

**STATE UNIVERSITY OF NEW YORK
COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY
FACULTY OF CHEMISTRY
GRADUATE PROGRAM DESCRIPTION**

I Statement of Objectives

The objective of the graduate program in Chemistry is to provide advanced instruction and training to qualified students desiring professional careers as chemists in the fields of polymer chemistry, environmental chemistry, natural products chemistry, ecological chemistry, and biochemistry. Students completing advanced degree requirements are qualified for positions in academe, government service, and private enterprise including, among others, teaching, research, management, and public service. The Chemistry Program seeks to supply highly trained professionals to help meet societal needs in the vital areas of environmental science and forestry within the mandates of the College's mission.

Development of both scholarly and practical attributes is an important aim of the program. Required of all students is extensive schooling in the fundamentals of chemistry, particularly the major areas of organic, physical, and analytical chemistry, as well as related subjects necessary for an understanding of the field, such as elements of physics, mathematics, biology, computer science, engineering, etc. Wide training in current, relevant technological and instrumental techniques is also mandated. Breadth of understanding provides not only a sound platform for current interests, but also enables and encourages flexibility necessary for future growth.

II Areas of Study

Even though only one degree is granted by the Faculty of Chemistry – that in *Chemistry* – several areas of study are available: *polymer chemistry, environmental chemistry, natural products chemistry, ecological chemistry, biochemistry and SB³ (Structural Biology, Biophysics and Biochemistry)*. In these study areas an emphasis on analytical, organic, physical, theoretical chemistry, or biochemistry are available, as is, in some instances, combinations of several emphases. In addition, ecological chemistry can be a joint program with the Faculty of Biology. Formal requirements are, therefore, somewhat different in detail for these study areas, although differences between them are not great.

III Entrance Requirements

A. Undergraduate Training

Students planning to obtain a graduate degree in chemistry at this College should present evidence of having completed the following courses in undergraduate work prior to arrival:

Mathematics: Through integral calculus.

Physics: Two semesters of physics with laboratory.

General Biology: Two semesters.

Analytical Chemistry: Two semesters with laboratory including Quantitative Analysis and Instrumental Methods.

Physical Chemistry: Two semesters with at least one semester of laboratory. Calculus must be used in the presentation.

Organic Chemistry: Two semesters with laboratory.

Additional chemistry/biology: One additional semester of either organic, physical, inorganic, analytical, polymer, environmental chemistry, or biochemistry (or biology for those students specializing in *biochemistry*.)

Deficiencies in the undergraduate courses must be made up after arrival at the College.

B. Graduate Record Examination and TOEFL

All prospective students will be required to take the three aptitude tests and the advanced test in chemistry (or the student's major field) of the Graduate Record Examination prior to their acceptance as graduate students by the Faculty of Chemistry. (The GRE requirement is waived for those applicants who already have completed an M.S. degree.) Students whose native language is not English will be required to take the TOEFL test, which measures proficiency in English.

C. Acceptance as a Graduate Student by the Faculty of Chemistry

Students will be accepted for graduate work by the Faculty of Chemistry on the basis of:

1. Undergraduate/Graduate Records
2. At least three recommendation letters from persons who are in a position to judge the student's past performance and professional promise.
3. GRE and TOEFL scores (where applicable).

IV General Requirements

All graduate students are required to complete successfully the prescribed core courses (described later), to present two seminars during their term of study, and to complete a research thesis. Doctoral students must, in addition, pass specified examinations and must demonstrate competence in at least one research tool. The students receiving financial support through the College teaching assistantships are required to serve as teaching assistants, primarily in laboratory courses.

A. Masters Program

Masters requirements are those dictated by Program Alternative 1 of the Graduate Academic Policies (GAP), with a total of 30 credits required, of which a minimum of 18 credits are for coursework and a minimum of 6 credits are awarded for the thesis. Requirements for a Master's Degree in Professional Studies (Alternative 3) through the chemistry department are available in a separate document from the Departmental Office

B. Doctoral Program

The Doctor of Philosophy degree requires a minimum of 60 graduate credits of which a minimum of 30 credits are for coursework and a minimum of 12 credits are awarded for thesis. The successful candidates must pass Qualifying Examinations consisting of Preliminary Examinations and a Comprehensive Examination. (These examinations are described in detail in section V).

V Detailed Requirements

A. Masters Program

1. Evaluation Examinations

During registration week of the first semester in which a student registers, he or she will be expected to take the American Chemical Society Examinations in (1) Inorganic Chemistry, (2) Quantitative Analysis, (3) Organic Chemistry, and (4) Physical Chemistry. These will be generally used as a guide by the student's major professor in determining the future course program.

2. Course Requirements

Students enrolled in graduate study in the M.S. program are expected to select, in consultation with the student's major professor, a program of appropriate chemistry, science, and related courses. The program must total at least 30 hours of credit earned through work designed expressly for graduate students, of which at least 18 credits must be for graduate level coursework (with 12 credits taken in residence), and a minimum of 6 credit hours are awarded for a thesis. The following core courses are required, depending on the student's area of study:

minimum of 18 hours of course credit

<p><u>Polymer Chemistry</u></p> <p>Introduction to Polymer Chemistry (FCH 550, 551, 552 or equivalent) – 9 cr. hrs. (if not taken previously) Advanced Physical Chemistry – 3 cr. hrs. Advanced Organic Chemistry – 3 cr. hrs. Advanced Polymer Chemistry – 3-6 cr. hrs. Dept. Seminar-- FCH 997 (1 cr. hr.); Additional courses to be selected from: Inorganic Chemistry, Organic Chemistry, Biochemistry others.</p>	<p><u>Environmental Chemistry</u></p> <p>Introduction to Environmental Chemistry (FCH 510, 511, 515 or equivalent) – 9 cr. hrs. (if not taken previously) Introductory Biochemistry -3 cr. hrs. (if not taken previously) Dept. Seminar-- FCH 997 (1 cr. hr.); Seminar class (FCH 797 or equivalent)- 2 cr. hrs. Additional courses to be selected from: Inorganic Chemistry, Organic Chemistry, Biochemistry, others - 6 cr. hrs.</p>
<p><u>Natural Products/Ecological Chemistry</u></p> <p>Organic mechanisms – 3-6 cr. hrs.) total Synthetic organic chem. – 3-6 cr. hrs.) 9 cr. hrs. Dept. Seminar-- FCH 997 (1 cr. hr.); Natural Products – 3 cr. hrs. Additional courses to be selected from: Advanced Physical Chemistry, Inorganic Chemistry, Biochemistry, others.</p>	<p><u>Biochemistry</u></p> <p>Introductory Biochemistry (FCH 530, 531, 532 or equivalent) – 9 cr. hrs. (if not taken previously) Advanced Biochemistry – 3 cr. hrs. Advanced Chemistry – 3 cr. hrs. Seminar class (FCH 797 or equivalent)- 2 cr. hrs. Dept. Seminar-- FCH 997 (1 cr. hr.); Additional courses to be selected from: Advanced Organic Chemistry, Inorganic Chemistry, Advanced Biology, others.</p>

All students are required to present a seminar by enrolling in FCH 997 (1 cr. hr.); this seminar will be in an area outside the student's research ("*Topic Seminar*"). All students will also present a seminar on the student's research topic ("*Capstone Seminar*"). The latter seminar should be presented during the semester in which the student will defend his/her thesis.

3. Thesis Requirement

A student will be required to demonstrate ability to complete a substantial research problem and to describe this research problem and to describe this research in the form of a M.S. thesis. The thesis will be reviewed by the student's Steering Committee after which the student will defend the thesis orally before an examining committee of four to six members.

4. Residence Requirements

A candidate for the M.S. degree must complete two semesters in residence as a full-time graduate student (excluding summer sessions), or the equivalent if registered as a part-time student.

5. Time Limit

By ESF policy, students must complete all requirements for the M. S. degree within three years of matriculating in the graduate program.

6. Teaching Assistance

Each student who receives a College Teaching Assistantship will serve as laboratory instructor or assist in other instructional duties.

B. Doctoral Program

1. Evaluation Examinations

During the registration week of the first semester in which a student registers, he or she will be expected to take the American Chemical Society Examinations in the areas in which the student has undergraduate coursework. The tests are given in (1) Inorganic Chemistry, (2) Quantitative Analysis, (3) Organic Chemistry, and (4) Physical Chemistry. These will be generally used as a guide by the student's major professor in determining the future course program.

2. Course Requirements

Students enrolled in graduate study in the Ph.D. program are expected to select, in consultation with the student's major professor, a program of appropriate chemistry, science, and related courses. They must complete a program of at least 60 credit hours earned through work designed expressly for graduate students, of which at least 30 credits must be for graduate level coursework and a minimum of 12 credits are awarded for a thesis. The following core courses are required, depending on the student's area of study:

minimum of 30 course credits

<p><u>Polymer Chemistry</u></p> <p>Introductory Polymer Chemistry – 6-8 cr. hrs. (if not taken previously) Advanced Physical Chemistry – 6 cr. hrs. Advanced Organic Chemistry – 6 cr. hrs. Advanced Polymer Chemistry – 6 cr. hrs. Dept. Seminar-- FCH 997 (1 cr. hr.); Additional courses to be selected from: Biochemistry, Inorganic Chemistry, Organic Chemistry, others.</p>	<p><u>Environmental Chemistry</u></p> <p>Intro. Env. Chemistry (and lab) – 9 cr. hrs. (if not taken previously) Intro. Biochemistry -3 cr. hrs. (if not taken previously) Seminar class (FCH 797 or equivalent) 5 cr. hrs. Dept. Seminar-- FCH 997 (1 cr. hr.); Advanced Chemistry – 9 cr. hrs. Additional courses to be selected from: Inorganic Chemistry, Organic Chemistry, Biochemistry, others - 9 cr. hrs.</p>
<p><u>Natural Products/Ecological Chemistry</u></p> <p>Organic Mechanisms – 6 cr. hrs. Synthetic Organic Chemistry – 6 cr. hrs. Natural Products – 3 cr. hrs. Advanced Physical Chemistry – 3 cr. hrs. Dept. Seminar-- FCH 997 (1 cr. hr.); Additional courses to be selected from: Inorganic Chemistry, Biochemistry, others</p>	<p><u>Biochemistry</u></p> <p>Introductory Biochemistry, (FCH 530, 531, 532, or equivalent – 9 cr. hrs.) (if not taken previously) Advanced Biochemistry – 3-6 cr. hrs.)total 9 Advanced Chemistry – 3-6 cr. hrs.)cr. hrs. Advanced Molecular Biology – 3 cr. hrs. Seminar class (FCH 797 or equivalent) 5 cr. hrs. Dept. Seminar-- FCH 997 (1 cr. hr.); Additional courses to be selected from: Advanced Organic Chemistry, Inorganic Chemistry, Advanced Biology, others.</p>
<p><u>SB3</u></p> <p>Biomolecular Modeling - 3 cr. hrs. Biochemistry, Cell and Molecular Biology I and II 6-8 cr. hrs. (if not taken previously) Introduction to Genetic Engineering - 3 cr. hrs. Introduction to SB3 Research (3 rotations) - 6 cr. hrs. Issues and Principles Directing Scientists - 1 cr. hr. Introduction to SB3 Faculty - 1 cr. hr. SB3 Seminar/Journal Club - 4 cr. hrs. (1/semester) others - 6 cr. hrs. with advisor's approval</p>	

All students are required to present a seminar by enrolling in FCH 997 (1 cr. hr.); this seminar will be in an area outside the student's research ("*Topic Seminar*"). All students will also present a seminar on the student's research topic ("*Capstone Seminar*"). The latter seminar should be presented during the semester in which the student will defend his/her thesis.

3. Qualifying Examinations

The Qualifying Examination, which must be passed by all students working towards a Ph.D. degree, is administered in two parts: (1) Preliminary Examination, and (2) Comprehensive Examination. (The Comprehensive Examination is referred to as the *Doctoral Candidacy Examination* in the GAP.)

a. Preliminary Examination

The Preliminary Examinations in *Organic Chemistry, Physical Chemistry, Analytical Chemistry and Biochemistry* are given each semester. Every prospective Ph.D. candidate must pass *two* of the above 4 Preliminary Examinations within 1 ½ years of entry into the Ph.D. Program. One of the examinations must be either Organic or Physical Chemistry. Exams are administered by a committee of at least 3 faculty members. Exams may be written or written and oral. The examination committee will decide whether the student passes or fails. However, if a student fails the same exam twice, any committee member or the student's major professor may bring the decision to the Chemistry Faculty for ratification.

In the event of failure, the student must take the examination again the next time it is offered. Two failures in the same examination will automatically revert the student to the Masters Degree Program. Students, who already have completed the M.S. degree in this Faculty, will be disqualified from pursuing the Ph.D. degree after two such failures.

Students who fail the Ph.D. program by not completing the Preliminary Examinations and who revert to Master's Program may formally reapply to the Doctoral Program upon the successful completion of the Master's Degree. The excellence of the M.S. thesis will be given great weight in the deliberation to reaccept the student. If accepted, all preliminary examinations must be successfully completed within one year after reentering the Ph.D. degree program.

Students admitted through the joint ESF, Syracuse University, Upstate Medical University program in Structural Biology, Biochemistry and Biophysics (SB3) program may follow the procedures agreed upon by the Inter-Institutional SB3 Program Committee. These do not include the ESF Chemistry preliminary examinations.

An M.S. candidate who elects to take and passes the preliminary examinations within the first year of study may switch to the Ph.D. program without writing an M.S. thesis. An M.S. candidate who has not passed the examination within 1½ years after beginning the program, but still wishes to switch to the Ph.D. Program may still do so, but must write and defend an M.S. thesis and pass the Preliminary Examinations.

b. Candidacy Examination

Candidacy exam committees in Chemistry may choose to use ESF candidacy examination Forms 2 or 3. Form 1 is not allowed. The examination consists of two parts: the preparation of a written paper followed by its oral defense. For Form 2, the student is assigned a problem, which is not directly related to the thesis research. The problem will, however, be within the area of the student's specialization. The student will have approximately four weeks to complete the paper and must furnish each member of the examining committee with a copy of it one week prior to the oral examination. For Form 3, The student prepares and defends a written proposal of future research likely to be carried out during their Ph. D. project. This research prospectus must be presented to the examining committee two weeks prior to the oral exam and should include preliminary studies supporting the feasibility of the proposed research. The exam will test the candidate's understanding of concepts directly related to his/her own immediate area of research, knowledge of prior related research that has been conducted by others, their ability to design and interpret experiments in this area, and capacity to think and write independently and to present work plans orally in a clear and rational manner. The oral examination will be administered by the examining committee and will last two hours. At the end of the examination, the committee will immediately determine whether the student should be admitted to candidacy for the Ph.D. degree. In the

event of failure, the student will have one more chance to pass the examination. Two failures will require the student's termination from the Ph.D. program.

The examination is generally taken after the completion of the majority of coursework. By ESF policy, it must be taken within no more than three years from the first date of matriculation in the Ph. D. program, and it must be taken at least one year before the student defends the Ph.D. thesis.

4. Thesis Requirements

A student will be required to demonstrate ability to complete a substantial research problem and to describe this research in the form of a Ph.D. thesis. The thesis will be reviewed by the student's Steering Committee after which the student will defend the thesis orally before an examining committee of four to six members.

5. Tool Requirements

Doctoral students must demonstrate competence in at least one research tool as a requirement for graduation. Such tools include, but are not limited to, *statistics*, *information literacy*, or the *ability to translate technical articles* in a language other than English commonly used in chemistry.

6. Residence Requirements

A candidate for the Ph.D. degree must complete four semesters in residence as a full-time graduate student (excluding summer sessions), or the equivalent if registered as a part-time student.

5. Time Limit

By ESF policy, students must complete all requirements for the PH. D. degree within three years of passing the doctoral Candidacy Exam.

7. Teaching Assistance

Each student who receives a College Teaching Assistantship will serve as laboratory instructor or assists in other instructional duties.

VI Steering Committee

The student's Steering Committee consists of the Major Professor and two other members of whom at least one is from the Faculty of Chemistry. The function of the Steering Committee is to assist the student in developing his/her course program, to serve on the Comprehensive Examination Committee, and to serve on the Thesis Committee. The committee is appointed by the Faculty Chairman in consultation with the Major Professor.