CHEMISTRY, MASTER OF SCIENCE (M.S.) WITH FUDAN UNIVERSITY [DUAL DEGREE]

Program goals
The VCU Department of Chemistry is committed to the dual mission of teaching and research at the bachelor’s, master’s and doctoral level. In teaching, the purpose is to provide high quality education in chemistry to students in preparation for professional careers at all levels. In research, the goals are to advance the science of chemistry, to keep faculty on the forefront of the field and to maintain an educational program consistent with the latest technology and development of the discipline. Service to the chemical profession is also an important aspect of the department’s activities.

Student learning outcomes
Graduates of the program must:
1. Demonstrate expertise (breadth and depth) in chemistry
2. Demonstrate appropriate ability to design and conduct experimental research
3. Demonstrate ability to analyze data critically and to design experiments independently
4. Develop competency in the responsible conduct of research
5. Develop effective oral and written communication skills

VCU Graduate Bulletin, VCU Graduate School and general academic policies and regulations for all graduate students in all graduate programs
The VCU Graduate Bulletin website documents the official admission and academic rules and regulations that govern graduate education for all graduate programs at the university. These policies are established by the graduate faculty of the university through their elected representatives to the University Graduate Council.

It is the responsibility of all graduate students, both on- and off-campus, to be familiar with the VCU Graduate Bulletin as well as the Graduate School website (http://www.graduate.vcu.edu/) and academic regulations in individual school and department publications and on program websites. However, in all cases, the official policies and procedures of the University Graduate Council, as published on the VCU Graduate Bulletin and Graduate School websites, take precedence over individual program policies and guidelines.

Visit the academic regulations section for additional information on academic regulations for graduate students. (http://bulletin.vcu.edu/academic-regs/grad/grad-info/)

Degree candidacy requirements
A graduate student admitted to a program or concentration requiring a final research project, work of art, thesis or dissertation, must qualify for degree candidacy, if applicable, is a formal statement by the graduate student’s faculty regarding the student’s academic achievements and the student’s readiness to proceed to the final research phase of the degree program.

Graduate students and program directors should refer to the following degree candidacy policy as published in the VCU Graduate Bulletin for complete information and instructions.

Visit the academic regulations section for additional information on degree candidacy requirements. (http://bulletin.vcu.edu/academic-regs/grad/candidacy/)

Graduation requirements
As graduate students approach the end of their academic programs and the final semester of matriculation, they must make formal application to graduate. No degrees will be conferred until the application to graduate has been finalized.

Graduate students and program directors should refer to the following graduation requirements as published in the Graduate Bulletin for a complete list of instructions and a graduation checklist.

Visit the academic regulations section for additional information on graduation requirements. (http://bulletin.vcu.edu/academic-regs/grad/graduation-info/)

Other information
The Department of Chemistry graduate handbook is available online (http://chemistry.vcu.edu/graduate-programs/graduate-handbook/).

Apply online at graduate.admissions.vcu.edu (http://www.graduate.admissions.vcu.edu).

Admission requirements

<table>
<thead>
<tr>
<th>Degree:</th>
<th>Semester(s) of entry:</th>
<th>Deadline dates:</th>
<th>Test requirements:</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S.</td>
<td>Fall</td>
<td>Apr 15</td>
<td>GRE-General TOEFL (International students only)</td>
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<tr>
<td></td>
<td>Spring</td>
<td>Oct 15</td>
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</tbody>
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In addition to the general admission requirements of the VCU Graduate School (http://bulletin.vcu.edu/graduate/study/admission-graduate-study/admission-requirements/), the following requirements represent the minimum acceptable standards for admission.

1. Applicants must have a bachelor’s degree from an accredited college or university with 30 credit hours in chemistry. (Admission on a provisional basis is possible for a student temporarily lacking this expected chemistry background.)
2. Graduate students in the Department of Chemistry may receive financial support via teaching or research assistantships or fellowships. Application forms and instructions for applying to all graduate programs are available on the Graduate School website at graduate.vcu.edu (http://www.graduate.vcu.edu/).
3. Fudan University students participating in this dual degree program will be full-time students in good standing in Fudan University’s Department of Chemistry.
4. Fudan University students will be required to (a) successfully pass an interview at Fudan University conducted by an identified faculty member of VCU’s Chemistry Department and (b) successfully pass
an English proficiency exam before the application to VCU will be processed.

5. Fudan University students’ program will be required to submit formal applications to the VCU International Admissions Office. The VCU Department of Chemistry is responsible for admitting these students to VCU.

6. Fudan University students will be required to submit to VCU their Fudan transcripts and grade-related information before their applications to VCU will be processed.

7. Fudan University students are classified as full-time, out-of-state graduate students and will assume all tuition, fees, housing and cost-of-living expenses while at VCU.

8. Students must receive a positive evaluation from both the Fudan and VCU chemistry departments to receive admission into the program. As part of the admission process, a member of VCU’s Department of Chemistry will interview applicants in Shanghai prior to admission into the program.

9. Fudan University students are required to maintain the equivalent of a VCU B average including their first year at Fudan University.

Degree requirements

In addition to general VCU Graduate School graduation requirements (http://bulletin.vcu.edu/academic-reg/grad/graduation-info/), students are required to complete course work in core and elective courses and to conduct significant research.

1. Credit hour requirements: Students in the M.S. in Chemistry program are required to earn a minimum of 30 graduate-level credit hours beyond the baccalaureate. At least one-half of the credit hours presented for graduation must be at the 600 level or higher.

2. Proficiency exams: Students must demonstrate competency in analytical, inorganic, organic and physical chemistry by satisfactory performance on the proficiency exams or with a minimum grade of B in the appropriate course. These examinations are at the level of sound undergraduate courses and are offered preceding the start of the school’s fall and spring semesters. These tests are used to evaluate the student’s strengths and weaknesses, and the student’s program is planned accordingly.

3. Other requirements: Students are to conduct a research study under the guidance of a thesis adviser. After their first year, students are required to present their research at a poster presentation every fall semester. Once students have completed all required course work (with a 3.0 GPA) and the literature seminar, they must submit the application to candidacy form to the chemistry graduate director. After candidacy, an acceptable research thesis and a final oral examination on the thesis are required. Full-time students should complete these degree requirements in two to three years.

Program schedule

1. In the first year (two semesters) at Fudan University, the Fudan student will successfully complete core courses required of all graduate students in the VCU M.S. in Chemistry program. The Department of Chemistry at VCU requires an M.S. student to earn a minimum of 15 credit hours in six graduate courses. A further minimum of 20 credit hours must be earned in seminar, seminar discussion, a mandatory course on chemistry perspectives and ethics and directed research courses. A departmental committee, composed of the VCU graduate program director, the VCU graduate admissions director and the Fudan program director, will determine the transferability and correspondence of Fudan courses to VCU courses and credit hours before the student enters VCU. This committee will advise the individual student on course work and credits eligible for transfer to meet the 15-credit didactic course requirement and what, if any, further coursework should be taken.

2. In the second year (two semesters) at VCU, the student will immediately begin laboratory research (CHEM 697). The student will also identify a thesis adviser no later than the beginning of enrollment at VCU (third semester of program). A co-adviser from Fudan University will also be appointed at this time. The student will enroll in didactic courses offered by the Department of Chemistry at the discretion of the VCU adviser. It is envisaged that the core courses will have been taken at Fudan and that specialized and topics courses will be taken at VCU. The Department of Chemistry will not create new courses for Fudan students.

3. In the third year, the Fudan student will remain at VCU to complete the fifth semester of the program. The student will continue to select from the department’s regular course offerings and will continue to work on the thesis with the VCU thesis adviser. All research data should be obtained by the end of the third semester at VCU.

4. In the sixth and final semester, the Fudan student will return to Fudan University to complete the writing of the thesis and will enroll in final elective courses (if necessary) pertinent to the student’s area of concentration. The two thesis advisers (one from VCU and one from Fudan) will oversee the completion of the thesis. The formal thesis will be written in Chinese with an English translation.

Curriculum requirements

Fudan University

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CHEM 6001</td>
<td>Advanced Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 6002</td>
<td>Advanced Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 6003</td>
<td>Principles of Quantum Chemistry and Its Applications</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 6004</td>
<td>Advanced Analysis for Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 6005</td>
<td>Advanced Polymer Chemistry</td>
<td>3</td>
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<tr>
<td>CHEM 6006</td>
<td>Polymer and Condensed Matter Physics</td>
<td>3</td>
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Recommended Fudan electives

Select 12 credit hours of the following: 12

- CHEM 6007 Advanced Inorganic Synthesis
- CHEM 6008 Inorganic Experiment
- CHEM 6009 Inorganic Synthesis
- CHEM 6010 Advanced Instrumental Analysis
- CHEM 6013 Advanced Organic Synthesis
- CHEM 6014 Advanced Experimental Organic Synthesis
- CHEM 6015 Chemical Statistical Thermodynamics
- CHEM 6016 Advanced Physical Chemistry Experiments
The minimum total of graduate credit hours required (at Fudan) for this degree is 30.

Virginia Commonwealth University

Course Title Hours

Required didactic courses

Select three core courses of the following four areas: analytical, inorganic, organic and physical 2

CHEM 504 Advanced Organic Chemistry I 9
CHEM 510 Atomic and Molecular Structure 4
or CHEM 511 Chemical Thermodynamics and Kinetics
CHEM 620 Advanced Inorganic Chemistry I
CHEM 63x or ENGR 691 (courses in analytical area) 3

Course completed twice

CHEM 698 Investigations in Current Chemistry Literature 1

Select five credit hours of recommended electives of the following, in consultation with adviser

BIOC 500-level (except BIOC 505, BIOC 506 and BIOC 507)

BIOC 530 Biochemistry, Cell and Molecular Biology Module 1: Protein Structure and Function
BIOC 531 Biochemistry, Cell and Molecular Biology Module 2: Basic Metabolism
BIOC 532 Biochemistry, Cell and Molecular Biology Module 3: Central Dogma of Molecular Biology
BIOC 533 Biochemistry, Cell and Molecular Biology Module 4: Lipids/Membranes and Bioenergetics

CHEM 602 Physical Properties of Macromolecules
BIOS 543 Graduate Research Methods I
or STAT 543 Statistical Methods I
BIOS 544 Graduate Research Methods II
or STAT 544 Statistical Methods II
CHEB 601 Chemical Biology I
CHEB 602 Chemical Biology II
CHEM 500-level

CHEM 604 Advanced Organic Chemistry II
CHEM 605 Physical Organic Chemistry
CHEM 606 Advanced Spectroscopic Methods in Organic Chemistry
CHEM 610 Applied Quantum Chemistry
CHEM 611 Molecular Spectroscopy
CHEM 612 Modern Statistical Mechanics: Fundamentals and Applications
CHEM 615 Chemical Thermodynamics
CHEM 616 Chemical Kinetics
CHEM 620 Advanced Inorganic Chemistry I
CHEM 621 Advanced Inorganic Chemistry II
CHEM 630 Electroanalytical Chemistry
CHEM 631 Separation Science
CHEM 632 Chemometrics
CHEM 633 Mass Spectrometry
CHEM 634 Surface Science
CHEM 635 Spectrochemical Analysis
CHEM 691 Topics in Chemistry
CHEM 698 Investigations in Current Chemistry Literature 5
ENGR 591 Special Topics in Engineering
ENGR 691 Special Topics in Engineering
MEDC 541 Survey of Molecular Modeling Methods
MEDC 670 Advanced Molecular Modeling Theory and Practice
NANO 570 Nanoscale Physics
NANO 571 Nanoscale Chemistry
NANO 650 Experimental Techniques in Nanoscience I
NANO 651 Experimental Techniques in Nanoscience II
NANO 660 Theoretical Studies of Nanostructures
NANO 661 Computational Nanoscience
PHYS 550 Techniques in Material Research
PHYS 573 Analytical Methods in Physics
PHYS 576 Electromagnetic Theory
PHYS 580 Quantum Mechanics
PHYS 591 Topics in Physics
PHYS 661 Surface and Materials Physics
PHYS 691 Special Topics

Other required courses

CHEM 690 Research Seminar in Chemistry (credit hours variable) 6
CHEM 692 Chemistry Seminar Presentation 6 2
Students must earn a minimum of 15 credit hours in six didactic graduate courses, not including credit hours for CHEM 690, CHEM 692, CHEM 693 or CHEM 697.

One of these courses may be waived upon satisfactory proficiency exam scores. The required number of credit hours for the degree does not change.

The ENGR 691 topics course must be materials characterization.

In some cases, students may be required to enroll in both CHEM 510 and CHEM 511 because of proficiency exam scores.

Students are expected to enroll in CHEM 698 (0.5 credit hour) twice during their graduate studies, including the semester preceding their literature seminar presentation (CHEM 692). Note: A maximum of two credit hours of CHEM 698 may be presented toward the didactic course graduation requirements to count as one course.

Students are expected to participate in the department’s seminar program by enrolling in CHEM 690 or CHEM 692 every spring and fall semester. At least two formal talks are to be presented in the seminar program by enrolling twice in CHEM 692 (one credit hour).

Students are expected to enroll in CHEM 693 within their first year of enrollment.

Students are expected to enroll in CHEM 697 (one credit hour minimum) every spring and fall semester.

The minimum total of graduate credit hours (at VCU) required for this degree is 30.

Graduate program director
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Program website: chemistry.vcu.edu (http://chemistry.vcu.edu/)