithmic problem formulation, and running existing programs.  
*3 credits*

**EST 585 Technology in Learning Systems**

This course is designed to provide educators with an overview of the ways in which technology is used to improve instruction. Specific areas of study include a systems approach to the design of learning environments and the use of technology in the conventional classroom and for individualizing student learning. Future educational uses of technology as well as present applications will be discussed.  
*3 credits*

**EST 587 Today's Technology, Impact on Education and Economics**

This course will involve the student in studies of the science, technology, and economics of four selected areas: electronics, transportation, energy, and health sciences. Classroom time will be supplemented by visits to appropriate facilities in each area; individuals and groups will also plan for the use of the information in their specific areas of responsibility. For example, teachers will be responsible for developing teaching strategies for use of the information in their classes and for student career advice and preparation. Those from commerce and industry will want to learn of the powerful influence of technological development on regional economics. This knowledge should prove helpful in carrying out strategic planning and forecasting within the student's organization.  
*3 credits*

**EST 588 Technical Communication for Management and Engineering**

The ability to communicate technical ideas clearly and effectively is critical to success in management and engineering. Hours and money are wasted when confused, distorted writing and speaking obscure the information they are intended to convey. This course will provide managers, engineers, and other technical professionals with practical methods for making their memos, reports, and correspondence clear, comprehensible, and persuasive. They will learn strategies for communicating with both nonspecialist and technical audiences, stating their purpose clearly, organizing points most effectively, and expressing ideas concisely and precisely. Special attention will be given to technical presentations and to communicating in meetings.  
*3 credits*

**EST 589 Technology-Enhanced Decision Making**

This course will examine the use of technological devices, especially computers, as aids in decision making. A treatment will be given of the cognitive science and artificial intelligence methods used in the structure and operation of some systems that support human decision making. Medical diagnosis systems, business and industrial planning systems, and computer-aided dispatch systems will be discussed. In addition, the application of high technology in air traffic control systems will be examined.  
*Prerequisite: EST 581*  
*Corequisite: EST 582 or permission of instructor*  
*3 credits*

**EST 590 Seminar for MS/TSM Students**

A forum for the discussion of research methods, project ideas, and preparation of a proposal. A final product of this seminar is an approved master's project proposal. Each student also leads a discussion about an important technology-society problem or issue such as safety of nuclear power plants, impact of video games, and the MX controversy. Each student will work with a faculty advisor on background research and preparation of the master's project proposal.  
*Fall, 3 credits*

**EST 591 Independent Study in Technology and Society**

The primary objective of independent study is to provide a student with opportunities to interact with faculty members who can be of assistance in his or her master's project. Students should consult individually with faculty members on workload and credit(s).  
*Prerequisite: EST 590 or permission of instructor*  
*Fall and spring, 1-3 credits*

**EST 592 Energy-Environmental Technology Assessment**

Case studies of technologies for energy production and use, emphasizing their "cradle to grave" impacts on the environment and on waste generation. Typical topics: nuclear power and radioactive waste; electricity generation from fossil fuels; solar energy and energy conservation technologies; energy-environmental aspects of transportation technologies; energy balance analysis; energy and Long Island.  
*3 credits*

**EST 593 Risk Assessment and Hazard Management**

A case-study approach to the assessment of risk and the management of natural and technological hazards, with emphasis on those that can harm the environment. The course focuses on technological hazards involving energy, transportation, agriculture, natural resources, chemical technology, nuclear technology, and biotechnology, and on natural hazards such as climatic changes, droughts, floods, and earthquakes. The first part of the course consists of

readings on risk assessment and hazard management and discussions of published case studies. During the second part of the course, students conduct their own case studies and use them as the basis for oral and written reports.

*Prerequisite:* EST 581

*Spring, 3 credits*

**EST 594 Institutional, Ethical, and Methodological Issues in Environmental Management and Policy**

Diagnosis of disagreements about environmental and waste problems. Institutional factors include the interests of industry, environmental, and governmental stakeholders; the legal-regulatory context; negotiation and public participation. Ethical factors include fairness in siting NIMBY facilities, environmental risk ethics, and end-use analysis. Methodological factors include evaluating (a) competing scientific theories and environmental models, (b) analytical methodologies (e.g., for estimating probabilities and unknowns, and for ranking facility sites or technology options), and (c) claims as to true overall impacts on risk, cost, energy use, and environmental quality of policy alternatives. Crosslisted with CEY 594.

*Prerequisite:* Permission of instructor

*Pre- or corequisite:* EST 581

*Fall, 3 credits*

**EST 595 Principles of Environmental Systems Analysis**

This course is intended for students interested in learning systems engineering principles relevant to solving environmental and waste management problems. Concepts include compartmental models, state spaces, optimization, risk assessment, and numerical and analytical solutions to differential equations.

*Fall, 3 credits*

**EST 596 Simulation Models for Environmental and Waste Management**

This course is intended for students interested in developing computer models for technology assessment and for environmental and waste management. Concepts developed in EST 595 Environmental Systems Engineering and Analysis will be applied to real-world problems. Techniques in model development will be presented in the context of applications in surface and groundwater management, acid rain, and health risks from environmental contamination. Crosslisted with CEY 596.

*Prerequisite:* EST 595 or permission of the instructor

*Spring, 3 credits*

**EST 597 Waste Management: Systems and Principles**

Technologies and policy options in waste management, emphasizing recycling, incineration, landfilling, and source reduction options for municipal solid waste on Long Island. Problems concerning paper, glass, plastic, organic materials, and other waste stream components. Environmental impacts and economics of landfills, materials recovery impacts and economics of landfills, materials recovery facilities, and waste-to-energy systems. The institutional and regulatory climate. Current and planned practices in the region. Hazardous wastes. Crosslisted with CEY 597.

*3 credits*

**EST 598 Teaching Practicum**

Designed to give graduate students teaching experience.

*3 credits*

*(Note: These credits cannot be counted as part of the 30 credits required for the degree)*

**EST 599 Special Projects and Topics**

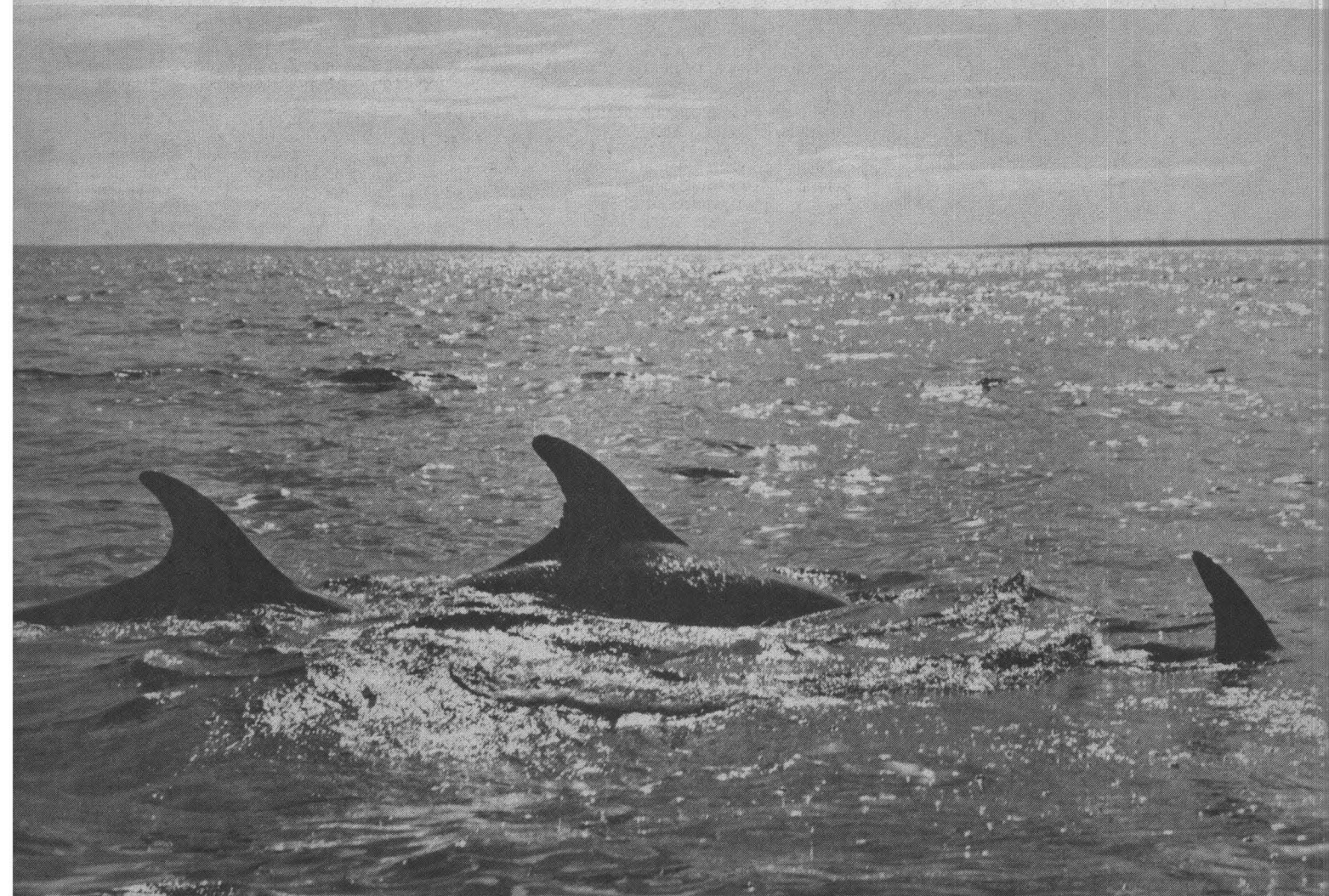
A technology assessment laboratory for emerging problems and focused research. May be run as a hands-on, group research study of an important environmental or waste problem affecting Long Island (perhaps to provide an assessment to a regulatory agency).

*Spring, 3 credits*

# Marine Sciences Research Center

*Dean: J.R. Schubel  
Endeavour Hall 145 (516) 632-8700*

*Graduate Studies Director: Henry J. Bokuniewicz  
Endeavour Hall 211 (516) 632-8681*



## Degree Requirements

### Requirements for the M.S. Degree in Marine Environmental Sciences

In addition to the minimum Graduate School requirements, the following are required:

A. Core courses (biological, chemical, geological, and physical oceanography) with at least a B average, or demonstration of proficiency to the satisfaction of the instructor. Any student who receives two Cs that have not been offset by two As will not be allowed to register for the following semester and may be asked to leave the program.

B. MAR 547 Oceanographic Problem Solving. All students must pass one semester of MAR 547. A maximum of two credits of MAR 547 can be counted toward the Graduate School's 30-credit requirement for the M.S. degree.

C. Seminar MAR 580 (two semesters).

D. An advisor by the end of the first year.

E. Master's research proposal due by end of first year, signed by advisor and two readers.

F. A minimum of six credits in specialty courses (excluding MAR 501, 502, 503, 506, 547, 555, and 580) selected by the student and his or her advisor and approved by the advisor.

G. Sea experience or appropriate field experience.

H. Oral presentation of thesis work.

I. Submission of approved thesis.

### Requirements for Ph.D. Degree in Coastal Oceanography

In addition to the minimum Graduate School requirements, the following are required:

A. Demonstrated proficiency in one approved foreign language.

B. Departmental examination.

C. Ph.D. degree dissertation proposal approved by three MSRC faculty.

D. Sea experience or appropriate field experience.

E. Seminar MAR 580 (two semesters).

F. An advisor by the end of the first year.

G. Practicum in teaching.

H. Oral qualifying examination.

I. Formal advancement to candidacy.

J. Oral defense of dissertation.

K. Submission of approved dissertation.

L. Residency. Normally at least two consecutive semesters of full-time study.

## Courses

### MARINE ENVIRONMENTAL SCIENCES COURSES

#### MAR 501 Physical Oceanography

Examines physics of ocean circulation and mixing on various scales with strong emphasis on profound effects of earth's rotation on motions and distribution of properties. An introduction to

physics of estuaries and other coastal water bodies.

*Corequisite:* MAR 555 or permission of instructor  
*Fall, 4 credits*

#### MAR 502 Biological Oceanography

A broad treatment of energy and nutrient cycling in coastal and open ocean environments. Introduction to organisms and habitats. Includes a student lab project to develop research skills.  
*Prerequisite:* Enrollment in Marine Environmental Sciences program or permission of instructor  
*Fall, 4 credits*

#### MAR 503 Chemical Oceanography

Introduction to chemical oceanography. Topics include origin and history of seawater, major and minor constituents, dissolved gases, the carbon dioxide system, distribution of properties in the world ocean, isotope geochemistry, and estuarine and hydrothermal vent geochemistry.  
*Prerequisite:* Enrollment in the Marine Environmental Sciences program or permission of instructor  
*Spring, 4 credits*

#### MAR 506 Geological Oceanography

An introduction to the geological oceanography of the world ocean with emphasis on the coastal environment; discussions of the physical processes controlling the structure and evolution of the ocean basins and continental margins, the distribution of marine sediment, and the development of coastal features.

*Prerequisite:* Enrollment in Marine Environmental Sciences program or permission of instructor  
*Spring, 4 credits*

#### MAR 510 Modeling Techniques in Chemical Oceanography

Derivation of solutions to advection-diffusion-reaction equations for marine sediments and waters. One- and multi-dimensional models are developed for dissolved and solid-phase substances in cartesian, cylindrical, and spherical coordinates. Effect of imposing multiple layers on these systems will be examined.

*Prerequisite:* Permission of instructor  
*Spring, 3 credits*

#### MAR 512 Marine Pollution

Review of the physical and chemical characteristics and speciation in the marine environment of organic pollutants, metals and radionuclides including bioavailability, assimilation by marine organisms, toxicity, and policy issues. Crosslisted with CEY 512.

*Prerequisites:* MAR 502, MAR 503  
*Fall, 3 credits*

#### MAR 519 Geochemistry Seminar

This course will explore topics in low-temperature geochemistry as chosen by the instructors and participants. The seminar series will be organized around a theme such as early diagenesis, estuarine geochemistry, or aquatic chemistry. Students will be required to lead one of the seminars and to participate in discussions.

*Prerequisite:* MAR 503 or permission of instructor  
*Fall, 2 credits*

#### MAR 520 New Production and Geochemical Cycles

Consideration of oceanic new production for a variety of ecosystems. Quantitative examination of the impact of new production on the transport and cycling of major and minor elements and pollutants.

*Pre- or corequisites:* MAR 502, 503  
*Spring, 2 credits*

#### MAR 522 Environmental Toxicology

The ecological and human health effects of toxic chemicals, especially chlorinated hydrocarbons, will be examined. Toxicological principles, carcinogenesis, and economic and political considerations are included.

*Spring, 3 credits*

#### MAR 523 Marine Botany

Introduction to seaweeds and seagrasses. Reproductive biology and taxonomy are discussed in terms of ecology, physiology, and distribution of seaweeds in temperate and tropical waters. Several trips to rocky shore communities and a regional conference on algae are a required part of the course.

*Prerequisite:* General botany/ecology, enrollment in Marine Environmental Sciences program, or permission of instructor  
*Spring, 3 credits*

#### MAR 526 Turbulence in Oceans and Coastal Waters

Basic properties and scales, similarity theory, spectra, boundary layers, stratified turbulence, double-diffusing convection measurements in ocean and atmosphere turbulence, internal waves and large-scale flows, parameterization of turbulent mixing.

*Spring, alternate years, 3 credits*

#### MAR 527 Global Change

The course examines the scientific basis behind questions of global change and some of the policy implications of changes to the region and country. Topics include evidence and courses of past climatic changes, greenhouse gases and the greenhouse effect, analogues with other planets, the Gaia hypothesis, climate modeling, and deforestation and the depletion of ozone.

*Prerequisite:* Permission of instructor

*Fall, 2 credits*

#### MAR 530 Organic Geochemistry

Introduction to the organic chemistry of the earth, oceans, and atmosphere. Topics include production transformation and fate of organic matter; use of organic biomarkers and stable and radioisotopes; diagenesis in recent sediments; oil and coal production and composition; dissolved and particulate organic matter in seawater.

*Prerequisite:* Permission of instructor  
*Fall, 3 credits*

#### MAR 531 Regional Planning Applied to Marine Sciences

This course will introduce the theories, techniques, and literature of regional planning with special emphasis on planning as a decision-making tool related to the marine environment.

*Fall, alternate years, 3 credits*

#### MAR 534 Aquaculture

Biological, economic, practical, social, and legal aspects of culturing marine and freshwater organisms, including plants, molluscs, crustaceans, and finfish. Basic principles of aquaculture and successes and failures with selected species. Field trips and the preparation and evaluation of aquaculture proposals.

*Spring, 4 credits*

#### MAR 536 Environmental Law and Regulation

This course covers environmental law and regulations from inception in common law through statutory law and regulations. The initial approach entails the review of important case law giving rise to today's body of environmental regulations. Emphasis is on environmental statutes and regulations dealing with waterfront and coastal development and solid waste as well as New York State's Environmental Quality Review Act (SEQRA) and the National Environmental Policy Act (NEPA).

*Spring, 3 credits*

#### MAR 537 Primary Productivity in the Sea

Review of classic and current research on primary production by marine microalgae and macroalgae. Topics will include photosynthesis and growth, nutrients, temporal and spatial variability, competition, and predation. Students will carry out original research projects.

*Fall, 3 credits*

**MAR 540 Marine Microbial Ecology**

An historical perspective of the field, aspects of nutrition and growth, microbial metabolism and trophodynamic relationships with other organisms. Emphasis on roles of microorganisms in marine environments such as salt marshes, estuaries, coastal pelagic ecosystems, and the deep sea, as well as microbial contribution to geochemical cycles. Contemporary and classical methodologies covered.

*Prerequisite:* MAR 502 or permission of instructor.

*Spring, alternate years, 3 credits*

**MAR 545 Continental Margin Sedimentation**

Examination of the sedimentary processes active across continental margins including coastal environments, shelf, slope, and rise.

*Prerequisite:* Permission of instructor

*Fall, 3 credits*

**MAR 546 Marine Sedimentology**

Study of sedimentology in the marine environment including an introduction to fluid mechanics, sediment transport theory, quantitative models of sedimentation, and dynamic stratigraphy.

*Prerequisite:* Permission of instructor

*Fall, 3 credits*

**MAR 547 Oceanographic Problem Solving**

Course gives students experience in integrating information from different disciplines to address important oceanographic problems. Sessions will be structured around problems of current interest to marine scientists and will involve active student participation in small working groups as well as short written essays to be critiqued by faculty.

*Prerequisites:* MAR 501, MAR 502

*Fall, 2 credits*

**MAR 548 Marine Geophysics**

Fundamentals of geophysics applied to the study of the oceans, ocean basins, and coastal zone dynamics including heat flow, seismology, gravity, magnetics, fluid mechanics, and flow in porous media.

*Prerequisite:* Permission of instructor

*Spring, 3 credits*

**MAR 550 Topics in Marine Sciences**

This is used to present special interest courses, including intensive short courses by visiting and adjunct faculty and courses requested by students. Those given in recent years include Nature of Marine Ecosystems, Science and Technology in Public Institutions, Plutonium in the Marine Environment, and Problems in Estuarine Sedimentation.

*Fall and spring, variable and repetitive credit*

**MAR 552 Directed Study**

Individual studies under the guidance of a faculty member. Subject matter varies according to the needs of the students.

*Prerequisite:* Permission of instructor

*Fall, spring, and summer, variable and repetitive credit*

**MAR 553 Fishery Management**

Survey of the basic principles of and techniques for studying the population dynamics of marine fish and shellfish. Discussion of the theoretical basis for management of exploited fishes and shellfish, contrasting management in theory and in practice using local, national, and international examples. Includes lab exercises in the use of computer-based models for fish stock assessment.

*Prerequisite:* Calculus I or permission of instructor

*Fall, 3 credits*

**MAR 555 Introduction to Mathematics for Marine Scientists**

Course is designed to assist non-math/physics majors who take required core courses as well as advanced courses in our program. Topics covered are differential equations, differential and integral calculus, (minimum) partial differential equations. Discussions include formulation of

practical problems, i.e., application of differential equations.

*Prerequisite:* Calculus I or permission of instructor

*Fall, 3 credits*

**MAR 556 Biology of Fishes**

Lectures and laboratories on comparative evolution, morphology, physiology, and ecology of fishes with emphasis on marine and estuarine forms.

*Prerequisite:* Permission of instructor

*Fall, 3 credits*

**MAR 558 Remote Sensing**

Theory and application of remote sensing and digital image analysis to marine research. Students will use standard software and PCs for digital filtering, enhancement, and classification of imagery.

*Prerequisite:* MAR 501, 502, 504, 506 or permission of instructor

*Spring, 2 credits*

**MAR 560 Ecology of Fishes**

Introduction to current research in the ecology of fishes. Topics such as population regulation, migration, reproductive strategies, predator-prey interactions, feeding behavior, competition, life history strategies, and others will be discussed.

*Prerequisite:* Familiarity with concepts of ecology or biological oceanography

*Spring, 3 credits*

**MAR 562 Early Diagenesis of Marine Sediments**

The course treats qualitative and quantitative aspects of the early diagenesis of sediments. Topics include diffusion and adsorption of dissolved species; organic matter decomposition and storage; and diagenesis of clay materials, sulfur compounds, and calcium carbonates. The effects of bioturbation on sediment diagenesis are also discussed. Crosslisted with GEO 562.

*Prerequisite:* Permission of instructor

*Fall, alternate years, 3 credits*

**MAR 565 Seminar Preparation**

Workshop in organizing, illustrating, and delivering an oral presentation. Students will practice giving short talks on their research and learn to compose their own slides. Students enrolling should have their research under way.

*Prerequisites:* MAR 501, 502, 503, 506, and 580

*Spring, 3 credits*

**MAR 567 Information for Environmental Management**

The information needs of environmental managers are explored. To meet these needs, data must be transformed into information. The student will learn the use of microcomputers to organize and analyze information and to provide suitable output for environmental management.

*Prerequisite:* Graduate student status or permission of instructor

*Fall, 3 credits*

**MAR 571 Zooplankton Ecology**

The course is designed to acquaint the student with the theoretical problems and applied methodology in ecological studies of marine and freshwater zooplankton. Topics will include taxonomy, anatomy, physiology, life history strategies, population dynamics, and food chain interaction.

*Prerequisites:* MAR 502 and permission of instructor

*Spring, alternate years, 2 credits*

**MAR 573 Special Topics—Chemical Oceanography**

This course is designed for the discussion of topics of special interest on demand that are not covered in regularly scheduled courses. Examples of possible topics include carbonate chemistry, isotope chemistry, and microbial chemistry.

*Prerequisite:* Permission of instructor

*Fall and spring, 1-4 credits*

**MAR 574 Special Topics—Physical Oceanography**

The course is designed for the discussion of topics of special interest on demand that are not covered in regularly scheduled courses. Examples of possible topics include atmosphere-ocean interaction and diffusion or dispersion in the ocean.

*Prerequisite:* Permission of instructor

*Fall, 1-4 credits*

**MAR 575 Special Topics—Geological Oceanography**

The course is designed for the discussion of topics of special interest on demand that are not covered in regularly scheduled courses. Examples of possible topics include coastal processes, fluvial processes, physics of sediment transport, and groundwater flow.

*Prerequisite:* Permission of instructor

*Fall and spring, 1-4 credits*

**MAR 576 Special Topics—Biological Oceanography**

The course is designed for the discussion of topics of special interest on demand that are not covered in regularly scheduled courses. Examples of possible topics include grazing in benthic environment, coastal upwelling, the nature of marine ecosystems, and marine pollution processes.

*Prerequisite:* Permission of instructor

*Fall, 1-4 credits*

**MAR 577 Special Topics—Coastal Zone Management**

The course is designed for the discussion of topics of special interest on demand that are not covered in regularly scheduled courses. Examples of possible topics include microcomputer information systems, environmental law, coastal pollution, dredge spoil disposal, science and technology in public institutions, and coastal marine policy.

*Prerequisite:* Permission of instructor

*1-4 credits*

**MAR 580 Seminar**

A weekly series of research seminars presented by visiting scientists and members of the staff.

*Fall and spring, no credit*

**MAR 585 Coastal Geology Seminar**

An assessment of recent developments in coastal geology. Discussion of advances in the application of sedimentology, stratigraphy, and geomorphology to the study of coastal environments. Modern-ancient analogues will be emphasized where appropriate.

*Prerequisites:* Stratigraphy and sedimentary marine geology

*Fall, 2 credits*

**MAR 590 Research**

Original investigation undertaken with the supervision of the advisor.

*Prerequisite:* Permission of instructor

*Fall and spring, variable and repetitive credit*

**COASTAL OCEANOGRAPHY COURSES****OCN 610 Waves**

Theory and observations of surface waves, internal waves, and planetary waves; wave-wave, wave-current, and wave-turbulence interactions; surface wave prediction; beach processes.

*Spring, alternate years, 3 credits*

**OCN 612 Dynamical Oceanography I**

The first course in a two-course series on basic methods and results in dynamical oceanography. This course will emphasize unstratified fluids. Topics covered will include but are not limited to basic conservation equations, effects of rotation, geostrophy, potential vorticity conservation, Ekman layers, and Ekman pumping.

*Prerequisite:* MAR 501 or permission of instructor

*Spring, 3 credits*



**OCN 615 Dynamical Oceanography II**

Continuation of Dynamics I. Course will cover some of the basic effects of stratification. Topics will include potential vorticity for baroclinic motion and baroclinic instability.

*Prerequisite:* Dynamical Oceanography I

*Fall, 3 credits*

**OCN 650 Dissertation Research**

Original investigation undertaken with the supervision of research committee.

*Fall and spring, variable and repetitive credit*

**OCN 655 Directed Study**

Individual studies under the guidance of a faculty member. Subject matter varies according to the needs of the student.

*Prerequisite:* Permission of instructor

*Fall, spring, and summer, variable and repetitive, 1-9 credits*

**OCN 670 Practicum in Teaching**

*Fall and spring, 1-3 credits, repetitive*

**OCN 677 Benthic Ecology**

Ecological interactions of benthic organisms with their habitat. There will be discussion of the nature of competition, predation, and disturbance, and of life history and feeding strategies. Most of the course will cover investigation of invertebrate fauna of coastal marine sediments, but there will be discussions of intertidal, abyssal, and lacustrine habitats.

*Prerequisite:* MAR 502, MAR 506, or permission of instructor

*Fall, alternate years, 2 credits*

# W. Averell Harriman School for Management and Policy

*Dean: Gerrit Wolf*

*Harriman Hall 305 (516) 632-7175*

*Graduate Studies Director: Thomas Sexton*

*Harriman Hall 309 (516) 632-7181*

*Director of Labor/Management Studies Program: Manuel London*

*Harriman Hall 306 (516) 632-7159*



## Degree Requirements

The curriculum consists of three major components, or concentrations: Business Management, Government Management, and Nonprofit Management. The Harriman School's Master of Science degree in Management and Policy may be obtained by satisfying the requirements of any of the above concentrations.

Each concentration may be pursued in three distinct ways: through the Two-Year Program, the Advanced Credit Program, or the Accelerated Program. The specific course requirements for each of the three programs within each of the three concentrations are outlined in the Harriman viewbook. The major distinctions among the programs are:

### Two-Year Program

The usual method for students with an undergraduate degree.

### Advanced Credit Program

A one-year program for students who already have an advanced degree (master's or Ph.D.).

### Accelerated Program

For undergraduates; study begins in the senior year with the Harriman master of science degree awarded after one additional graduate year.

All Harriman students must perform a paid eight- to 12-week summer internship and write a faculty-approved internship report. The Harriman School provides assistance with both internship and career placements.

The elective specialization in Decision Sciences may be pursued only in the Two-Year Program. It is designed for students with a strong background in quantitative analysis. See the Harriman viewbook for details.

Requirements for the Advanced Certificate Programs in Labor/Management Studies and in Health Care Management are also given in the Harriman viewbook.

## Courses

### FIRST YEAR

The first-year curriculum is required of all students and is designed to provide a commonly shared analytic base upon which the students build a specialization in the second year. However, in instances where the student can demonstrate prior mastery of a particular area in the first-year curriculum, exemption is permitted and an advanced course is substituted.

#### PAM 512 Comparative Management

Historical, legal, political, and cultural perspectives on the roles and interrelationships of government, nonprofit organizations, and business. *Spring, 3 credits*

#### PAM 515 Data Analysis

The uses and limitations of mathematical techniques, especially in the use of data in advocating alternative policies. Probability, estimation, hypothesis testing, analysis of variance, and regression analysis are among the topics covered. *Fall, 4 credits*

#### PAM 517 Management Information Systems

This course focuses on the design of information systems to aid in managerial decision making. *Spring, 3 credits*

#### PAM 532 Business Finance

Analysis of financial markets and the tools for operating in these markets. *Spring, 3 credits*

#### PAM 533 Microeconomics

The techniques and approaches of microeconomic reasoning are applied to issues of policy. The theory of the market and the price system are closely examined for the purpose of identifying those areas where neoclassical economics is helpful to the analyst and manager. Special attention is paid to cost-benefit analysis and models of economic behavior. *Fall, 4 credits*

#### PAM 534 Public Finance

Normative and positive economic analysis of the public sector. Description and evaluation of the existing system of government taxes, expenditures, and transfers. Applied welfare economic analysis of types of market failure including public goods and externalities. Analysis of distortions to economic behavior caused by the imposition of taxes or subsidies. Equity and efficiency and optimal taxation. *Spring, 3 credits*

#### PAM 535 Financial Accounting

Topics include cover budgeting and accounting techniques. Building on basic practices in the private sector, the course develops practices unique to public and nonprofit sectors, e.g., government agencies. Special topics include cash flow management and debt financing and management. *Fall, 3 credits*

#### PAM 536 Financial Management

This course examines the financial and economic bases of a series of urban problems including transportation, employment, health, housing, and fiscal management. Macro- and microeconomic theory will provide the framework for analysis. *Fall, 3 credits*

#### PAM 541 Group Project

Under faculty supervision groups of students work for clients on policy issues in a variety of areas such as development, energy, housing, and health. The course is intended to provide students with an opportunity to apply the analytic skills they have learned in the classroom to real problems. Other purposes are to give them practice in writing, speaking, and working cooperatively in small groups, all of which are important skills for the policy analyst. *Spring, 3 credits*

#### PAM 543 Modeling

The course develops the mathematical and computational tools useful in the analysis of problems and applies them to areas ranging from the design of local service delivery to the modeling of national policy issues. Topics include linear and integer programming, networks, and queuing. *Spring, 4 credits*

#### PAM 564 Communications

This course is designed to strengthen writing and speaking skills and to familiarize students with the forms of communication used by policy analysts and managers. Major emphasis will be on the development of effective strategies for

organizing materials, defining problems, analyzing issues, and structuring arguments, but there will also be extensive practice in writing under pressure, editing one's own work, presenting material orally, and working in groups. *Fall, 3 credits*

## SECOND YEAR

#### PAM 516 Applied Analysis

Application of knowledge from microeconomics, model building, and statistics to solving complex managerial and policy problems using PCs, standard programs, and actual data. *Prerequisites: PAM 515, 533, and 543* *Spring, 3 credits*

#### PAM 518 Operations Research

Applications of operations research techniques. Among specific areas modeled are emergency services, sanitation, environmental protection, crime prevention, criminal justice, blood banking, energy supply and demand, manpower scheduling, and education. Techniques discussed include linear programming, queuing theory, simulation, and Markov processes. *Spring, 3 credits*

#### PAM 522 Managerial and Professional Computing

This course covers advanced topics in personal computing for managers and analysts. Topics include spreadsheets, data bases, and higher-level programming. *Fall, 3 credits*

#### PAM 531 Political and Administrative Decision Making

Theory and practice of public sector decision making. Group decision models, bargaining and coalition theory, public choice, economic organization of public agencies, regulation exit and voice theory, metropolitan governance, and the role of formal planning. *Fall, 3 credits*

#### PAM 542 Technology and Public Policy

Designed to provide students interested in entering careers in public service with an opportunity to deal with public policy and operational management issues that involve technology as a primary component. *Spring, 3 credits*

#### PAM 545 Family Policy

An overview of the history, principles, and domains of family policy. Specific areas of study will include the effects of the industrial revolution and the Protestant reformation on the family and on family/state relations; the policy implications of feminism and other recent revolutions, such as those in the areas of medicine and technology; selected policy domains such as reproduction, child care, child and spouse abuse, income security, and taxation; and cross-cultural perspectives on family policy. *Fall, 3 credits*

#### PAM 551 Business Planning

This course covers the essential elements of business planning, both for small businesses and large corporations. *Spring, 3 credits*

#### PAM 552 Advanced Data Analysis

Advanced statistical techniques for analyzing data in the context of management decision making. Classical approaches to hypothesis testing, estimation, regression, and time series analysis are discussed and contrasted with exploratory procedures. Statistical decision analysis is presented and illustrated by examples from the field of management. Emphasis throughout is on application of statistical concepts. *Spring, 3 credits*

**PAM 555 Techno Policy Seminar**

Two topics in public policy are examined in depth, chosen from among energy, transportation, health, criminal justice, child welfare, and educational finance. A range of solutions are compared and evaluated.

Fall, 3 credits

**PAM 560 Design and Analysis of Management Information Systems**

Integrates the areas of computer technology, systems analysis, systems design, and organizational behavior to aid in designing large-scale applications and decision support systems. Both the technological and managerial aspects of system design and implementation are considered.

Spring, 3 credits

**PAM 566 New Ventures**

This course focuses on the essential qualities of successful new enterprises. Examples of both successful and failed new ventures are given. Students develop a business plan for their own new venture and present it to venture capitalists.

Fall, 3 credits

**PAM 571 Marketing**

Concepts and techniques of marketing are discussed in detail. Emphasis is on case studies and applications to business, government, and nonprofit organizations.

Spring, 3 credits

**PAM 578 Theory and Management of Nonprofit Organizations**

The purpose of the course is to develop an understanding of the role of nonprofit organizations in the U.S. economy, the public policy issues affecting the nonprofit sector, and the problems of managing nonprofit organizations. The scholarly literature on nonprofit organizations is examined, and case studies of problem solving and program development in the nonprofit sector are analyzed.

Fall, 3 credits

**PAM 579 Nonprofit Management**

This course provides general knowledge of the operations and management of organizations and special familiarity with the characteristics and management problems of nonprofit organizations.

Fall, 3 credits

**PAM 580 Entrepreneurship and Strategy for Nonprofit Organizations**

This course presents the principles and techniques of strategic management by which an organization sets and implements its long-range direction. This includes the processes of environmental scanning; self-assessment of organizational purpose and comparative advantage; and synthesis of organizational mission, plans, and strategic initiatives. Special attention is given to the study of the entrepreneurship process through which programs, resources, and new organizations are developed in the nonprofit sector, and to the subject of profit-making ventures by nonprofit organizations. Extensive use is made of case studies.

Spring, 3 credits

**PAM 581 Public Management**

How can organizations in the public sector be made more effective? Focus of the course is on the concept of appropriateness of fit of managerial structure. Theory is drawn from Taylorism, the Hawthorne studies, job redesign, and management by objectives.

Fall, 3 credits

**PAM 582 Business-Government Relations**

This course covers topics in the regulation of business, the lobbying of government, joint ventures, and contracting.

Spring, 3 credits

**PAM 583 Cases on Business-Government Relations**

This is a research-oriented course in which students first study a number of case histories in the areas of regulation, lobbying, business promotion, procurements, and government-business partnerships, and then each student develops a case study from original sources.

Prerequisite: PAM 582

Fall, 3 credits

**PAM 585 Program Evaluation**

How to design experiments that will provide valid inferences for program effectiveness. Accumulating evidence, combining data from mixed sources, monitoring performance, and modifying existing programs, cost/benefit analysis, survey, research, and other analytical methods. Examples from criminal justice, municipal services, educational innovation, and health care.

Fall, 3 credits

**PAM 589 Operations Management**

Analysis and management of manufacturing and service operations in industry and government. Examines problems in business such as inventory, quality control, automation, scheduling, and productivity.

Spring, 3 credits

**PAM 591 Special Topics in Policy Analysis and Public Management**

Designed to accommodate innovative subject matter on an experimental basis and to provide courses taught by visiting faculty.

Fall and spring, 3 credits each semester, repetitive

**PAM 592 Organizational Behavior**

An approach to understanding the behavior of individuals in organizations will be developed, with emphasis on implications for effective management. This approach will be used to analyze decision problems encountered in managing human resources in the private sector. Topics include employee ability, motivation and incentive systems, satisfaction, performance, staffing and retention, training, and employee development.

Fall, 3 credits

**PAM 593 The Legal Process**

This course will teach students basic theories and principles of substantive and administrative law. Students will learn the uses of law in the planning, analysis, and management of public systems. They will also experience where and how to find the law they will need for professional practice as public sector policy makers and implementors. It is not a pre-law course as such; it is a professional course.

Fall, 3 credits

**PAM 595 Individual Directed Research in Policy Analysis and Public Management**

Designed to accommodate independent research projects on an individual basis with faculty guidance.

Fall and spring, variable and repetitive credit

**PAM 596 Small Group Studies in Policy Analysis and Public Management**

Designed to accommodate ad hoc small-group student research projects on an experimental basis. Projects will be designed by PAM faculty and students. Topics will be announced at the beginning of each semester.

Fall and spring, 1-3 credits each semester

**DECISION SCIENCES COURSES****PAM/AMS 540 Linear Programming**

Formulation of linear programming problems and solution by simplex method. Duality, sensitivity analysis, dual simplex algorithm, decomposition. Applications to the transportation problem, two-person games, assignment problem, and introduction to integer and nonlinear programming.

Corequisite: Linear algebra course

Fall, 3 credits

**PAM/AMS 544 Integer Programming**

Discrete optimization. Linear programming in which the variables are restricted to being integer valued. Cutting plane methods, enumeration methods, and group theoretic methods. Special treatment of knapsack problem and cutting stock problems.

Prerequisite: PAM 540

Fall, odd years, 3 credits

**PAM/AMS 546 Network Flows**

Theory of flows in capacity constrained networks. Topics include maximum flow, feasibility criteria, scheduling problems, matching and covering problems, minimum length paths, minimum cost flows, and associated combinatorial problems.

Prerequisite: AMS 530 or permission of instructor

Spring, even years, 3 credits

**PAM/AMS 548 Nonlinear Programming**

Necessary and sufficient conditions for unconstrained and constrained optima. The geometric background is developed using tangents and cones in finite dimensional spaces. Computational methods, including interior (penalty function), boundary (gradient projection), and exterior (cutting plane) approaches.

Prerequisite: PAM 540 or permission of instructor

Spring, 3 credits

**PAM/AMS 550 Operations Research: Stochastic Models**

Queuing problems under varying assumptions on input, service mechanism, and queue discipline. Basic ideas of inventory theory. Introduction to statistical decision theory. Monte Carlo methods.

Prerequisite: AMS 507 or equivalent

3 credits

**PAM/AMS 553 Simulation and Modeling**

A comprehensive course in formulation, implementation, and application of simulation models. Topics include data structures, simulation languages, statistical analysis, pseudorandom number generation, and design of simulation experiments. Students will apply simulation modeling methods to problems of their own design. Crosslisted with CSE 529.

Prerequisite: CSE 201 or equivalent

Spring, 3 credits

**PAM/AMS 554 Queuing Theory**

Introduction to the mathematical aspects of congestion. Birth and death processes. Queues with service priorities and bulk service queues. Analysis of transient and steady state behavior. Estimation of parameters. Applications to engineering, economic, and other systems.

Prerequisite: AMS 507

Fall, even years, 3 credits

**PAM/AMS 556 Dynamic Programming**

Stochastic and deterministic multistage optimization problems. Stochastic path problems. Principle of optimality. Recursive and functional equations. Method of successive approximations and policy iteration. Applications to maintenance, inspection, and replacement problems.

Prerequisite: PAM 550 or PAM 558

3 credits

**PAM/AMS 557 Inventory Theory**

Nature of inventory systems. Design and control. Continuous and periodic review policies. Economic order quantities and the optimality of policies.

Prerequisite: AMS 507

Fall, odd years, 3 credits

**PAM/AMS 558 Stochastic Processes**

Review of probability theory. Poisson processes. Renewal theory. Markov processes. Applications to queues, statistics, and other problems of engineering and social sciences.

Prerequisites: AMS 504; AMS 507 or equivalent

Spring, 3 credits

**PAM/AMS 569 Probability Theory I**

Probability spaces and sigma-algebras. Random variables as measurable mappings. Borel-Cantelli lemmas. Expectation using simple functions. Monotone and dominated convergence theorems. Inequalities. Stochastic convergence. Characteristic functions. Laws of large numbers and the central limit theorem.

*Prerequisite:* AMS 504 or equivalent  
3 credits

**PAM/AMS 605 Probability Theory II**

Advanced probability. Conditional sigma-fields, stochastic processes, Brownian motion, Markov property, weak convergence, infinitely divisible distributions, martingales, stochastic integrals, stochastic differential equations, stochastic approximation.

*Prerequisite:* PAM 569 or permission of instructor  
3 credits

**LABOR/MANAGEMENT STUDIES CURRICULUM****For Graduate Students—Full Time or Part Time**

Students enrolled in a master's degree program at Stony Brook who complete a six-course, 18-credit program will receive the New York State Advanced Certificate in Labor/Management Studies. (One three-credit course may be accepted as an approved elective in a related area of study.)

The program must be completed in three years. Credits earned may be used as an area of concentration or as elective courses.

**PAM 504 New Developments in Human Resource Administration**

This is an advanced course, designed to examine new developments and professional concerns in human resource administration. The course focuses on such topics as Japanese methods of increasing productivity and their adaptation to the American workplace; developing union/management cooperation for productivity; methods of training to bring the disadvantaged into the workplace; impact of the computer revolution on the personnel field; specialized personnel needs of the new workforce in a high-tech and service economy. Crosslisted with CES 513.

*Prerequisite:* PAM 505/CES 515  
Fall, 3 credits

**PAM 505 A Survey of Human Resources Administration**

This is the mandated course in the human resource sector of the Labor/Management Studies curriculum. The basic elements of personnel administration are presented: an overview of human resource functions; recruitment, selection, and placement; job classification and development of wage and benefit systems; employee supervision, counseling, discipline, and grievance handling; and the legal framework of human resource administration. The course concludes with an overview of the human resource approaches specific to union and nonunion environments. Crosslisted with CES 515.

*Spring, 3 credits*

**PAM 506 A Survey of Labor Relations**

This is the mandated course in the labor relations sector of the Labor/Management Studies curriculum. It addresses the historical development of labor unions in the United States; the evolution of the legal framework governing labor relations today; the major elements of collective bargaining and dispute resolution techniques used in both the private and public sectors of America's workplace. A discussion of the future of American labor unions in view of the new work force and modern human resource techniques concludes the class. Crosslisted with CES 516.

*Fall, 3 credits*

**PAM 507 Contemporary Issues in Labor Relations**

Collective bargaining in America: areas of union growth, stability, and decline. Examination of current labor-management agreements in the key areas of wages, productivity, retirement and health plans, employee security, and career advancement. The chief problems emerging in current negotiations in both the private and public sectors will be examined. Crosslisted with CES 518.

*Prerequisite:* PAM 506/CES 516  
*Spring, 3 credits*

**PAM 508 The Crisis of De-Industrialization**

This course explores the economic, political, and ethical questions posed by the unprecedented rate of migration of American industry in recent years. The early migration of the textile industry to the decline of our smokestack industries is examined, followed by the new and enterprising responses of communities and unions to plant closure and migration, and the replacement of jobs by the growth of high-tech and service economies. The role of tax laws and government programs in inhibiting migration and assisting labor/community buyouts; the new American dedication to sustaining industrial competitiveness. Crosslisted with CES 520.

*Spring, 3 credits*

**PAM 509 Protest Movements in American Labor**

Rebels, radicals, revolutionaries, and reformers have all focused upon the American worker as an instrument of social change in trying to shape the thought and action of working people to their particular philosophy. The programs and influence of such leaders as Eugene V. Debs, John Reed, Charlotte P. Gilman, Margaret Sanger, Martin Luther King, Big Bill Haywood, and Norman Thomas will be examined, as will such publications as *Masses*, *Mother Earth*, *Messenger*, and *New Masses*. The course concludes with an analysis of the effect of these efforts on today's American labor movement and social structure. Crosslisted with CES 522.

*Spring, 3 credits*

**PAM 510 In Addition to Wages: Employee Benefits**

This course addresses an area of major social change: new developments in fringe benefit programs available to American workers. Topics include pensions, social security, savings and profit-sharing plans, and other benefits available to the individuals in the private, public, and nonprofit sectors. Future fringe benefit programs and policies will also be explored. Crosslisted with CES 510.

*Prerequisite:* PAM 505/CES 515  
*Spring, 3 credits*

**PAM 511 Human Relations in the Workplace**

This course focuses on improving the quality of work life for employees, as a value in itself and as an incentive to greater productivity and reduced turnover. Communication, providing opportunities for job enrichment and career development, employee assistance programs, recreational programs, and developing the joint participation of employees and management are the hallmarks of the well-managed corporation. Crosslisted with CES 511.

*Spring, 3 credits*

**PAM 514 Collective Bargaining and Arbitration in the Public Sector**

The history, procedures, and problems of public sector labor relations, and comparisons with the private sector. The role of public opinion and politics in public sector bargaining. Students will role play the negotiation of a public-sector contract: preparation of bargaining package, negotiation, mediation, fact-finding, arbitration. They will

also prepare, present, and critique a public sector grievance case from its shop origins to its final disposition by arbitration. Crosslisted with CES 514.

*Prerequisite:* PAM 506/CES 516  
*Fall, 3 credits*

**PAM 519 Grievance Handling and Arbitration**

Grievance and arbitration procedures in a variety of private- and public-sector labor agreements will be examined in terms of contract clauses, practical procedures, and problems characteristic of different employment sectors. Dispute settlement between parties themselves will be explored, and the final recourse to arbitration examined in terms of arbitrator selection, case preparation, presentations at hearings, and analysis of awards. Crosslisted with CES 519.

*Prerequisite:* PAM 506/CES 516  
*Spring, 3 credits*

**PAM 521 From Bullets to Ballots: A History of Industrial Relations in America**

The growth and development of labor unions from craft guilds in an agricultural society to present-day national and industrial organizations. The early struggles of workers to organize, the development of labor legislation, the evolution of unions as a major political force, and the advent of public-sector unions and their impact on workplace issues. The course examines the uncertain future of unions as the country moves from a production to a service-oriented economy. Crosslisted with CES 521.

*Spring, 3 credits*

**PAM 523 Human Resource Management in the Individual Firm or Organization—Workshop**

This course is designed for human resources practitioners who wish to prepare themselves for higher-level executive positions: planning for the personnel function relative to organizational purpose and size of workforce; developing recruiting plans, job classifications, and wage schedules; establishing benefit systems; training supervisors; systematizing employee supervision and evaluation methods. Finally, the class will develop such motivational incentives as career development, job enrichment, and employee assistance programs, and learn how to devise model affirmative action and employee safety procedures. Crosslisted with CES 523.

*Spring, 3 credits*

**PAM 524 Labor Negotiations Workshop**

This is an advanced class in the negotiation of labor agreements in the private and public sectors. Through case studies and presentations students acquire an understanding of the attitudes and strategies of both negotiating parties: evaluation of economic and political environment; gathering of essential information; determination of bargaining style and strategy; role playing of negotiations using sample contracts. Guest lecturers critique class performance, offering suggestions for improving negotiation skills. Crosslisted with CES 524.

*Prerequisite:* PAM 506/CES 516  
*Spring, 3 credits*

**PAM 525 Labor Relations Law**

The course will explore the legal interrelationships in selected areas among employers, employees, unions, and government. Topics will include the evolution of labor relations law and the practical implications of legislation, court decisions, and regulatory procedures governing labor/management relations in both the public and private sectors. Crosslisted with CES 525.

*Prerequisite:* PAM 506/CES 516  
*Fall, 3 credits*

**PAM 526 Job Evaluation and Compensation Systems**

An advanced course providing students with both theory and specific knowledge of job evaluation and compensation systems, including union

issues, comparable worth, and legal requirements. Includes preparation of job analysis, descriptions, specifications, and evaluations; theory of compensation systems as they relate to job satisfaction and employee morale; and development of wage and salary surveys, internal and external equity pay scales, performance-based pay systems, and salary administration procedures. An analysis of incentives—bonuses, stock options, salary deferrals, and special benefits—will complete the course. Crosslisted with CES 526.

*Prerequisite:* PAM 505/CES 515

*Spring, 3 credits*

**PAM 527 Women, Work, and Dollars**

The course addresses the economic and social struggle of women to achieve workplace equality. It includes an examination of their labor force participation: remuneration of women, segregated employment patterns, special problems of pink-collar and professional women, and an analysis of the corporate environment and the role of affirmative action in removing formal and informal barriers to progress. The new campaign for pay equity, techniques for establishing a fair wage, conflicting views of pay, equity as a solution to sex discrimination, alternative definitions of success, and women's contribution to the world of work. Crosslisted with CES 517.

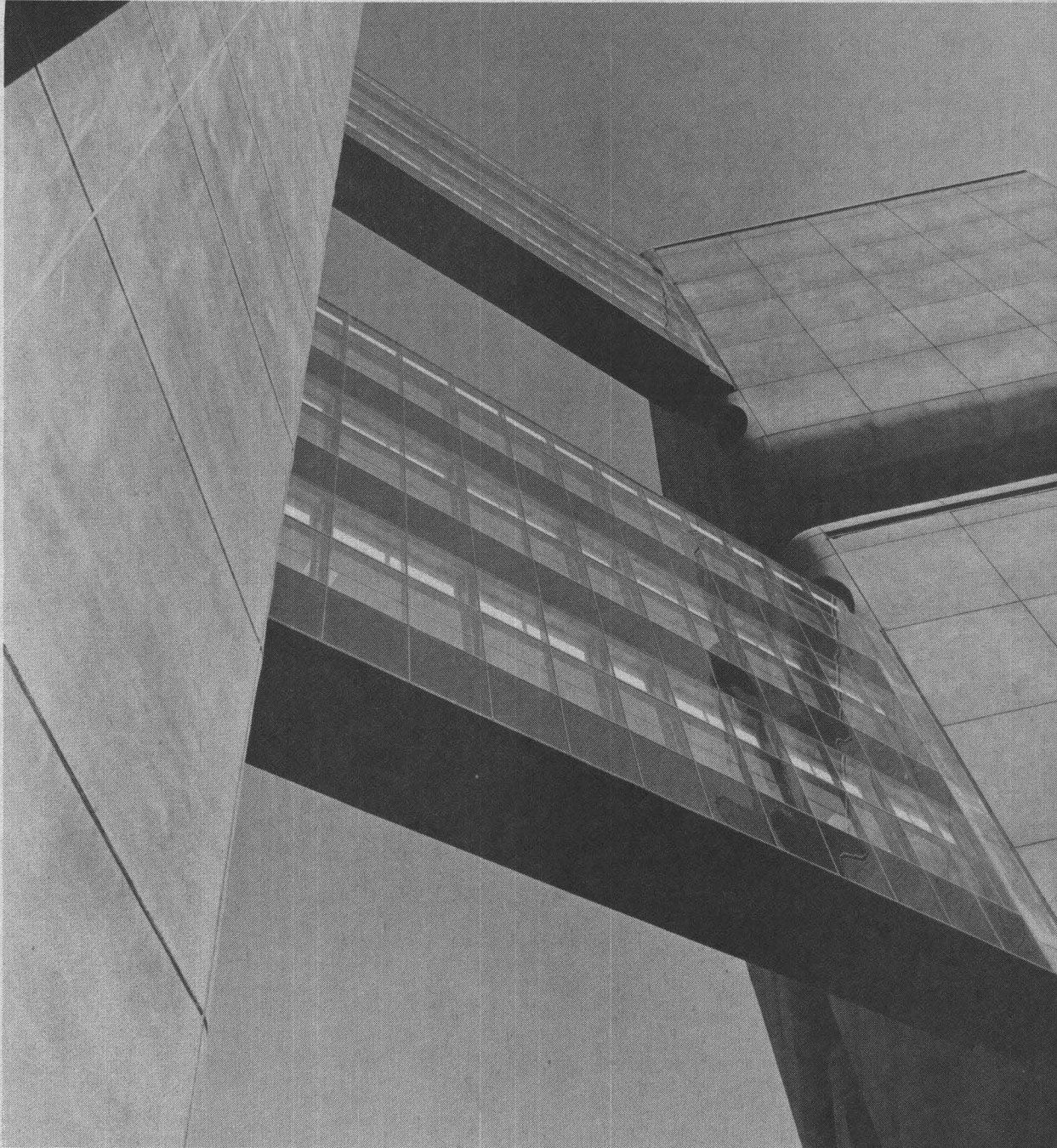
*Spring, 3 credits*

**PAM 537 Employee Training and Career Development**

Provides an overview of employee training methods, training design, development programs, and evaluation procedures, including cost/benefit analysis. Emphasis is placed on how to perform a needs analysis, how to select the latest training technologies, and how to apply these technologies to enhance adult learning. Employee development strategies are reviewed. Students apply these concepts to a specific organization for hands-on learning. A focus on career planning and development gives students a chance to take interest inventories and make self-assessments of abilities and learning styles. Students formulate their own career plans and develop action strategies.

*Spring, 3 credits*

# Health Sciences Center



# Anatomical Sciences (HBM)

*Chairperson: Jack T. Stern*  
*Health Sciences Center T-8, Room 060 (516) 444-2350*

*Graduate Studies Director: Susan Larson*  
*Health Sciences Center T-8, Room 041 (516) 444-3115*

## Degree Requirements M.S. Degree Requirements

Graduate Studies in Anatomical Sciences normally does not accept students whose goal is a master's degree. In exceptional instances, a student already in the program may be awarded an M.S. degree upon completing an approved course of study, including a minimum of 30 graduate credit hours, passing a comprehensive examination, and/or submitting and defending a master's thesis.

## Requirements for the Ph.D. Degree

In addition to the minimum requirements of the Graduate School, the following are required:

### A. Formal Course Requirements

The following courses are required for all students:

1. Human Gross Anatomy
2. Microscopic Structure of the Human Body
3. Introduction to Mammalian Physiology
4. Neuroanatomy or Neurobiology
5. Biometry
6. Laboratory Rotation in Anatomy (three semesters). The student will work in three different laboratories during the first two years of study. The particular laboratories will be selected by the graduate committee in conjunction with the student. A rotation may be taken during the summer.
7. Graduate Seminar. The student will be required to write a formal essay on a topic selected by the graduate committee in the first semester. In the second semester the student will make an oral presentation of that essay to faculty and students of the department. Thereafter, the student is required to present a seminar once each academic year until completion of the program.

All students must achieve a B or higher in all required courses and must maintain a B average in all elective courses.

### B. Preliminary Examination

Upon completion of formal courses (normally, at the end of the second year of study), each student is given a preliminary examination consisting of both an oral and a written portion. Depending on the area of concentration, the examination covers human anatomy, functional morphology, and/or embryology.

### C. Advancement to Candidacy

The faculty will recommend a student to the Graduate School for advancement to candidacy upon satisfactory completion of all required coursework and the preliminary examination. The student then becomes a formal candidate for the Ph.D.

### D. Dissertation Proposal Examination

Following advancement to candidacy, the student selects a dissertation advisor and a dissertation committee consisting of at least two additional members of the Department of Anatomical Sciences and one person from outside the department, school, or university. In consultation with this committee, the student prepares a thesis proposal. The dissertation proposal examination consists of an oral presentation of this proposal to the faculty as a whole, followed by an oral defense before the dissertation committee. This examination should occur by the end of the third year of study.

### E. Ph.D. Dissertation

The student, under the supervision of the dissertation committee, performs the research leading to the preparation of a written dissertation. The dissertation must contain the results of original and significant investigation.

### F. Dissertation Defense

Following completion of the dissertation, the student presents his or her findings in a formal public oral defense. The defense is conducted by the dissertation committee, but is not chaired by the student's advisor. Following the presentation of results, the student is questioned by members of the committee and by other members of the audience.

### G. Teaching Requirement

It is expected that, with the exception of the first year, a student will function as a teaching assistant once a year until completion of the program.

### H. Residence Requirement

The university requires at least two consecutive semesters of full-time graduate study. Generally, the demands of the course of study necessitate a longer period of residence. However, pursuit of a degree on a part-time basis will be considered under special circumstances.

## Courses

### HBA 521 Gross Anatomy of Head, Neck, and Trunk

Tutorial laboratories with emphasis on dissections of the human head, neck, and trunk.  
*Prerequisite:* Permission of instructor  
*Fall modules, 4 credits*

### HBA 531 Gross Anatomy of the Human Body

A course comprising (1) laboratories in which detailed dissection of the human body is undertaken and (2) lectures covering topics in gross anatomy including embryology, functional and topographic anatomy, clinical correlations, and introduction to radiology.  
*Prerequisite:* Permission of instructor  
*Fall modules, 7 credits*

### HBA 536 Biological Clocks

A consideration of the temporal dimension of biological organization and of periodic phenomena that are a basic property of living systems. Topics include a survey of circadian rhythms; influence of light, temperature, and chemicals; use of the clock for adaptation to diurnal, tidal, and lunar cycles for direction finding (homing and orientation) and for day-length



measurement (photoperiodism); chronopathology and chronopharmacology; aging and life cycle clocks; possible molecular mechanisms of the clock. Crosslisted with BCD 536.

*Prerequisite:* Permission of instructor  
*Spring, 3 credits*

### **HBA 537 Physiology and Biochemistry of the Cell Cycle**

An integrated view of the cell developmental cycle in prokaryotes and eukaryotes. Topics include cell cycle anatomy; measurements on fixed and living cells; kinetics of cell population growth; theory and methodology of batch, synchronized, and continuous cultures; general patterns of nucleic acid synthesis; regulation of enzyme activity during the cell cycle; temporal control of gene expression; development and function of cellular organelles during the cell cycle; and the control of cell division. Crosslisted with BCD 537.

*Prerequisite:* Permission of instructor  
*Fall, 3 credits*

### **HBA 560 Advanced Regional Anatomy**

A course in advanced human gross anatomy for graduate students or advanced undergraduates in biology, anthropology, and other life sciences. *Prerequisite:* Permission of instructor  
*Fall and spring, 3-8 credits*

### **HBA 563 Aspects of Animal Mechanics**

An introduction to biomechanics. Covers free-body mechanics and kinetics as applied to vertebrate locomotion. Considers the structure and physiology of muscle as it relates to adaptations of the musculoskeletal system.

*Prerequisites:* Introductory physics and biology or permission of instructor  
*Spring, even years, 2 credits*

### **HBA 564 Primate Evolution**

The taxonomic relationships of primate evolutionary history as documented by the fossil record and structural and chemical evidence. Emphasis on primates prior to the origin of the human lineage. Laboratory included. Open to senior undergraduates.

*Prerequisite:* Permission of instructor  
*Spring, odd years, 4 credits*

### **HBA 565 Human Evolution**

Survey of the fossil record of human evolution from the later Tertiary through the Pleistocene. The course emphasizes the record of morphological evolution including evolution of the skull, teeth, and limbs. Topics include the ape-human furcation, radiation of the early hominids, the evolution of *Homo erectus*, Neanderthal man, later human ancestors, the evolution of the brain and intelligence, and bipedalism and other morphological complexes. The lectures and laboratories utilize extensive comparative anatomical material, fossil casts, and a slide collection. Crosslisted with ANT 565.

*Prerequisite:* Permission of instructor  
*Spring, alternate years, 4 credits*

### **HBA 566 Studies in Functional Morphology**

Introduction to the theory and methods of functional morphology. Various methods of analysis and the application of experimental techniques such as electromyography or bone-strain analysis are discussed as they pertain to the understanding of the interaction between form and function. Special emphasis is placed on the analysis of human and nonhuman primate morphology, and the application of this analysis to interpretation of the fossil evidence for human and nonhuman primate evolution.

*Prerequisite:* Permission of instructor  
*Fall, odd years, 2 credits*

### **HBA 580 Comparative Anatomy and Evolution of Mammals**

The comparative anatomy, evolutionary history, and radiation of fossil and living mammals. A course requiring a major research project on any aspect of mammalian comparative anatomy. Supplemented by lectures and seminars on the evolutionary history and radiation of mammals. Comparative osteological and fossil cast collections will be utilized. Lecture/seminar series can be taken separately as HBA 581.

*Prerequisites:* Previous course in human or vertebrate anatomy and permission of instructor  
*Fall, even years, 4 credits*

### **HBA 581 Evolution of Mammals**

A course on the evolutionary history and radiation of mammals from the Mesozoic to the present from paleontological and anatomical perspectives. Particular emphasis will be placed on the origin of mammals and the origin, evolution, and anatomical diversity of modern and extinct orders of mammals.

*Prerequisites:* Previous course in human or vertebrate anatomy and permission of instructor  
*Fall, even years, 2 credits*

### **HBA 582 Comparative Anatomy of Primates**

The comparative anatomy of living primates. Laboratory dissection with emphasis on relating structural diversity to behavior and biomechanics.

*Prerequisites:* HBA 364, previous course in human or vertebrate anatomy, and permission of instructor.  
*Fall, 4 credits*

### **HBA 590 Projects in Anatomical Sciences**

Individual laboratory projects closely supervised by faculty members to be carried out in staff research laboratories.

*Prerequisite:* Permission of instructor  
*Fall and spring, 1-6 credits each semester, repetitive*

### **HBA 656 Cell Biology**

An introduction to the structural organization of cells and tissues as they relate to function. Emphasis on cell organelle structure and function in specialized cells in tissues. Covers the organization and interaction of cells in tissues and comparative examples of tissues from vertebrates and invertebrates. Crosslisted with BCD 656.

*Prerequisite:* Baccalaureate degree in science or permission of instructor  
*Spring, 3 credits*

### **HBA 657 Developmental Biology**

The developing systems at all levels from the morphological to the molecular utilizing material from both animal and plant kingdoms. Emphasis on molecular and cellular approaches to the basic principles of development; the mechanisms of storage, recruitment, and utilization of genetic information during early embryogenesis; molecular and cellular aspects of pattern formation; mechanisms of cell and tissue interaction during development; and regulation of gene expression during terminal differentiation. Crosslisted with BCD 657.

*Prerequisite:* Permission of instructor  
*Fall, 3 credits*

### **HBA 661 Laboratory Rotation**

Supervised introduction to the approaches, techniques, and general research goals of individual faculty members' laboratories on a rotational basis. Ph.D. students are required to participate in three rotations in their first two years of study.

*Fall and spring, 4 credits*

### **HBA 690 Graduate Seminar**

Seminars by graduate students on current literature in the areas of the anatomical sciences. *Prerequisite:* Permission of instructor  
*Fall and spring, 1 credit, repetitive*

### **HBA 692 Advanced Topics in Anatomical Sciences Literature**

Tutorial readings in anatomical sciences with periodic conferences, reports, and examinations arranged with the instructor.

*Prerequisite:* Permission of instructor  
*Fall and spring, 1-2 credits, repetitive*

### **HBA 694 Dissertation Research**

Original investigation under supervision of dissertation advisor and committee.

*Prerequisite:* Permission of dissertation advisor  
*Fall and spring, 1-9 credits, repetitive*

### **HBA 695 Practicum in Teaching**

Practice instruction in the teaching of anatomical sciences carried out under faculty supervision.

*Prerequisite:* Permission of instructor  
*Fall and spring, 1-4 credits, repetitive*

# Molecular Microbiology (HBM)

**Chairperson: Eckard Wimmer**  
Life Sciences Building 280 (516) 632-8787

**Graduate Studies Director: Patrick Hearing**  
Life Sciences Building 270 (516) 632-8813

## Degree Requirements Requirements for the Ph.D. Degree, Graduate Studies in Molecular Microbiology

The predoctoral training program offers its students the opportunity to study questions in virology, bacteriology, immunology, biochemistry, and cell and developmental biology utilizing the experimental approaches of the molecular biologist and geneticist. Instruction and course planning involve faculty members from the Department of Microbiology and selected members from the departments of Biochemistry and Cell Biology, Medicine, Pathology, and Pharmacology, and from two outside institutions, Cold Spring Harbor Laboratory and Brookhaven National Laboratory. The general philosophy of the program is that a successful research career in the diverse and heterogeneous area of molecular biology requires a broadly based background, familiarity with at least all of the above areas, and a frame of mind that is receptive to new approaches.

The department has an active seminar program of outside speakers who present topics relevant to molecular microbiology, and there is a yearly two-day symposium in which ongoing research in the department and recent progress in the field are presented and discussed. This symposium is held early in the fall in order to introduce new students to the faculty, to other students, and to the areas of ongoing research within the department. The Department of Microbiology also presents a colloquium each fall on human diseases, with outstanding researchers from throughout the country presenting their current work on the selected topic. Students in the program are encouraged to attend all of these programs as part of their training.

In addition to the minimum requirements of the Graduate School, the following are required:

### A. Course Requirements

It is the policy of the Department of Microbiology that a study must obtain a grade of B or higher in each course.

#### First Year

##### Fall

Introductory Biochemistry I  
Molecular Genetics  
Experimental Microbiology  
(lab rotations)\*  
Microbiology Seminar

##### Spring

Graduate Genetics or Biology  
of Cancer (alternate years)  
Animal Virology  
Experimental Microbiology  
(lab rotations)\*  
Microbiology Seminar

\*Students spend two or three months in each of three laboratories. At the end of their first year students generally identify and enter the laboratory in which they will conduct their thesis research.

#### Second Year

##### Fall

Molecular Biology of the Cell  
Molecular Aspects of Immunology  
Graduate Research  
Microbiology Seminar

##### Spring

Graduate Genetics or Biology  
of Cancer (alternate years)  
Readings in Microbiology Literature  
Graduate Research  
Microbiology Seminar

### B. Comprehensive (Preliminary) Examination

At the end of the fourth semester, the student will take a written comprehensive (preliminary) examination covering all areas of the prescribed course of study.

### C. Thesis Proposal Examination

In the fall semester of the third year, each student submits a written proposal of his or her thesis research (similar to an NIH grant proposal), and orally defends that proposal before his or her thesis committee shortly thereafter.

### D. Advancement to Candidacy

After successful completion of all required and elective courses, the comprehensive (preliminary) examination, and the thesis proposal examination, the student will be recommended to the Graduate School for advancement to candidacy.

### E. Ph.D. Dissertation

The research for the Ph.D. dissertation is conducted under the supervision of the thesis committee. Upon approval of the completed dissertation by this committee, a dissertation examining committee is appointed by the program and approved by the vice provost for graduate studies. A formal public oral defense of the dissertation is scheduled, at which the student presents his or her findings and is questioned by members of the examining committee and other members of the audience.

### F. Teaching Requirement

It is expected that each graduate student completing a doctoral degree will have functioned as a teaching assistant during at least two semesters of his or her graduate career.

## Courses

### HBM 503 Molecular Genetics

Introduces the classical work and current developments in lower and higher genetic systems. Covers gene structure and regulation in prokaryotic and eukaryotic organisms, mutational analysis and mapping, transposable elements, and biological DNA transfer mechanisms. Bacteriophage as well as lower and higher eukaryotic systems are used to illustrate aspects of molecular genetic structure and function.

*Prerequisite:* Permission of instructor  
Fall, 3 credits

**HBM 509, 510 Experimental Microbiology**

An introduction to modern microbiological research. The student rotates through three professors' laboratories, spending two or three months in each. The selection of laboratories is made in consultation with the student's advisory committee. By taking part in ongoing projects the student will learn experimental procedures and techniques and become acquainted with research opportunities in the department.

*Prerequisites:* Matriculation in a graduate program and permission of the graduate studies director

*Fall and spring, 1-8 credits each semester*

**HBM 522 Biology of Cancer**

A short course with the emphasis on cancer as a disease of man. Lectures address human cancer as seen by the clinician and as basic research relates to human disease. This course provides students with a link between courses in cell and molecular biology and the application of this basic information to tumor management.

*Spring, even years, 1 credit*

**HBM 531 Medical Microbiology**

Information derived from molecular and experimental cellular biology will be presented to provide a foundation for understanding the basic aspects of the growth, regulation, structure, and function of viruses and prokaryotic and eukaryotic cells. The properties of the infectious agents will be correlated to human diseases caused by these agents. Laboratory experiments will demonstrate basic techniques to identify and quantify microorganisms.

*Prerequisite:* Permission of instructor

*Spring modules, 1-4 credits*

**HBM 599 Graduate Research**

Original investigations under faculty supervision.

*Prerequisite:* Permission of instructor

*Fall and spring, 1-9 credits each semester*

**HBM 611 Molecular Biology of the Cell**

The topics covered include composition and structure of the plasma membrane, ion transport, endocytosis and exocytosis, cellular organelles, protein trafficking, nucleus and chromatin structure and function, cytoskeleton, cell cycle, cell communication, and intracellular signal transduction. The course is organized around discussions of required reading material led by the instructor and an expert in the field under discussion.

*Prerequisites:* Matriculation in the molecular microbiology or genetics graduate program

*Fall, 3 credits*

**HBM 612 Animal Virology**

Describes the molecular mechanisms used by animal viruses to replicate nucleic acids and control gene expression. Several viruses are covered in great experimental detail to illustrate the methodology used to investigate viruses. Attributes of all major virus groups are considered. Focus is on original data rather than on review articles.

*Prerequisite:* Permission of instructor

*Spring, 3 credits*

**HBM 621, 622 Short Courses in Microbiology**

On occasion the department will present short courses covering topics in microbiology at an advanced level. Classes will meet one or two periods for three to five weeks. Announcement of the courses will be made by sending notices to university departments.

*Prerequisite:* Permission of instructor

*Fall and spring, 1 credit*

**HBM 690 Microbiology Seminar**

A weekly meeting devoted to current work in the department. Enrolled students present seminars each week throughout the semester.

*Prerequisite:* Permission of instructor

*Fall and spring, 1 credit each semester, repetitive*

**HBM 691 Readings in Microbiology Literature**

Readings in microbiology literature covering areas of molecular biology and genetics.

*Prerequisite:* Permission of instructor

*Spring, 1 credit*

**HBM 694 Dissertation Research in Microbiology**

For the student who has been advanced to candidacy. Original research will be under the supervision of the thesis advisor and advisory committee.

*Prerequisite:* Permission of dissertation advisor

*Fall and spring, 1-9 credits*

**HBM 800 Full-Time Summer Research**

Full-time laboratory research projects supervised by faculty members.

*Prerequisites:* Permission of instructor and full-time graduate student status

*Summer, no credit*

# Oral Biology and Pathology (HBO)

**Chairperson: Israel Kleinberg**  
Westchester Hall 196 (516) 632-8923

**Graduate Studies Director: Jerry Pollock**  
Westchester Hall 101 (516) 632-8924

## Degree Requirements

In addition to the minimum degree requirements of the Graduate School, the following are required:

A. All students must complete all or part of the Oral Biology and Pathology Oral Systems course. M.S. students must, in addition, complete three graduate courses selected from offerings within and outside the department. Ph.D. students are generally required to complete six course offerings at the graduate level.

B. To become a Ph.D. candidate, the student must pass an advancement-to-candidacy examination. To do this, the student must prepare a detailed written proposal in the format of a National Institutes of Health research grant application. A public seminar is presented by the student to members of his or her advisory committee, the department, and the university community at large, in which the student defends the proposal. This is followed by a further defense by the student before his or her advisory committee. A determination for advancement to candidacy is then made and forwarded to the vice provost for graduate studies for official approval.

C. The candidacy examination is used to examine the student's ability to handle the intellectual and communicative processes involved in carrying out independent research.

D. An original research thesis is required for completion of both the M.S. and Ph.D. degrees. The format is similar to the advancement-to-candidacy examination in that the student defends the thesis in a public seminar followed by a second examination by the student's dissertation committee. If recommended for approval, this determination is submitted to the vice provost for graduate studies, who makes the final decision to award the degree.

E. Each student has the opportunity to engage in various aspects of the teaching program of the department and a major effort is made to assist students to attend and present papers at various scientific meetings.

## Courses

### HBO 500 Biology of the Oral Mineralized Tissues

This course deals with the basic chemistry, crystallography, ultrastructure, and metabolism of the calcium phosphates involved in the formation and physiological and pathological resorption of the various mineralized tissues found in or associated with the oral cavity (enamel, dentin, cementum, bone). Ectopic calcifications and calculus formation will be examined.

*Prerequisites:* HBO 560, 561, 562, and 563 or their equivalent; permission of instructor  
*Fall and spring, 3 credits each semester*

### HBO 510 Salivary Metabolism and Secretion

Consideration is given to the normal and abnormal structure and function of the glandular systems found in the oral cavity. The composition, regulation, and functions of the secretions from the major and minor salivary glands will receive particular attention.

*Prerequisites:* HBO 560, 561, 562, and 563 or their equivalent; permission of instructor  
*Fall and spring, 3 credits each semester*

### HBO 520 Oral Microbial Systems

Consideration is given to the structural composition, metabolism, and environmental relationships of the bacterial systems formed on and in association with the oral hard and soft tissues. Specific and mixed bacterial populations and their role in oral disease will be dealt with.

*Prerequisites:* HBO 560, 561, 562, and 563 or their equivalent; permission of instructor  
*Fall and spring, 3 credits each semester*

### HBO 530 Molecular Biology and Pathology of the Periodontium

This course deals with the ultrastructure and biochemical composition of the periodontal tissues, the microbial interrelations with the

organic and inorganic components of the periodontal tissues, the biochemical dynamics of gingival inflammation and wound healing, and the metabolic processes responsible for the composition and flow of gingival crevice fluid.

*Prerequisites:* HBO 560, 561, 562, and 563 or their equivalent; permission of instructor  
*Fall and spring, 3 credits each semester*

### HBO 535 Epithelial Keratinization and Differentiation

A consideration of the role of stabilization of gene expression in the development and maturation of mammalian cells and tissues. Differentiation in skin and cartilage will be considered in detail. Alterations in the differentiative process of these tissues that may result in pathological disorders will be discussed.

*Prerequisites:* Permission of instructor required; HBP 531 suggested; students must have had background in cellular biochemistry  
*Fall and spring, 3 credits each semester*

### HBO 545 Sugar and Man

This course will examine the societal and biologic factors that influence the role played by sugar in the development of human disease. Topics will include the chemistry and metabolism of sugar, the sweet taste, the place of carbohydrates in the diet, and sucrose substitutes. Special emphasis will be given to the role of sugars in oral disease.

*Prerequisites:* HBO 560, 561, 562, and 563 or their equivalent; permission of instructor  
*Fall and spring, 3 credits each semester*

### HBO 550 Oral Diagnostics and Therapeutic Technology, Lectures and Laboratory Techniques

Recent advances in the use and development of research technology for the early diagnosis and treatment monitoring of oral and systemic disease. Includes relationships of dry mouth to salivary physiology, diabetes, and drug medications; the use of the Periotron and enzyme assays for the diagnosis of gingivitis and periodontal disease; iontophoresis for the treatment of sensitive teeth; oral candidiasis and denture stomatitis and early detection and causes of dental caries.

*Prerequisites:* HBO 560, 561, 562, and 563 or their equivalent; permission of instructor  
*Fall and spring, 4 credits each semester*

### HBO 560 Oral Biology and Pathology I

This course is the first of four comprehensive courses on molecular structure, biochemical and physiological function, developmental anatomy, and pathology of the various systems that constitute the oral apparatus. The course consists

of the following two units of instruction: (1) the embryological development of the face and oral cavity and (2) the biology and pathology of the oral mineralized tissues.

*Prerequisites:* Undergraduate degree in basic science and permission of instructor  
*Fall and spring, 3 credits each semester*

**HBO 561 Oral Biology and Pathology II**

This course is the second of four comprehensive courses on molecular structure, biochemical and physiological function, developmental anatomy, and pathology of the various systems that constitute the oral apparatus. The course consists of the following two units of instruction: (1) the biology and pathology of the periodontal structures and (2) the microbiology of the oral cavity.

*Prerequisites:* Undergraduate degree in basic science and permission of instructor  
*Fall and spring, 3 credits each semester*

**HBO 562 Oral Biology and Pathology III**

This course is the third of four comprehensive courses on molecular structure, biochemical and physiological function, developmental anatomy, and pathology of the various systems that constitute the oral apparatus. The course consists

of the following two units of instruction: (1) the biology and pathology of the salivary glands and their products and (2) the biology and pathology of the oral mucous membranes.

*Prerequisites:* Undergraduate degree in basic science and permission of instructor  
*Fall and spring, 3 credits each semester*

**HBO 563 Oral Biology and Pathology IV**

This course is the last of four comprehensive courses on molecular structure, biochemical and physiological function, developmental anatomy, and pathology of the various systems that constitute the oral apparatus. The course consists of the following two units of instruction: (1) the biology and pathology of the oral sensory systems and (2) the biology and pathology of oral motor systems.

*Prerequisites:* Undergraduate degree in basic science and permission of instructor  
*Fall and spring, 3 credits each semester*

**HBO 590 Research Projects in Oral Biology and Pathology**

Individual laboratory projects closely supervised by faculty members to be carried out in their research laboratories.

*Prerequisite:* Student must be enrolled in a master's or doctoral program  
*Fall and spring, 3 credits each semester*

**HBO 599 Graduate Research**

Original investigations undertaken with the supervision of a faculty member.

*Prerequisite:* Permission of instructor  
*Fall and spring, 1-12 credits each semester*

**HBO 690 Oral Biology and Pathology Seminars**

Research seminars by students, staff, and visiting scientists.

*Prerequisite:* Permission of instructor  
*Fall and spring, 1 credit each semester, repetitive*

**HBO 694 Dissertation Research in Oral Biology and Pathology**

Original investigation undertaken with the supervision of a member of the staff.

*Prerequisite:* Permission of thesis advisor  
*Fall and spring, 1-12 credits each semester*

**HBO 695 Oral Biology and Pathology Teaching Practicum**

Practice instruction in the teaching of oral biology and pathology at the undergraduate level carried out under faculty orientation and supervision.

*Prerequisite:* Permission of instructor  
*Fall and spring, 1-4 credits each semester*

# Pathology (HBP)

**Chairperson: Frederick Miller**

**Health Sciences Center BHS T-9, Room 140 (516) 444-3000**

**Graduate Studies Director: Howard B. Fleit**

**Health Sciences Center BHS T-9, Room 140 (516) 444-3020**

## Degree Requirements

In addition to the minimum requirements of the Graduate School, the following are required:

### A. Course Requirements

1. BMO 520 Graduate Biochemistry I
2. BCD 656 Comparative Cell and Tissue Biology
3. HBP 533 Graduate Immunology
4. HBM 503 Molecular Genetics
5. HBP 531 General Pathology
6. Students must accumulate seven to nine credits from a list of Graduate School electives.

Courses 1 through 6 are taken in the first and second years of the program. Students in the first year are also obliged to rotate in three laboratories with the goal of selecting an environment for their post-first-year research.

B. Participation in HBP 691 Pathology Journal Club and HBP 690 Seminar in Pathology.

C. Satisfactory performance on a departmental qualifying exam at the end of the second year.

D. Submission and successful defense of a research proposal before a preliminary examination committee. This obligation must be addressed before the end of the fall semester of the third year in the program. The committee is selected by the graduate studies director on the recommendation of the student and his or her advisor.

E. All students, whether or not they are supported by teaching assistantships, are required to gain faculty-guided experience in teaching in HBP 390 and HBP 310.

F. When requirements A through E have been met the student is advanced to candidacy and his or her research is monitored by a thesis research committee that normally meets with the student at least once a year.

G. The thesis committee recommends when the research is suitable for presentation as a thesis. A successful oral defense

before the thesis defense committee and a seminar before all faculty and graduate students are required before the Ph.D. degree is awarded.

## Courses

### HBP 511 Pathobiology for Graduate Health Care Practitioners

For graduate students who have obtained primary health care baccalaureate degrees through the case study approach. Covers the underlying principles of modern experimental pathology. Focuses on the clinical aspects of the body system, including relevant underlying biochemistry, structure, or pathophysiology at the organ, tissue, cell, or molecular level.

*Prerequisites:* Undergraduate degree, health care experience, biochemistry or cell biology, anatomy, and microbiology.

*Fall and spring semesters, 3 credits*

### HBP 531 General Pathology

Introduction to the nature and causes of disease, death, reaction to injury, and repair. Analysis of associated structural changes in cells and tissues, with reference to their functional correlates.

*Prerequisites:* Histology, gross anatomy, physiology, and biochemistry, prior or concurrent microbiology, and permission of instructor.

*Spring, 4-6 credits with lab, 3 credits without lab*

### HBP 532 Medical Immunology

A general introduction to the principles of immunology for professional students including definition of antigens and antibodies, description of cellular events in the immune response, theories of antibody formation, mechanism of inflammation, hypersensitivity states, and diseases associated with responsiveness of the immune system. Biochemistry, genetics, and histology.

*Prerequisites:* Advanced courses in biology, biochemistry, genetics, and histology (these courses may be taken concurrently with HBP 532) and permission of instructor

*Spring, 2 credits*

### HBP 533 Immunology

Principles of immunology for graduate students in the biological sciences including definition of antigens and antibodies, specificity of the immune response, serological quantitation of proteins and hormones, immunoglobulin structure, the genetics of immunoglobulin synthesis, cellular cooperation in the immune response, hypersensitivity, tolerance, transplantation. Open to advanced undergraduates.

*Prerequisites:* Advanced courses in biology and biochemistry and permission of instructor

*Fall, 3 credits*

### HBP 553 Pathology of Neoplasia

A study of the nature and behavior of neoplastic tissue, the etiologies of cancer, and the effect

of tumors upon the host. Includes laboratories to acquaint the student lacking a background in histology or physiology with the appearance and behavior of cancer on the tissue and organ levels.

*Prerequisite:* Permission of instructor

*Spring, 2 credits*

### HBP 554 Advanced Immunology

Mechanisms of injury produced by immunological reactions in tissues, autoimmune diseases, immunodeficiency diseases. Supervised laboratory experience in selected topics in immunology or immunology can be arranged.

*Prerequisite:* HBP 531 or 533

*Spring, 2 credits*

### HBP 556 Laboratory Medicine

A four-week, full-time (6 hours per day) course dealing with clinical laboratory decision making and the basis for the laboratory evaluation of human disease. The presentations are both didactic and practical and are given by an interdepartmental faculty. While intended principally for senior medical students, the course might be taken by advanced microbiology or biochemistry students interested in clinical applications.

*Prerequisite:* Permission of instructor

*Spring, 6 credits*

### HBP 561 Electron Microscopy for Experimental Pathologists

Use of the electron microscope (EM), alone and in conjunction with other methodologies, in studies of biological dysfunction. Special techniques include histochemistry, enzyme histochemistry, immunohistochemistry, diffraction, stereo EM, and scanning EM. Design of protocols, preparation, and interpretation of data.

*Prerequisite:* Permission of instructor

*Fall and spring semesters, variable credits, 2-6 per semester*

### HBP 562 Histochemistry

Theoretical basis of histochemical techniques (enzyme histochemistry, autoradiography, cytophotometry, immunohistochemistry) as applied to the analysis of chemical components of cells and tissues.

*Prerequisites:* HBP 533 and permission of instructor

*Fall, 2 credits*

### HBP 590 Seminars in Immunology

A series of monthly seminars focusing on research in progress by the participants, current journal articles in the field of immunobiology, and prepared reviews of specified areas in the general field.

*Prerequisite:* Permission of instructor

*Fall and spring, 1 credit per semester*

### HBP 622 Clinical Pathologic Correlations: Gross Pathology

Correlative exercises in clinical pathology and human gross anatomic pathology including

surgical biopsy material. Open to students in medical sciences.

*Prerequisites:* Systems pathology, general pathology course, permission of instructor  
*Fall, variable credits, 1-3 per semester*

**HBP 691 Journal Club in Pathology**

Designed to provide students with a forum for acquiring skills involved in the critical analysis and presentation of scientific data by active participation in seminars on major topics in cellular and molecular pathology, and critical discussion of selected topics with presentation of papers from the literature.

*Prerequisite:* Permission of instructor; open only to pathology graduate students  
*Fall and spring, 1 credit*

**HBP 694 Thesis Research in Pathology**

Original investigation under the supervision of a staff member.

*Prerequisite:* Permission of instructor  
*Fall and spring, variable and repetitive credit, 1-12 credits per semester*

**HBP 695 Teaching Practicum in Pathology**

Practice instructions in the teaching of pathology carried out under faculty orientation and supervision.

*Prerequisite:* Permission of instructor  
*Fall and spring, repetitive, 1-4 credits per semester*

# Pharmacological Sciences (HBH)

**Chairperson: Arthur P. Grollman**  
Health Sciences Center T-7, Room 140 (516) 444-3080

**Graduate Studies Director: Daniel Bogenhagen**  
Health Sciences Center T-8, Room 193 (516) 444-3068

## Degree Requirements Requirements for the Ph.D. Degree in Pharmacological Sciences

In addition to the minimum Graduate School requirements, the following are required:

A. Core courses in graduate biochemistry, pharmacology, regulatory biology, and laboratory techniques.

B. One track course such as neuropharmacology, genetic toxicology, or medicinal chemistry, and two electives.

C. Four semesters of student seminar.

D. Completion of the qualifying examination for advancement to candidacy.

E. Preparation and defense of the Ph.D. dissertation.

## Courses

### HBH 531 Principles of Medical Pharmacology

Basic principles that underlie actions of drugs on physiological processes with particular reference to therapeutic and toxic actions. Primarily for medical, dental, and graduate students.

*Prerequisites:* Physiology, biochemistry, and permission of instructor  
*Spring modules, 5 credits*

### HBH 541 Medicinal Chemistry

Includes the pharmacological principles that govern drug action, selectivity, and molecular mechanisms of drug action at the receptor level. Discusses the relationship of molecular structure to biological activity with emphasis on functional groups, stereochemistry, and charge distribution. Covers the major classes of drugs, comparing and contrasting mechanism of action within the classes.

*Fall, odd years, 3 credits*

### HBH 545 Biochemical Laboratory Techniques

An introduction to the theoretical principles and experimental techniques used in modern biochemical research. Lectures and demonstrations will be used to present topics in laboratory computers, chromatography, mass spectrometry, protein sequencing, cloning technology, sedimentation, electrophoresis, ligand binding, and nuclear magnetic resonance. Procedures for the safe handling of toxic chemicals and radioisotopes will also be discussed.

*Prerequisite:* Permission of instructor  
*Fall, 3 credits*

### HBH 555 Neuropharmacology

An advanced course for graduate students interested in developing an understanding of neuropharmacology and research on this topic. Following a general introduction to nerve cell structure and synaptic and chemical transmission, three themes—receptors, receptors as channels, and G-protein-coupled receptors—will be developed. Recent advances in cell and molecular biology provide the framework for instruction and discussion.

*Prerequisite:* Permission of instructor  
*Fall, even years, 3 credits*

### HBH 560 Regulatory Biology

A literature-based course focusing on major research areas in molecular and biochemical pharmacology. Examines important drugs, hormones, and neurotransmitters to illustrate how effector molecules interact with and modify the biochemistry of living systems. Topics include the hormonal regulation of gene expression, interactions of drugs and regulatory proteins with nucleic acids and enzymes of nucleic acid metabolism, the central role of adenylate cyclase in cellular regulation, biochemical and molecular actions of mutagens and teratogens, and regulation of cellular function by peptides and proteins. Emphasis on the specificity of drug-receptor interactions and the transduction of this interaction to the biochemical response in the target cell.

*Prerequisite:* Graduate biochemistry  
*Spring semester, 3 credits*

### HBH 564 Genetic Toxicology

An advanced course covering DNA damage in prokaryotic and eukaryotic systems, focusing on molecular mechanisms of cytotoxicity, mutagenesis, and carcinogenesis, and emphasizing biochemical and genetic aspects of DNA repair.

*Prerequisite:* Permission of instructor  
*Fall, 3 credits*

### HBH 570 Biochemical and Molecular Aspects of Parasitology

Lectures on the biology, pharmacology, immunology, and epidemiology of major tropical diseases of man, with special emphasis on biochemical and molecular mechanisms of action of therapeutic agents. Covers selected tropical diseases. In alternate years, the course will consist of a series of seminars presented by participants and invited speakers and will consider potentially attractive subjects for research, applying biochemical and molecular methods to tropical and related pathogens.

*Prerequisite:* Graduate biochemistry  
*Spring semester, 3 credits*

### HBH 580 Selected Topics in Pharmacology

Student seminars and readings on topics to be arranged through consultation with staff.

*Prerequisite:* Permission of instructor  
*Fall and spring semesters, variable credit*

### HBH 590 Pharmacology Seminars

Advanced research seminars by staff and visiting lecturers.

*Prerequisite:* Permission of instructor  
*Fall and spring, 1 credit*

### HBH 599 Graduate Research in Pharmacological Sciences

Original research projects under faculty supervision.

*Prerequisite:* Permission of instructor  
*Fall, spring, and summer, variable credit*

### HBH 686 Minicourse: Advanced Seminars in Pharmacological Sciences

A series of five to six lectures by members of the Stony Brook faculty in conjunction with distinguished outside speakers on topics of current importance in pharmacology and related areas of biochemistry, molecular biology, and cell biology.

*Fall, spring, 1-2 credits*

### HBH 694 Thesis Research in Pharmacology

Original investigation undertaken as part of the Ph.D. program under supervision of thesis adviser and committee.

*Prerequisite:* Permission of thesis adviser  
*Fall, spring, variable credit*

### HBH 800 Full-time Summer Research

Full-time laboratory research projects supervised by staff members.

*Prerequisites:* Permission of instructor and full-time graduate student status  
*Summer, no credit*



# Physiology and Biophysics (HBY)

*Chairperson: Simon J. Pilkis*  
*Health Sciences Center T-6, Room 140 (516) 444-2287*  
*Graduate Studies Director (516) 444-2287*

## Degree Requirements

In addition to the minimum Graduate School requirements, the following are required:

A. Completion of HBY 531, HBY 550, HBY 551, HBY 552, HBY 590, HBY 591, HBY 690, HBY 694, HBY 695.

B. Satisfactory completion of the preliminary examination at the end of the second year of study.

C. Submission of a thesis research proposal by the end of the third year.

D. Participation in the teaching practicum.

E. Submission of an approved dissertation and successful oral defense.

F. Completion of all requirements within seven years.

## Courses

### HBY 501 Physiology

An introduction to normal function of human tissues and organs and their regulation by nervous and endocrine systems. Emphasis on the organization and function of physiological control systems and the maintenance of a constant internal environment. Enrollment restricted to graduate students in disciplines other than basic biological sciences.

*Fall modules, 4 credits*

### HBY 506 Transport

Molecular and ion transport mechanisms in microorganisms, higher cells, and cellular organelles. Emphasis will be placed on the molecular basis of transport functions, their genetic and physiological control, and energy coupling mechanisms in active transport. Membrane structure, chemical composition, and biosynthesis will be considered in terms of their role in membrane transport. Crosslisted with BMO 506.

*Spring, even years, 2 credits*

### HBY 531 Introduction to Mammalian Physiology

An introduction at the graduate level to physiology, with emphasis on human physiology. The principles of cellular physiology are presented, followed by an introduction to the circulatory, respiratory, gastrointestinal, renal, endocrine, and nervous systems.

*Prerequisite: Admission to medical or dental school or permission of instructor*  
*Spring modules, 5 credits*

### HBY 550 Molecular Endocrinology

Deals principally with hormonal regulation of intermediary metabolism and gene expression in a variety of tissues. Covers intercellular and intracellular signaling mechanisms (cAMP, Ca<sup>2+</sup>, IP<sub>3</sub>, etc.), the molecular mechanism of hormonal action, covalent modification of enzyme activity, hormonal control of gene expression, and general mechanisms of enzyme regulation including both membrane-bound and cytoplasmic enzymes.

*Prerequisites: Physiology and biochemistry*  
*Fall, even years, 3 credits*

### HBY 551 Biomembranes

A survey of biological membranes. Major topics to be considered include the structure and assembly of biomembranes, the mobility of the membrane components, molecular neurobiology, membrane transport, the chemosmotic hypothesis, and receptors on biological membranes.

*Prerequisite: An undergraduate course in physical chemistry*  
*Spring, even years, 3 credits*

### HBY 552 Physiology of Excitable Membranes

Topics to be covered in this course include the resting potential, the basis of the action potential, linear cable properties, and synaptic transmission. Model systems studied in detail include squid axon, the neuromuscular junction, and the cardiac Purkinje fiber.

*Prerequisites: Physics, physical chemistry, and calculus*  
*Spring, odd years, 3 credits*

### HBY 555 Applied Math for Electrophysiologists

The derivation and solution of ordinary differential equations is taught in the context of circuit theory and equivalent circuit representations of cells and tissues. Nonlinear circuits, linearization, and piecewise linearization. Fourier series, Fourier transforms, and Laplace transforms. Introduction to diffusion, heat flow, cable theory, and noise analysis.

*Prerequisites: Calculus through differential equations; physics*  
*Spring, odd years, 3 credits*

### HBY 590 Special Topics in Physiology and Biophysics

Student seminars and tutorials on advanced topics to be arranged through consultation with faculty members.

*Prerequisite: Permission of instructor*  
*Fall and spring, 1-2 credits each semester, repetitive*

### HBY 591 Physiology and Biophysics Research

Original investigation undertaken with a member of the staff.

*Prerequisite: Permission of instructor*  
*Fall and spring, 1-12 credits each semester, repetitive*

### HBY 690 Seminar in Physiology and Biophysics

Seminars and discussions on major topics in physiology and biophysics by students, staff, and visiting scientists.

*Prerequisite: Permission of instructor*  
*Fall and spring, 1-2 credits each semester, repetitive*

### HBY 694 Thesis Research in Physiology and Biophysics

Original thesis research undertaken with the supervision of a member of the staff.

*Prerequisite: Permission of thesis advisor*  
*Fall and spring, 1-12 credits each semester, repetitive*

### HBY 695 Practicum in Teaching in Physiology and Biophysics

Practical experience and instruction in the teaching of physiology and biophysics carried out under faculty supervision.

*Prerequisite: Permission of instructor*  
*Fall and spring, 1-4 credits each semester, repetitive*

### HBY 800 Full-Time Summer Research

Full-time laboratory research projects supervised by staff members.

*Prerequisites: Permission of instructor and full-time graduate status*  
*Summer, no credit*

# Guide to the Preparation of Theses and Dissertations

## I Introduction

The submission of a thesis or dissertation is the last step in the program leading to the award of your degree. Your manuscript is a scholarly statement of the results of a long period of research and related preparation. The final copies become official and permanent records available to all for close scrutiny and study. Doctoral dissertations are published in microfilm form, and the abstracts are published in *Dissertation Abstracts International*. Microfilming techniques and interlibrary loan services have made theses and dissertations more accessible than ever before. Thus, theses and dissertations are visible reflections of the quality of work produced by students, advisors, departments, and the Graduate School. It is important, therefore, that your work not be marred by careless errors in form.

This brief guide describes the acceptable form for master's theses and doctoral dissertations at the University at Stony Brook. All questions regarding the quality of the research and writing of a thesis or dissertation should, of course, be directed to your advisor or dissertation director and the supervising committee. If, after reading these guidelines carefully, you still have questions about acceptable format or important deadlines, direct these questions to the Graduate School (516-632-7040) **before** the final draft is typed.

The following guidelines were designed to cover only doctoral dissertations and those master's theses that are filed with the Graduate School. Consult with your departmental graduate advisor if there are any questions about using this guide for internship reports, special reports, practica, or theses that are filed only in your department, as is required in certain degree programs.

## II Important Dates and Procedures

For the exact deadlines to submit your defended and approved thesis or dissertation to the Graduate School, consult the current academic calendar and your department's posting. **Graduate students are urged to complete their theses/dissertations and defenses as early as possible during their final semester.** You are responsible for ensuring that changes suggested by one committee

member are approved by all committee members as soon as possible. If you wait until the last minute, there may not be enough time to make necessary changes in the content or form of your manuscript and to obtain approval of changes from all committee members. Such delays may result in the postponement of graduation until the next awarding date.

The following are general Graduate School procedures that are based on Library, Graduate School, and microfilming requirements. Format regulations are minimal to allow the freedom of choosing individual disciplinary formatting. Also refer to the final checklist in Section XI.

1. Register for at least one credit during the semester in which you intend to graduate.
2. Complete the degree application packet, obtain your graduate studies director's signature on the back of the blue application, and bring the packet to the Office of Records for filing. The graduate studies director's signature does not imply academic clearance; it signifies only that your department is aware of your intention to graduate and that your completion papers should be prepared in time for graduation. Consult the current academic calendar and your department's posting for deadlines. This date is usually three months prior to graduation.
3. Master's theses: Submit an original and two official copies (an original and three copies for Engineering and Basic Health Sciences students). Only the copies will be bound.

Doctoral dissertations: Submit an original and three copies (an original and four copies for Engineering and Basic Health Sciences students). Only two (three) official copies will be bound.

- a. For both master's theses and doctoral dissertations, the original must be packaged in clean, 9" x 12" manila envelopes, with no more than 125 pages in each envelope. An extra copy of the title page of the manuscript must be taped to the front of each envelope. Each remaining copy must be packaged in

its own manila envelope large enough to accommodate it, with a copy of the title page taped to the front.

- b. You are responsible for the cost of binding (in the case of doctoral dissertations, binding and microfilming). Appropriate fees should be paid in the form of a bank or postal money order or *certified* personal check. These are the *only* forms of payment that will be accepted.
- c. Master's candidates: One extra copy of the committee approval page is required.

Doctoral candidates: One extra copy each of committee approval page, title page, and abstract. Additionally, doctoral candidates will be asked to complete the following forms and submit them with the dissertation. These forms are available in the Graduate School and may be picked up at any time.

1. National Research Council's Survey of Earned Doctorates
2. University Microfilms Agreement
3. Exit Questionnaire
4. Ph.D. Employment Form

Note: The completion statement, indicating successful completion of all degree requirements, is normally sent directly to the Graduate School Office from your department after your thesis or dissertation is accepted by the Graduate School.

## III Parts of the Thesis/Dissertation

The completed manuscript falls into three parts: the preliminary pages, the text, and the reference material. The internal arrangement of the text and reference material will be decided in consultation with your thesis/dissertation advisor. Whichever form of organization you decide to adopt, be sure to follow it consistently throughout the thesis or dissertation.

The preliminary pages should be arranged in the following sequence. These pages, unless otherwise indicated below, are numbered in lower-case Roman numerals centered at the bottom of the page within the margin limit.

## Order of Pages and Sections

- a. Title Page: Unnumbered but included in the page count. (See sample, Figure 1.)
- b. Copyright Page (optional): Unnumbered and not included in the page count. (See Section IX, Microfilming and Copyrighting.)
- c. Thesis or Dissertation Committee Approval Page: Page ii of your manuscript. (See sample, Figure 2.)
- d. Abstract: Page iii of your manuscript. (See sample, Figure 3, noting the word limit.)
- e. Dedication Page (optional): Unnumbered but counted.
- f. Frontispiece (optional): Unnumbered and not counted.
- g. Table of Contents: List all parts of the thesis or dissertation that follow the Table of Contents page. Make sure all major divisions are included.
- h. List of Illustrations: Include symbols, figures, tables, illustrations, etc.
- i. Preface (optional): Unnumbered but counted. May include the acknowledgments. No part of the thesis or dissertation essential to an understanding of the main body of the text should be included in the preface.
- j. Acknowledgments (optional): Unnumbered but counted.
- k. Vita, Publications, and Fields of Study (optional): Apply to doctoral dissertations only.
- l. Text: Begin Arabic numbering (see Section V, Pagination). The introduction (optional) and the main body of the thesis or dissertation should consist of well defined divisions, such as parts, chapters, sections, etc., as well as footnotes (see Section VI, Footnotes).
- m. Bibliography: See Section VI, Footnotes, and List of References and Bibliography.
- n. Reference Material: If appropriate, a glossary or a list of abbreviations devised specifically for use in the thesis or dissertation should be included. "List of References," or some similar phrase, should be used to head a list of publications that have been cited in the text. A bibliography may also list publications that have been cited in the text. A bibliography may list publications you have consulted or to which the reader should refer, whether or not they have been cited in the text.
- o. Index (optional): Last portion of this section.
- p. Appendix (optional).

**Figure 1**

### Sample Title Page

Use the term "thesis" if you are a master's candidate. Use the term "dissertation" if you are a doctoral candidate.

Use the complete name for the degree (e.g., Master of Arts, Master of Science, Master of Music, Doctor of Philosophy, etc.)

Your degree program should be stated by its officially approved name. If you wish, departments within programs may be mentioned in parentheses under the name of the program. (**Note:** "Degree program" in this guide refers to programs that have been sanctioned by Albany and the State Department of Education. Campus-approved degree programs are not to be used.) For example,

English  
(Comparative Literature)

Do not place statements of acknowledgment on the title page. If you wish to acknowledge separately the auspices under which your research has been carried out and/or funded you may include a paragraph on a separate unnumbered page following the abstract or include it in your acknowledgment page.

The date at the bottom of the title page is the month (May, August, or December) and year in which the diploma is to be awarded.

**Figure 2**

### Sample Committee Approval Page

Type your full legal name, centered, on the line above the main statement. Initials should not be used.

In the body of the main statement use the term "thesis" if you are a master's candidate. Use the term "dissertation" if you are a doctoral candidate.

Type signature lines according to the number of members on your committee. Underneath each line, fully identify the member by typing his or her name, title, and department. In addition, include the discipline and affiliation of the outside member.

The first line is reserved for your thesis/dissertation advisor. The second line is reserved for the chairperson of the defense. These two designators must not be the same person. Committee members should sign in permanent **black** ink. India ink is considerably more permanent than other inks and is most preferred, but some pens such as Bic black and Scripto permanent black are also acceptable; felt-tip ink is *not*.

**Sample**

**[Title of Thesis or Dissertation]**

**A [Thesis/Dissertation] Presented**

by

**[Full name, including middle name of author]**

to

The Graduate School

in Partial Fulfillment of the Requirements

for the Degree of

**[Full Name of the Degree]**

in

**[Full name of Degree Program]**  
**[Area of Concentration (optional)]**

State University of New York

at Stony Brook

**(Month and Year Diploma Awarded)**

**Sample**

State University of New York

at Stony Brook

The Graduate School

---

**[Your full name above line]**

We, the [thesis/dissertation] committee for the above candidate for the \_\_\_\_\_ degree, hereby recommend acceptance of this **[thesis/dissertation]**.

**[Type the number of lines you need. Under each line, type member's name, title, and department.]**

---

**[Reserved for Dissertation Director]**

---

**[Reserved for Chairperson of Defense]**

---

**[Last line reserved for outside member. Include discipline and affiliation]**

This **[thesis/dissertation]** is accepted by the Graduate School

---

**Figure 3**

**Sample Abstract Page**

On the abstract page, use your full legal name. Do not use initials.

The abstract should consist of a short statement of your research, a brief exposition of the methods and procedures employed in gathering the data, and a condensed summary of the findings of your study.

The doctoral abstract may consist of several pages but is limited to 350 words. It will be published in *Dissertation Abstracts International* without further editing or revision; therefore, special care should be taken in its preparation. The following method will be used for counting words. There should be a maximum of 2,450 typewritten characters per abstract. Count the number of characters (including spaces and punctuation) in a line of average length and multiply by the number of lines. In an average abstract, there will be about 70 characters per line with a maximum of 35 lines.

If you wish, you may leave a longer abstract in your doctoral dissertation if you supplement it with a 350-word summary. This summary will serve as the required extra copy actually used for the publication.

There is no word limit for master's thesis abstracts. However, if it is to be copyrighted, a 150-word limit should be observed.

The date on the abstract is only the year the degree is awarded.

The abstract begins on page iii of the preliminary pages. Continue lower-case Roman numeral pagination throughout the abstract.

<b>Sample</b>
<b>Abstract of the [Thesis/Dissertation]</b>
<b>[Title]</b>
by
<b>[Full name]</b>
<b>[Degree]</b>
in
<b>[Name of degree program]</b>
<b>[Area of concentration (optional)]</b>
State University of New York at Stony Brook
<b>[Year]</b>
[Begin typing abstract here, double spaced, and observing word limit for doctoral dissertations.]

**Figure 4**

**Sample Table of Contents**

The table of contents page is one of the most important parts of your manuscript. The sample shown is only a guide to illustrate a probable form. Your table of contents should list all the main divisions of your manuscript following the table of contents as well as subdivisions within the body, references, appendices, and addenda.

<b>Sample Table of Contents</b>	
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List of Figures . . . . .	vii
List of Tables . . . . .	viii
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Vita, Publications, and Field of Study . . . . .	xi
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Mean Field Equation . . . . .	4
Effect of Fluctuations . . . . .	12
III. Apparatus . . . . .	25
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Temperature Regulations . . . . .	31
IV. Flux Detector . . . . .	34
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Practical Details . . . . .	60
a. DC Transformer . . . . .	76
b. Use as Voltmeter . . . . .	78
V. Experiment . . . . .	80
Sample Construction . . . . .	80
Fluctuation Measurements . . . . .	82
Current Measurements—	
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VI. Conclusion . . . . .	122
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**IV  
Printing Methods**

An original and the requisite number of copies (see Section II, 3a), unbound, of the approved thesis or dissertation must be submitted to the Graduate School before the deadline. See Section II, Important Dates and Procedures. In addition, for doctoral candidates one extra copy of the title page, committee approval page, and abstract are required. Master's candidates need supply only one extra copy of the committee approval page. The graduate school will arrange for binding the copies and for microfilming doctoral dissertations. The binding process usually takes about three months. See Section X for distribution.

There are four approved methods for the preparation of the manuscript. The one you select will depend upon the number of copies you wish to have for your use in addition to the official copies, the cost, and the kinds of material to be reproduced.

You are forewarned that shaded background, lack of sharp contrast between the print and the background, streaking, or spotting will be cause for rejection. If you have doubts about the visual clarity of your manuscript, you should obtain a sample of the copy produced by the equipment you intend to use and bring it to the Graduate School to confirm that it will be accepted.

**1. Computer/Word Processor**

Pica or elite typefaces may be used, but no smaller than elite will be acceptable. Proportional spaced typefaces may be used, provided that the average character spacing is no smaller than 15 per inch. The right-hand margin may be justified or ragged. All official copies of the manuscript must be produced on 8½" x 11" white, 16- to 20-pound bond paper of at least 25 percent rag content. The printing must be clean and letter quality. Dot matrix is usually *not* acceptable, but a ruling on near-letter-quality printfaces may be obtained from the Graduate School on presentation of a full-page print sample.

If a thesis is typeset rather than typed, a typeface of no smaller than 12 point may be used for the text of the thesis. For tabular material, bibliographies, and lists of references 10-point typefaces may be used.

There are three duplicating procedures from which to choose: 1) Print the entire required number of copies on a printer. There is 16- to 20-pound paper available in continuous feed form that may be purchased from commercial stationers. Bear in mind that the edges of the tear sheets must be smooth. 2) Print your original on regulation paper and photocopy the required number of copies on regulation paper. 3) Print your copy on any type of paper and photocopy the required number of copies on regulation paper, one of which will be used as the "original."

The Quick-Copy Center on campus is available to you. For a reasonable rate (currently 2½ cents a copy), photocopying and collating is done; students must supply their own regulation paper. This service is fast and dependable. It is located in the print shop on the first floor of the Administration Building. Their service is on a first-come, first-served basis, but it is suggested that you telephone (2-6220) for an appointment at peak periods such as around deadlines.

**2. Ribbon and Photocopy Process**

Type the manuscript on white, 16- to 20-pound bond paper of at least 25 percent rag or cotton content using an electric

typewriter and a carbon film ribbon. All additional copies are photocopied from the original typescript on regulation paper. See above information on the Quick-Copy Center.

### **3. Multilith Process 1**

Type the manuscript on white paper. This copy is given to a commercial processor who will make a multilith master by a photographic process. The desired number of copies is obtained from this master. The copies must be prepared on 16- to 20-pound bond paper of at least 25 percent rag or cotton content. You may retain the original manuscript and the processed master.

### **4. Multilith Process 2**

Type the manuscript on a multilith master stencil. All copies are obtained from the stencil master. If you use this process there will be no original and you will file all official copies on 16-to-20 pound bond paper of at least 25 percent rag or cotton content.

### **Published Material**

If approved by your advisor and thesis/dissertation committee, reports of research undertaken during graduate study that have been published in appropriate media may be accepted in their printed form as part of your manuscript.

The pages from the published materials themselves must be reproduced by one of the above acceptable methods. As closely as possible standard margins of 1½" should be maintained on these pages; this may necessitate enlargement or reduction of the materials. If there is a need to use oversized materials, see instructions for oversized materials in this section.

### **Non-Typed Material**

In preparation for any of the above processes, if symbols, equations, formulae, accent marks, etc., are drawn by hand, they must be done in permanent black ink (Bic black and Scripto permanent black will be accepted); felt-tip pens or ballpoints are not to be used. This requirement also applies to signatures on the committee approval page. If Multilith Process 2 is used, you should obtain information from the commercial processor on the special procedures to be followed for hand drawings.

### **Photographs**

Photographs, either singles or composites, must be within the required margins of 1½". Captions may be included on the photographs themselves, or, if space permits, on the same page, rather than on a facing caption page.

Multilith reproduction of photographs may be used. Copies may also be prepared on single-weight matte finish photographic paper. Glossy photographs guaranteed by the photographer not to crack

or break are acceptable, as are photographs on resin-coated polycontrast paper. If you intend to glue your photographs onto regulation paper, you will need as many prints of each photograph as there will be copies of the manuscript.

Color photographs may be used, but keep in mind that they will appear in black and white on reproduced copies, so that color alone must not be relied upon for illustrative or interpretive purposes, unless a color photocopier is used or you provide a separate print for each copy.

The negative is required for each single or composite picture. The negatives are submitted with your manuscript, each in a separate envelope on which you list your name, department, name of your dissertation director, title of your manuscript, and the figure (or plate, etc.), and page number of the photograph within the manuscript.

If the print is an enlargement or reduction from the original negative, the ratio of enlargement or reduction must also be noted on the envelope. If negatives are not available for inclusion, a typewritten statement informing the Graduate School where they are located should be supplied to be kept on file. If negatives do not exist, as in the case of polaroid photographs, a typewritten statement to this effect is required.

### **Drawings**

All drawings must be produced to the highest standards of draftsmanship, using permanent black ink. Drawings may be made directly onto regulation paper. A more common method is to draw them on vellum-type paper and then have copies multilithed or photocopied. Copies prepared this way are permissible in the original manuscript.

### **Oversized Material**

When materials larger than the standard size page (8½" x 11") are included in the manuscript, they should first be reduced as much as possible, consistent with their use. Charts and graphs may often be reduced in size by a photographic process or on a photocopying machine with a reducing feature. Form letters, questionnaires, and other printed material should be kept within the required margins when reproduced. Whenever material is enlarged or reduced to meet the margin requirements, it is acceptable to include these reproduced pages in your original copy.

If your material is oversized and cannot be reduced, you may fold the material to manuscript size. The maximum dimensions of materials that may be bound into the manuscript are 17" x 22" before folding. The fold should be made in a pleating fashion, and the folded edges should not be less than ½" from either edge of the

manuscript so that they will not be cut or sewn in binding. The maximum dimensions for the material, when folded, are 8" x 10".

Oversized material larger than 17"x 22" should be folded and inserted into a pocket and placed at the end of your manuscript. Special pockets may be purchased at commercial stationers or you may construct your own by cutting down the open end of a manila envelope. When such a special pocket is required, the reference to the material it contains should be made in the text. In the list of figures, illustrations, tables, etc., the following note should be made: "Plates 1 through (last plate number) in pocket in back cover." The oversized materials themselves should not be assigned page numbers, but your name and the title of your thesis or dissertation should appear on each sheet in the lower right-hand corner.

### **Graphs**

You may use any graph paper as long as the official copies are reproduced on regulation paper and within the required margins. If you wish the grid to reproduce, use red-lined graph paper.

### **Maps**

You should consult with your advisor concerning the appropriateness of maps being included in your thesis or dissertation. Maps should be folded according to the instructions for oversized material, above.

### **Units**

For scientific work, SI units must be used except where there is good reason not to do so, for example, where it is the accepted practice of workers in the field to use other units.

### **Overall Appearance**

The text of the thesis or dissertation must be clear and grammatical. Grossly illiterate work will not be accepted. Interlineations, crossed out letters or words, strikeouts, pencil markings, and visible or extensive erasures or corrections will not be accepted in the final copies submitted for deposit. No material may be secured in your manuscript by paper clips, staples, or adhesive tape.

## **V**

### **Physical Specifications**

A thesis or dissertation reflects the quality of work produced by the author, the advisor, the department, and the Graduate School. Therefore, it is important that the final manuscript is properly collated and not marred by poor spelling, sloppy punctuation, or other careless errors. To avoid these problems you are urged to use **qualified professional typists who are acquainted with this guide.** If you need

assistance in contacting a qualified typist, a list of recommended typists is kept in the Graduate School Office. Before you give your manuscript to a typist, you should contact the typist and discuss his or her experience, time schedule, and fees. Keep a copy of any material given to a typist.

### **Paper**

Official copies of the thesis or dissertation must be prepared on white, unpunched, 16- to 20-pound bond paper of at least 25 percent rag or cotton content. Onion skin or easy-erase paper will not be accepted. Use 8½" x 11" paper.

### **Typefaces**

Pica or elite typefaces may be used, but no type smaller than elite will be acceptable. Use a good quality, all-black ribbon. If using a standard electric typewriter, several spools of ribbon should be rotated in use to obtain an even impression. On a typewriter with a one-time ribbon, use a good-quality acetate black ribbon.

Whether using a typewriter or computer, the same machine must be used for the entire dissertation or thesis since the manuscript will be rejected if it lacks visual uniformity. Exceptions will be made in the case of format style, when larger type is used for chapter or division headings, or if it is necessary to change type for equations or symbols. Corrections and retyping of pages must be done on the same machine used in preparing the rest of the manuscript.

### **Corrections**

Keep corrections to a minimum. No interlineations, crossing out of letters or words, strikeouts, pencil markings, or extensive erasures are permitted. Correction strips treated with corrective powder and correction fluid, when properly applied, are satisfactory. However, they should be used sparingly. Do not cover errors with any type of correction tape.

### **Spacing and Indentation**

The body of your manuscript should be double spaced. There are some machines that produce the equivalent of double spacing with a space and a half. The first line of each paragraph should be indented five spaces. The first line of the text of each chapter or major division should be six spaces below the last line of the chapter title or section heading. Refer to instructions in Section VI on spacing for quotations, footnotes, references, and appendices.

### **Margins**

All margins of the text—top, bottom, right, and left—should measure 1½ inches from the edges. The pages are usually trimmed at the bindery, so it is important to adhere to these specifications.

### **Hyphenation**

Avoid dividing words at the end of more than two successive lines of text. Do not divide the word at the end of the last line of text on any page.

### **Pagination**

Page numbers should be computer generated or typed. Hand numbering will be cause for rejection of your manuscript. The preliminary pages are numbered in lower-case Roman numerals at the bottom center. Every page in the main body must be consecutively numbered in Arabic numerals at the *upper right corner*. This includes figures, tables, photographs, illustrations, etc. If caption pages are used facing such material they are numbered in the upper left hand corner. (See information on captions in Section VI.) Photographic paper onto which type will not adhere need not be numbered but must be counted. See information on the order of pages and sections under Section III for numbering optional preliminary pages. As a further exception, oversized sheets that are placed in a special pocket in the back cover are not assigned page numbers (see information on oversized material under Section IV).

Letter suffixes such as 10a, 10b, 10c, etc., are not permitted. If it becomes necessary to make additions to your completed manuscript, you may add them in the form of an addendum at the end. No punctuation of any kind should be used with page numbers.

## **VI**

### **General Format Information**

#### **Footnotes**

If the nature of your footnotes allows, they should be placed at the bottom of the page. This form is especially convenient for students and scholars who consult microfilm copies of the thesis or dissertation. Each entry should be contained in its entirety on the page and not continued on to the next page. If your footnotes contain extensive commentary (as opposed to simple references), they may be placed at the end of the chapters or at the end of the manuscript. If you place footnotes at the end of the chapters, there should be, in place of the first footnote you would otherwise put on the bottom of the page, a note indicating the inclusive pages where the footnotes may be found. You need do this only once in each chapter that will have footnotes.

Each footnote should be single spaced if it continues beyond one line, and double spaced between each entry. If footnotes are placed at the bottom of the page, they should be separated from the main

part of the text by an unbroken line that extends the length of 20 spaces from the left margin. This line should begin two spaces beneath the last line of your text.

The form of footnotes themselves may be that customarily employed in publications addressed to the discipline concerned. Parenthetical notations in your text are also permissible. (i.e., author's name, year, page number etc.), as long as they are detailed in your bibliography. You are urged to check your footnotes and bibliography very carefully to avoid complaints from librarians and scholars about inaccurate or poorly organized entries.

#### **Quotations**

The recommended practice is to include prose quotations of fewer than six lines as regular running lines of text, enclosed within quotation marks. If the quotation exceeds six lines, single space the entire quotation, beginning two lines below the last line of the regular text. Indent the quotation on both the left and the right margins for a centering effect. Paragraphs within the indented quotation should be indented an additional four spaces. No quotation marks are used for quotations thus set off from the regular text.

A quotation within a quotation should be enclosed within single quotation marks whether it appears as a running line of the text or is set apart.

Quotations of poetry not exceeding one line may be included in the running line of text, enclosed within quotation marks. More than one line should be set apart from the text in the same way as prose quotations of more than six lines. Quotations of poetry set off from the text should be centered on the page.

#### **List of References and Bibliography**

Prepare your list of references and bibliography using the form of citation that is standard in your field or the form prescribed in any standard manual of style. Single space each entry if it continues beyond one line, and double space between each entry.

#### **Appendices**

The text in appendices may be single or double spaced. Single spacing is recommended, but if the text of the appendix is extensive, double spacing may prove to be more readable.

#### **Figures**

Figures and tables may be placed in groups either following chapters or at the end of your manuscript. They may also be interspersed throughout the text of your manuscript. Your decision should be based on what would produce the most clarity for your reader. Drawings may be done by hand, in permanent black ink,

directly on regulation paper. A more common method is to draw them on vellum-type paper and then have copies multi-lithed or photocopied. Copies prepared this way are permissible in the original manuscript.

Figures and tables must be captioned. If a page must be turned to read a figure or table, the edge to be bound should be the top of the figure, and the caption should appear at the bottom (which is along the right-hand margin when the manuscript is in normal reading position), allowing for regulation margin of 1½". All captions must be listed in the List of Figures or Tables in the preliminary pages (see sample Table of Contents). For figures or tables that have parts, such as a,b,c etc., you must caption each part.

If your figure or table is too large to allow room for a caption, prepare a caption page that precedes the figure or table and appears to the reader face to face with the table or figure. Indicate the page number of the figure itself, not the facing caption page, in the List of Figures and Tables.

### **Captions**

Unless the caption or identifying legend appears on the page with the figure or illustration, captions should be placed on a page facing the figure or illustration. The text of the caption should be centered on the page, double spaced, with the page number in the upper left hand corner, as indicated above in the pagination section. If the caption is on the same page as the figure or illustration, it may be single spaced and should be printed either at the top or bottom of the page. If the page must be turned to be read, the top will be the bound edge and the caption will appear at the bottom, which is the right-hand margin in the normal reading position. When preparing a caption page for a figure or illustration that must be turned to be read, the caption page should be typed so that, when turned, it may be easily read above the figure or illustration page.

## **VII**

### **Permissions for Copyrighted Material**

The filing of a thesis or dissertation in a library is generally presumed to constitute publication in a legal sense. The reproduction of a dissertation by University Microfilms is similarly regarded as a form of publication. Consequently, you are expected to conform with the provisions of the copyright law with regard to quoting from copyrighted material. For this reason, University Microfilms requires that you subscribe to the following statement, which appears on the agreement form:

The author hereby certifies that the use of any copyrighted material in the manuscript beyond brief excerpts is with the permission of the copyright owner, and will save and hold harmless University Microfilms from any damage which may arise from such copyright violations.

Subscription to this section does not mean that you must ask permission from the copyright owners for every quotation of a prose passage of approximately 150 words, nor does the quotation of a few lines of verse in a work of scholarship or criticism call for permission; however, these general considerations do not absolve you from your responsibility in the matter of copyrighted materials. If you quote continuously or extensively from a particular author, especially in such fields as fiction, drama, poetry, or criticism, or if you reproduce maps, charts, statistical tables, or other similar materials that have been copyrighted, you must write to the copyright owner(s), describe the use to which you are putting the material, and request permission to include it in your thesis or dissertation. This practice also applies if you cite your own published work(s) and your publisher holds the copyright.

For your protection, a statement listing such materials should be included in your thesis or dissertation under Acknowledgments. The statement should indicate 1) that permission has been granted for their use, and 2) the source(s) of the permission (see also the information on published material in Section IV.

If your published material lists a coauthor, and if the coauthor is listed by reason of having directed and supervised the research that serves as the basis of the thesis or dissertation, list only your name as the author in the preliminary pages of your thesis or dissertation. In the Acknowledgments you will state, "The text of this (thesis/dissertation) (in part/in full) is a reprint of the materials as it appears in (names of publications). The coauthor(s) listed in the publication(s) directed and supervised the research that forms the basis for this thesis or dissertation."

It is your responsibility to resolve any copyright problems arising from the use of published material.

If you own the copyright of the published material, you must supply a copyright page showing the following information for each publication:

Copyright by (name of author/  
copyright owner)

Copyright Registration Number: \_\_\_\_\_  
(obtain this number from copyright  
certificate)

(year copyright was obtained)

For a master's thesis, when the copyright owner is other than yourself, a written statement from the copyright owner(s) is sub-

mitted when the thesis is filed, granting you permission to use the copyrighted material and for the University at Stony Brook to reproduce the material by photocopy or in microfilms on a one-at-a-time basis.

For a doctoral dissertation, when the copyright owner is other than yourself, a written statement from the copyright owner(s) is submitted when the dissertation is filed, granting you permission to use the copyrighted material and authorizing University Microfilms to sell microfilm copies on a one-at-a-time basis.

No thesis or dissertation incorporating reprinted material that has been copyrighted will be accepted without appropriate authorization.

## **VIII**

### **Assembling your Thesis/ Dissertation for Deposit with the Graduate School**

You are urged to deposit the final copies of your thesis or dissertation as early as possible during the semester in which you expect to receive your degree. Consult the Graduate School for deadlines.

After you have successfully passed your defense or colloquium, obtain the signature of each of your committee members on the committee approval page. The signatures must be in black ink. Photocopy the appropriate number of copies of this page so that there will be a copy for every manuscript. Present the original and copies of this page as separate items when you file your thesis or dissertation.

Assemble your manuscript by placing the original and the requisite number of copies (see Section II, 3a) in strong manila clasp envelopes of appropriate size. The copies must be unbound and unperforated. You can then bring the envelopes to the Graduate School for the signature of the vice provost and for filing. An extra copy of the title page should be affixed to the outside of each envelope to serve as an identifying label. Mark one envelope "original" and the others "copy" as appropriate. If your manuscript is over 500 pages, it should be divided into two equal parts, labeled appropriately as Part I and Part II, for binding into two volumes.

Your official copies will be examined by the Graduate School to determine whether they meet the requirements outlined in this guide. After the vice provost for graduate studies signs the committee approval page your department will be notified. If you have completed all other requirements for the degree, your department will send the Graduate School a completion statement.

After your thesis or dissertation has been deposited with the Graduate School you may not withdraw it from the university until

the circulating copy has been bound, cataloged, and placed on the shelf in the library. The archival copy may not be withdrawn at any time, but may be consulted in the library.

#### **Distribution**

The original copy of your thesis or dissertation is placed in the Library Archives, unbound, and used for interlibrary loans. One bound copy is placed on the shelves in the Library Thesis Room. One bound copy is given to your department library, and, in the case of the Engineering and Basic Health Sciences students, one copy is designated for each respective dean's office.

There is no other official distribution. If you wish to distribute bound copies to your advisor or committee members, you must arrange to have additional copies bound by the Career Development Office (632-6810) and distribute them yourself.

### **IX**

#### **Microfilming and Copyrighting**

The Graduate School will send the original manuscript of all doctoral dissertations to University Microfilms International in Ann Arbor, Michigan, where they will be microfilmed, and the abstract published in *Dissertation Abstracts International*. A master microfilm of each dissertation is assigned a publication number and then kept on deposit. You will be issued your publication number directly from UMI approximately four months after you file your dissertation. This number is used to order your microfilm copies. When the original manuscript is returned to campus, it is deposited in the Main Library Archives. The original of master's theses are not microfilmed. They are sent directly to the Archives from the Graduate School. To order a photocopy of a thesis, contact the preservation officer in the Library. There is a fee for this service.

Students in the Ph.D. in Music Composition program should consult the Department of Music graduate studies director for separate guidelines on publication of their compositions with the American Music Center.

#### **Microfilm Agreement**

When you file your dissertation you will be required to sign an agreement form with UMI, at which time you may take the option to copyright your dissertation (see information on copyrighting in this section). This form is part of the doctoral Exit Questionnaire packet, available in advance from the Graduate School.

#### **Fee**

There is a fee (currently \$45.00) for microfilm publication. This fee includes the

publication of your abstract in *Dissertation Abstracts International*. Payment is to be in the form of a certified personal check (your bank will certify your check, usually for a fee), or a bank or postal money order, made payable to University Microfilms International. Before preparing your check or purchase order, confirm the current fee with the Graduate School.

#### **Copyrighting the Doctoral Dissertation**

Since your doctoral dissertation will be published in microfilm form by University Microfilms, it is important to decide whether you want the protection of a copyright. The danger of fraudulent reproduction or improper use of a dissertation is not likely to be very great. Whether or not your dissertation should be copyrighted depends on the nature of the materials and your plans for its future publication or revision. In deciding the matter, the following considerations are pertinent.

Whether or not the dissertation is copyrighted, you retain the right to publish all or any part of your dissertation by any means at any time, except by reproduction from a negative microfilm as described in the Microfilms Agreement Form that you sign. It is important to note that, as the author, you will be unable to obtain copyright for the publication of your dissertation in another form at some later date unless you have obtained copyright at the time of first publication by University Microfilms, or unless the dissertation has been so thoroughly and completely revised as to constitute a new work.

The university does not have a mandatory policy on copyrighting doctoral dissertations. You may, however, take the option to copyright your dissertation by completing the copyright section on the Microfilm Agreement Form. If you decide to copyright, University Microfilms will obtain a copyright for your dissertation in your name. The present fee for this service is \$25.00 and includes the \$10.00 registration fee imposed by the Copyright Office in Washington, D.C., and the cost of two positive microfilm copies deposited in the Library of Congress. This \$25.00 fee may be included with the \$45.00 microfilm fee, making a total of \$70.00, payable to University Microfilms. The certificate of registration will be mailed to you approximately five months after University Microfilms receives your dissertation.

A copyright page should be placed in your dissertation following the title page. In the center of the page, just above the bottom margin, type the following:

Copyright by  
(your full name)  
(current year)

#### **Copyrighting the Master's Thesis**

Copyrighting your master's thesis is optional. However, you may copyright your manuscript independently through the Copyright Office of the Library of Congress, Washington, DC 20557 (phone 703-557-8700).

If you decide to copyright your manuscript, a copyright page should be placed in your thesis following the title page. In the center of the page, just above the bottom margin, type the information, shown above, for a doctoral dissertation that is to be copyrighted.

### **X**

#### **Binding the Thesis/Dissertation**

After you have filed your original and the requisite number of copies (see Section II, 3a), the Graduate School will arrange for binding of the copies in a standardized fashion for distribution to the Thesis Room of the library and to your department library. In the case of Engineering and Basic Health Sciences, a bound copy is retained in each respective dean's office. The original remains unbound in the Library Archives. Ph.D. students in music composition will submit their compositions already bound. Consult with your graduate studies director for special guidelines.

The fee for binding is currently \$5.95 per copy. There is a minimum charge of \$11.90 (\$17.85 for Engineering and Basic Health Sciences students). If your manuscript is over 500 pages it will be bound in two volumes at the cost of \$11.90 for two volumes. Payment for binding all copies is due when official copies are filed with the Graduate School. You must obtain either a certified personal check (your bank will certify your check) or a money order, which may be purchased at any bank or post office. The Graduate School will not accept cash or any other form of payment. Make your payment payable to Ruzicka Library Bindery.

The binding process takes approximately three months. When the bound copies are returned from the bindery, the library will notify your department to collect its copy.

### **XI**

#### **Final Checklist for Filing a Thesis/Dissertation with the Graduate School**

The criteria set forth in this guide have been established and must be followed in order that each manuscript accepted for official deposit in the University at Stony Brook Library, and for publication by the University Microfilms, is a uniform document. Before presenting your thesis or dissertation to the Graduate School be certain that you have followed the guidelines correctly.



Listed below is a summary of steps you need to go through in order to obtain your degree. To avoid unnecessary delays please follow these instructions carefully.

### **General Requirements for Degree Candidates**

Enrolled for at least one credit in the semester in which you wish to graduate  
All outstanding university fees paid  
All library books returned  
Defense or colloquium completed  
Committee approval page signed by all members of your committee  
Applied for diploma

### **Graduate School Exit Questionnaire Packet Completed (Doctoral Candidates Only)**

Microfilm Agreement (not for D.M.A. or Ph.D. in Music Composition)  
National Research Council Survey of Earned Doctorates  
Employment Data Form  
Exit Questionnaire

### **One Extra Copy of the Following Pages for Graduate School Use**

Committee approval page signed by all members of the defense (signatures must be in black ink)  
Title page (Ph.D. dissertations only)  
Abstract (Ph.D. dissertations only)

### **Payments: Certified Personal Checks or Money Orders Only**

Microfilming fee (doctoral candidates only) made payable to University Microfilms International  
Copyright fee (optional, doctoral candidates only) made payable to University Microfilms International; may be combined with above fee  
Binding fee, made payable to Ruzicka Library Bindery. (Do not include the original when figuring your binding cost.)

### **Thesis/Dissertation**

Original and the requisite number of copies (see Section II, 3a) prepared on 16- to 20-pound bond paper with 25 percent rag or cotton content  
The original and each copy in a clasp envelope with a copy of the title page affixed to the front of the envelope  
Every page consecutively numbered  
Preliminary pages prepared according to sample pages shown in this guide  
Copyright page (optional, doctoral candidates only) placed directly after title page, unnumbered and uncounted, in the form shown in this guide. Copyright request signed in Microfilm Agreement

## **XII**

### **Preparing the Dissertation for the Ph.D. in Music Composition**

For the Ph.D. degree in music composition, the dissertation consists entirely of music either conventionally notated, electronically recorded, or both, along with the preliminary pages specified in this guide. Candidates must submit three approved copies of the dissertation to the Graduate School by the date announced in the academic calendar to qualify for the degree in that semester. Both copies will be deposited in the university libraries, one in the University Archives and the other in the Music Library. In addition, one extra copy each of the title page, committee approval page, and abstract must be submitted to the Graduate School. For works comprising nine or fewer performers, a set of performing parts may be submitted in addition to the required full score. The parts will be housed in the Music Library.

For works consisting wholly of electronic music, three copies of the preliminary pages (title page, committee approval page, and abstract), along with three copies of the dissertation itself, must be submitted in three separate manila envelopes with clasps for deposit in the library.

A table of contents is not required for music compositions. The abstract should be a statement describing the performing forces and may include other information that would inform a prospective reader about the work.

#### **Microfilming**

Microfilming the dissertation in composition is not required. Candidates in composition may, at their discretion, choose to have the dissertation submitted to University Microfilms International for microfilming, in which case the general Graduate School guidelines for submitting such dissertations must be followed. Whether or not the dissertation is submitted to University Microfilms, the abstract will be submitted to *Dissertation Abstracts International* with this statement:

This dissertation is available for consultation at and on inter-library loan from the Music Library at the State University of New York at Stony Brook.

#### **Physical Specifications of the Score**

The three unbound copies should be submitted on high-quality, acid-free paper. The copying process must be one that does not result in excessively acidic paper (which browns and deteriorates quickly). For this reason, the diazo process—also known as ozalid and blueprint—is *not* acceptable.

A photoreproduction process such as Xerox is acceptable if done on high-quality acid-free paper. Shaded background, lack of sharp contrast between the print and the

background, streaking, or spotting will be cause for rejection of the photoreproduced copy. If you have doubts about the visual clarity of the copies, you should submit a sample of the copy produced by the machine you intend to use to the Graduate School for a judgment. The music librarian is able to supply names of music copying services that use the photoreproduction process. If you are considering any copying process other than photoreproduction, you must receive approval from the music librarian.

All margins—top, bottom, right, left—should measure 1½ inches from the edges. The pages may be trimmed during binding, so it is important to adhere to these specifications. Sheets punched for spiral binding are not acceptable. Because of preservation considerations, absolutely no adhesive tapes, glue, or paste may be used anywhere on the score.

For scores accompanied by pre-recorded electronic music, a statement that an electronic tape accompanies the score should appear prominently on the score.

#### **Specifications of the Electronic Music Tape**

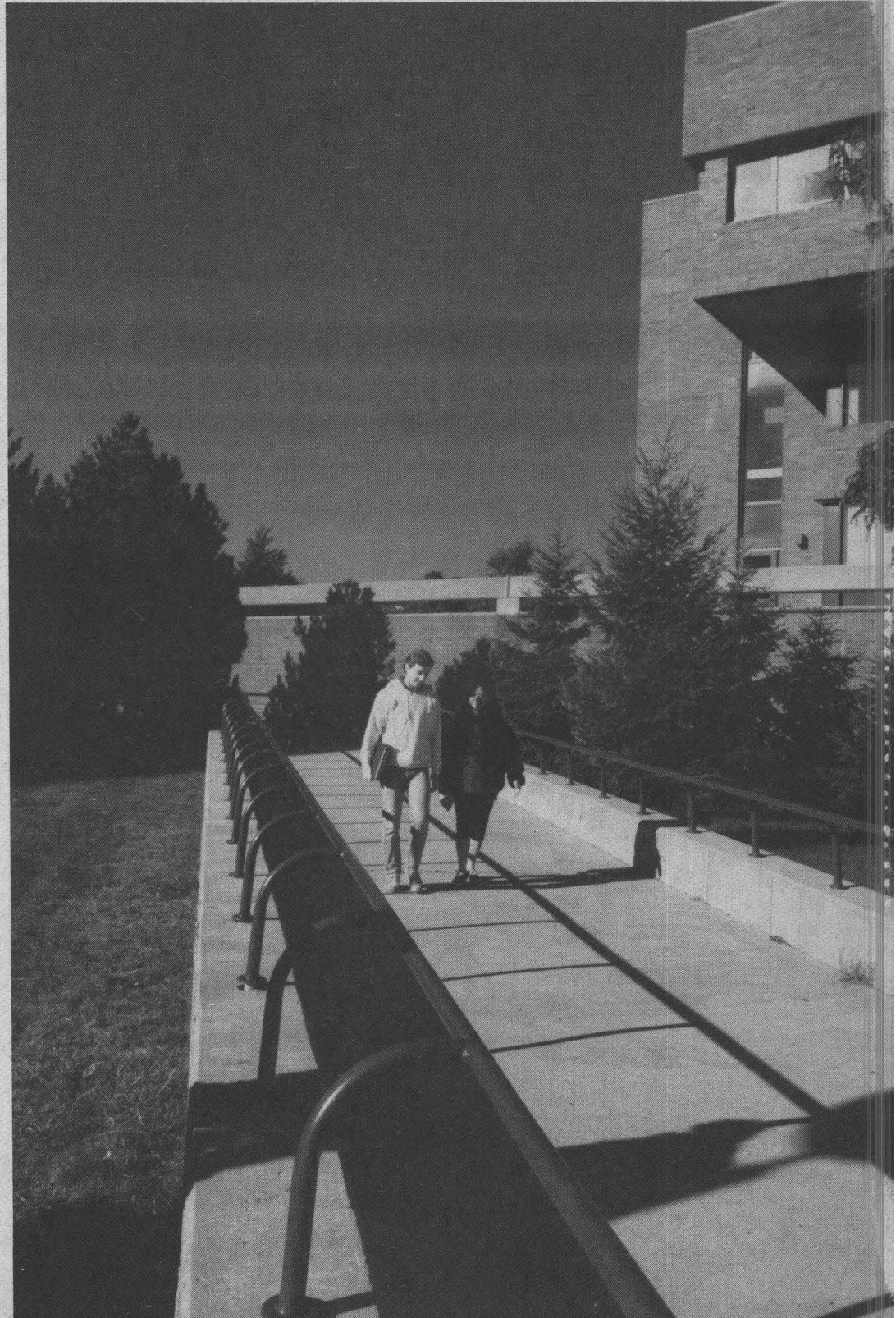
Tape on which the work is recorded should be of archival quality, at least 1.0 mil thick. Cassette tapes are not acceptable. Tapes should be ½-track stereo, recorded at 7½ ips, and wound "tails out" on 7-inch open reels. If the nature and length of the work require it, a 10-inch reel may be used, and the speed may be 15 ips. Each reel should contain only the length of tape required for the musical work. Leader should be attached to each end of the tape. Each tape must be submitted in a sturdy container. Tapes and containers must each be labeled with the composer's name, the title of the work, and appropriate technical information. The containers must list the date of composition and the duration of the work, and might also include a brief statement identifying such aspects as the sound source and the mechanical process of the work.

#### **Binding the Dissertation**

After you have filed two copies with the Graduate School, one copy will be sent to the bindery and bound for deposit in the Music Library. The other copy remains unbound in the University Archives. You may submit additional personal copies for binding when you file the official copy.

To determine the cost of binding the dissertation, you must make an appointment to show your official copy to the music librarian, who will ascertain the cost. Payment for binding all copies is due at the time the official copy is filed in the Graduate School. Consult the Graduate School for details concerning method of payment.

# Directories, Index, Map



## STATE UNIVERSITY OF NEW YORK

### General Statement

State University's 64 geographically dispersed campuses bring educational opportunity within commuting distance of virtually all New York citizens and compose the nation's largest centrally managed system of public higher education.

When founded in 1948, the university consolidated 29 state-operated, but unaffiliated, institutions. In response to need, the university has grown to a point where its impact is felt educationally, culturally, and economically the length and breadth of the state.

More than 390,000 students are pursuing traditional study in classrooms or are working at home, at their own pace, through such innovative institutions as Empire State College, whose students follow individualized and often nontraditional paths to a degree. Of the total enrollment, more than 131,000 students are 25 years or older, reflecting State University's services to specific constituencies, such as refresher courses for the professional community, continuing educational opportunities for returning service personnel, and personal enrichment for more mature persons.

State University's research contributions are helping to solve some of modern society's most urgent problems. It was a State University scientist who first warned the world of potentially harmful mercury deposits in canned fish, and another who made the connection between automobile and industrial exhaust combining to cause changes in weather patterns. Other university researchers continue important studies in such wide-ranging areas as immunology, marine biology, sickle-cell anemia, and organ transplantation.

More than 1,000 public service activities are currently being pursued on State University campuses. Examples of these efforts include special training courses for local government personnel, state civil service personnel, and the unemployed; participation by campus personnel in joint community planning or project work; and campus-community arrangements for community use of campus facilities.

A distinguished faculty includes nationally and internationally recognized figures in all the major disciplines. Their efforts are recognized each year in the form of such prestigious awards as Fulbright-Hayes, Guggenheim, and Danforth fellowships.

The university offers training in a wide diversity of conventional career fields, such as business, engineering, law, medicine, teaching, literature, dairy farming, medical technology, accounting, social work, forestry, and automotive technology. Additionally, its responsiveness to progress in all areas of learning and to tomorrow's developing societal needs has resulted in concentrations that include the environment, urban studies, computer science, immunology, preservation of national resources, and microbiology.

SUNY programs for the educationally and economically disadvantaged have become models for delivering better learning opportunities to a once forgotten segment of society. Educational Opportunity Centers offer high school equivalency and college preparatory courses to provide young people and adults with the opportunity to begin college or to learn marketable skills. In addition, campus-based Educational Opportunity Programs provide counseling, developmental education, and financial aid to disadvantaged students in traditional degree programs.

Overall, at its EOCs, two-year colleges, four-year campuses, and university and medical centers, the university offers 4,399 academic programs. Degree opportunities range from two-year associate programs to doctoral studies offered at 12 senior campuses.

The 30 two-year community colleges operating under the program of State University play a unique role in the expansion of educational opportunity. They provide local industry with trained technicians in a wide variety of occupational curricula, and offer transfer options to students who wish to go on and earn advanced degrees.

The university passed a major milestone in 1985 when it graduated its one-millionth alumnus. The majority of SUNY graduates pursue careers in communities across the state.

State University is governed by a board of trustees, appointed by the governor, that directly determines the policies to be followed by the 34 state-supported campuses. Community colleges have their own local boards of trustees whose relationship to the SUNY board is defined by law. The state contributes 33 to 40 percent of their operating costs and one-half of their capital costs.

The State University motto is "To Learn—To Search—To Serve."

### Campuses

#### University Centers

State University of New York at Albany  
 State University of New York at Binghamton  
 State University of New York at Buffalo  
 State University of New York at Stony Brook

#### Colleges of Arts and Science

State University College at Brockport  
 State University College at Buffalo  
 State University College at Cortland  
 State University of New York Empire State College  
 State University College at Fredonia  
 State University College at Geneseo  
 State University College at New Paltz  
 State University College at Old Westbury  
 State University College at Oneonta  
 State University College at Oswego  
 State University College at Plattsburgh  
 State University College at Potsdam  
 State University College at Purchase

#### Colleges and Centers for the Health Sciences

State University of New York Health Science Center at Brooklyn  
 State University of New York Health Science Center at Syracuse  
 State University of New York College of Optometry at New York City  
 Health Sciences Center at SUNY at Buffalo\*  
 Health Sciences Center at SUNY at Stony Brook\*

#### Colleges of Technology and

#### Colleges of Agriculture and Technology

State University of New York College of Technology at Alfred  
 State University of New York College of Technology at Canton  
 State University of New York College of Agriculture and Technology at Cobleskill  
 State University of New York College of Technology at Delhi  
 State University of New York College of Technology at Farmingdale  
 State University of New York College of Agriculture and Technology at Morrisville  
 State University of New York College of Technology at Utica/Rome\*\* (Upper-division and master's programs)  
 Fashion Institute of Technology at New York City\*\*\*

\* The Health Sciences Centers at Buffalo and Stony Brook are operated under the administration of their respective university centers.

\*\* This is an upper-division institution authorized to offer baccalaureate and master's degree programs.

\*\*\* While authorized to offer such baccalaureate and master's degree programs as may be approved pursuant to the provisions of the Master Plan in addition to the associate degree, the Fashion Institute of Technology is financed and administered in the manner provided for community colleges.

### Specialized Colleges

State University of New York College of Environmental Science and Forestry at Syracuse  
State University of New York Maritime College at Fort Schuyler

### Statutory Colleges\*\*\*\*

New York State College of Agriculture and Life Sciences at Cornell University  
New York State College of Ceramics at Alfred University  
New York State College of Human Ecology at Cornell University  
New York State School of Industrial and Labor Relations at Cornell University  
New York State College of Veterinary Medicine at Cornell University

### Community Colleges

(Locally sponsored two-year colleges under the program of State University)

Adirondack Community College at Glens Falls  
Broome Community College at Binghamton  
Cayuga County Community College at Auburn  
Clinton Community College at Plattsburgh  
Columbia-Greene Community College at Hudson  
Community College of the Finger Lakes at Canandaigua  
Corning Community College at Corning  
Dutchess Community College at Poughkeepsie  
Erie Community College at Williamsville, Buffalo, and Orchard Park  
Fashion Institute of Technology at New York City\*\*\*  
Fulton-Montgomery Community College at Johnstown  
Genesee Community College at Batavia  
Herkimer County Community College at Herkimer  
Hudson Valley Community College at Troy  
Jamestown Community College at Jamestown  
Jefferson Community College at Watertown  
Mohawk Valley Community College at Utica  
Monroe Community College at Rochester  
Nassau Community College at Garden City  
Niagara County Community College at Sanborn  
North Country Community College at Saranac Lake  
Onondaga Community College at Syracuse  
Orange County Community College at Middletown  
Rockland Community College at Suffern  
Schenectady County Community College at Schenectady  
Suffolk County Community College at Selden, Riverhead, and Brentwood  
Sullivan County Community College at Loch Sheldrake  
Tompkins Cortland Community College at Dryden  
Ulster County Community College at Stone Ridge  
Westchester Community College at Valhalla

\*\*\* While authorized to offer such baccalaureate and master's degree programs as may be approved pursuant to the provisions of the Master Plan in addition to the associate degree, the Fashion Institute of Technology is financed and administered in the manner provided for community colleges.

\*\*\*\* These operate as "contract colleges" on the campuses of independent universities.

### Board of Trustees

Frederic V. Salerno, B.S., M.B.A., Chairperson ..... Rye  
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Subject to the powers of State University trustees defined by law, the operations and affairs of the State University at Stony Brook are supervised locally by a ten-member Council. Nine are appointed by the Governor; the tenth, a student member with all the rights and responsibilities of the other members, is elected by the student body. All positions are listed correct as of July 1, 1990.

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Miriam Caulfield, *Secretary*  
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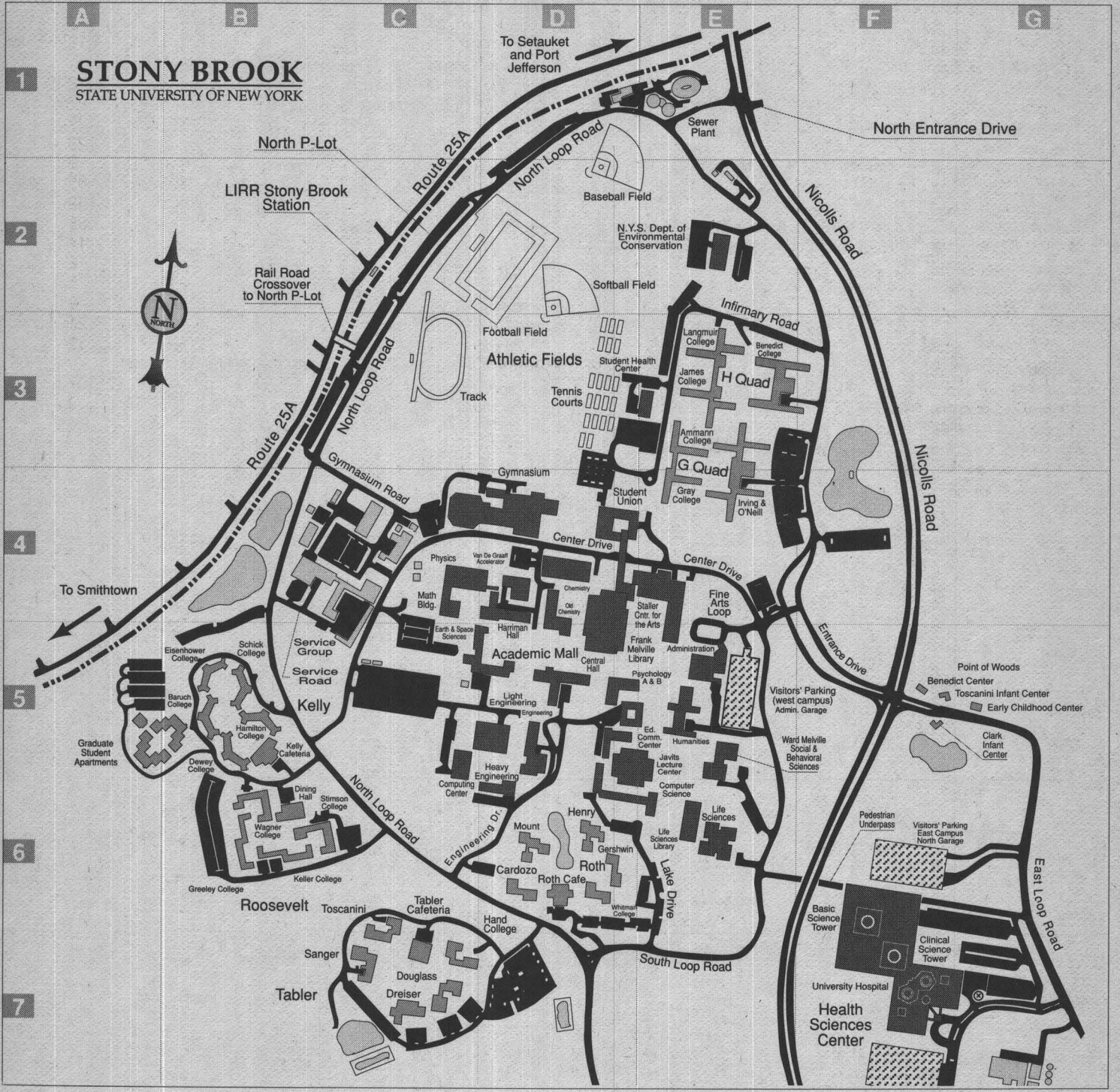
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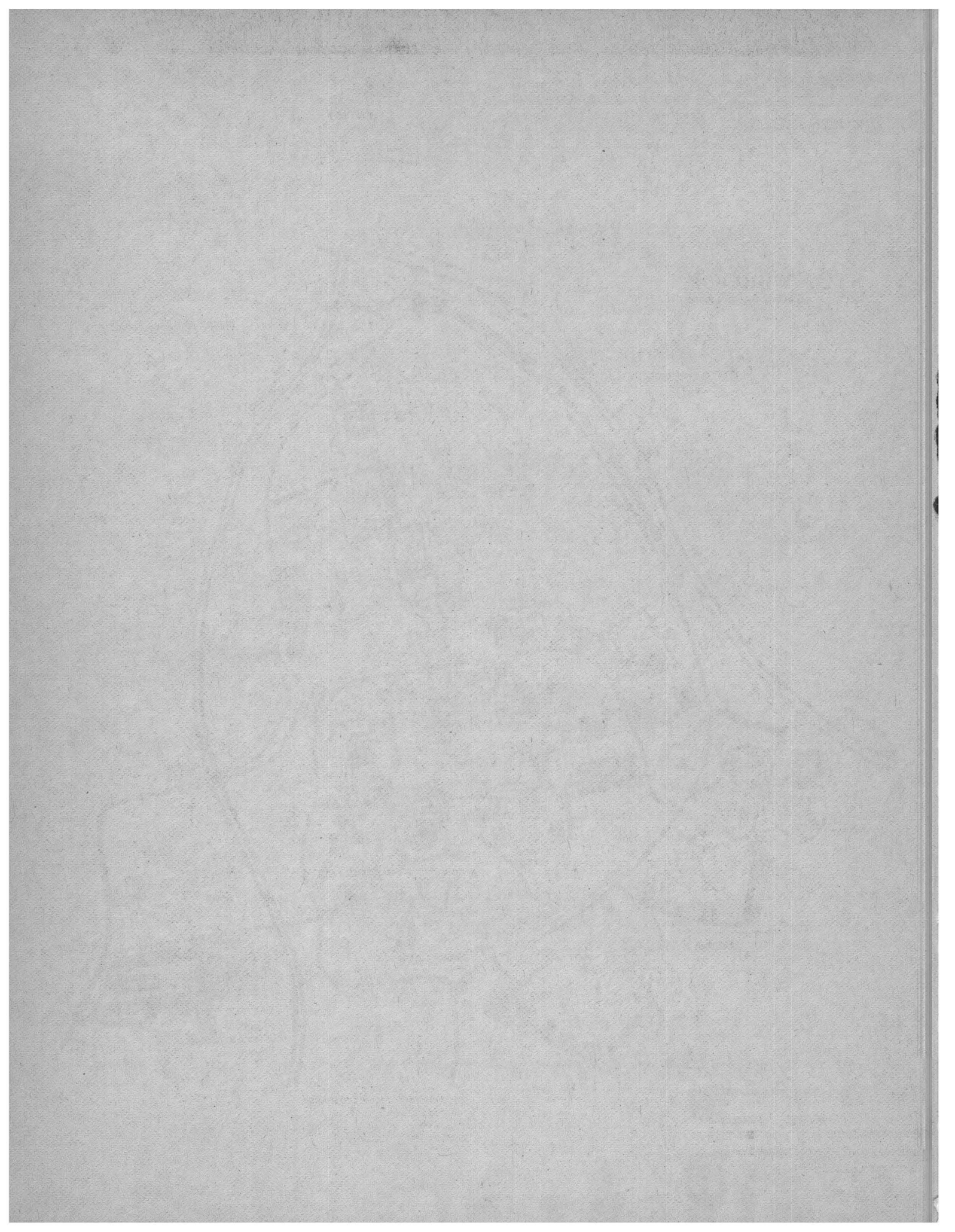
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# STONY BROOK

STATE UNIVERSITY OF NEW YORK







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