Program Description

The Department of Chemistry and Biochemistry offers both a Doctor of Philosophy (Ph.D.) and a Master of Science (M.S.) degree in Chemistry. The Ph.D. degree in chemistry requires evidences of high quality scientific research leading to peer-reviewed publications with classroom teaching, laboratory supervision, and proposal and manuscript writing experiences. The program covers all modern areas of chemistry including analytical, biochemistry, computational, environmental, inorganic, organic, and physical chemistry and interdisciplinary areas in material, energy, environmental, and biomedical research. The intensive graduate training includes formal lecture courses, hands-on laboratory and theoretical research experiences, teaching experiences, independent proposal development, preparation of manuscripts, and preparation of a research thesis or dissertation for publication.

Program Mission

The Department of Chemistry and Biochemistry aims at a comprehensive graduate education in all areas of modern chemistry including research training for a diverse student body. The Program aims for national and international distinction and thereby produces well qualified chemists for education institutions, governmental agencies, and industrial and business entities.

Program Objectives

- To provide the best education and career opportunity for all students including those from the underrepresented minority groups with the best cultural and nurturing environment conducive to learning and scholarly activities.
- To prepare students for development of methods of independent and systematic investigations leading to scientific discoveries.
- To prepare students for a successful career at academic institutions, industrial and business entities, and governmental agencies.
- To promote professional development and growth of the faculty.

Time Limits

For full-time students working toward an **M.S. degree**, the degree requirements should be completed by the end of the second year following the first semester of study. Students beyond their second year of full-time study will be reviewed by their thesis committee for satisfactory progress every semester. A report of unsatisfactory will result in dismissal from the program. Under special circumstances, MS students must graduate in three years in fulltime status. Part time students are considered separately.

For full-time students working toward a **Ph.D. degree**, we recommend that the final defense be completed within five years. Under special circumstances, Ph.D. students must graduate in eight years in fulltime status. Part time students are considered separately. Students beyond their fifth year of full-time study will be reviewed by their dissertation committee for satisfactory progress every semester. A report of unsatisfactory will result in dismissal from the program. The student will be allowed to apply for a Masters degree in this case.

Doctoral Program in Chemistry

Learning Outcomes

1. In-depth knowledge in one main chemistry field with sufficient background in two related fields through advanced course work and laboratory research.
    - Students will have a good understanding of one main field of chemistry by receiving at least a "B" grade for the core course in this field.
    - Students will acquire an in-depth knowledge of the main chemistry field by reading scientific papers and performing original research.
    - Students will have a good understanding of two additional chemistry subjects by receiving at least "B"s in two courses relevant to the fields.
    - Students will pass comprehensive exams in the student's research area plus 1-2 additional areas of chemistry.
2. Carry out independent chemistry research with competency in research design, data gathering and interpretation, and communication of research results through scientific publications and presentations.
    - Conduct a thorough literature review and provide a properly referenced written report.
    - Master advanced laboratory techniques and computer programs commonly used in scientific research.
    - Demonstrate the ability to conduct original laboratory or theoretical research.
    - Able to gather and interpret laboratory or computational research results.
    - Able to organize and complete a quality written dissertation including laboratory and literature research.
    - Able to prepare manuscripts for publications.
3. Competitive professional employment in academia, industry, consulting, government, and teaching at the college level.
    - Understand current needs of potential employers

- Attend professional meetings and make oral or poster presentations
- Secure internships in governmental labs and/or in industry
- Successful passing of Chemistry Teaching Course (CHEM750) as teaching assistants and tutoring undergraduate students

4. Understanding and awareness of professional, ethical and safety applications of their knowledge.
   - Develop and understand the ethical and social dimension of science and the role and responsibility of chemistry for the advancement of the society.
   - Learn and put into practice the expectations of responsible conduct in the professional field.
   - Participate in professional meetings and workshops.

Admission Requirements

In addition to the requirements of the Division of Graduate Studies, applicants must have the following:

- B.S. degree in chemistry or a closely related field with passing grades 'C' or better for the following courses with labs:
- 2 semesters of General Chemistry
- 2 semesters of Organic Chemistry
- 1 semester of Analytical Chemistry
- 1 semester of Physical Chemistry
- 1 semester of Inorganic Chemistry
- GRE Score (*Applicants could take the Department's equivalent exam instead*)
- Three Letters of Recommendation
- Statement of Purpose for Graduate Study

Retention Requirements

In addition to satisfying the basic requirements of the Division of Graduate Studies, students are required to maintain a chemistry GPA of 3.00 or higher every semester. Seminar courses, dissertation courses, and other non-chemistry elective courses are excluded from the calculation of the chemistry GPA. Students whose chemistry GPA is below 3.00 will be placed on probation for 1-2 semesters to fix the deficiencies.

During the time a student's only course work is to carry out thesis/dissertation research, an unsatisfactory progress in research during any semester, judged by the faculty advisor and the Graduate Advisory Committee, will trigger probationary status. A consecutive unsatisfactory progress will result in dismissal of the student from the program.

Repeating a Course

If a student receives a grade of "C" or lower in a chemistry core course or a course in the student's major field of study, that course must be retaken and the student must earn a grade of "B" or better.

Degree Candidacy Requirements

After completing the lecture and seminar course requirements, students need to take and pass the comprehensive examination and defend an independent research proposal in order to become an official Ph.D. candidate. The comprehensive examination of 3 subjects must be taken and passed during the second year of study and the written independent research proposal must be prepared and defended during the third year of study or at least one year before graduation.

Graduation Requirements

The minimum number of credit hours for the Ph.D. degree in Chemistry is 60 credit hours.

- 18 credit hours from graduate Chemistry lecture courses
- 2 credit hours for Seminars
- 40 credit hours for Dissertation Research
- Teach at least 2 semesters of undergraduate courses as a teaching assistant.
- Pass Area Comprehensive Examination in three subject areas.
- Write and defend an Independent Research Proposal.
- Defend dissertation before the Dissertation Committee and public audience.
- Submit an approved dissertation for publication of five bond copies, one each to the Division of Graduate Studies, the Department, the University Library, the Faculty Advisor, and the student.

The 18 credit hours of lecture courses must include at least three out of the following five core courses for a total of at least 9 credit hours. Under special circumstances, with recommendation of the faculty advisor and approval by the program director, an elective course critical for the student's subject of study can be used to replace one of the three core courses.

CHEM 723 Advanced Analytical Chemistry
CHEM 731 Advanced Biochemistry
CHEM 736 Physical Organic Chemistry
CHEM 741 Advanced Inorganic Chemistry
CHEM 758 Quantum Chemistry

Students entering the Ph.D. Program with a M.S. Degree in Chemistry: Students who earned a M.S. degree from another institution are allowed to transfer up to three (3) lecture courses or 9 credit hours if these courses are equivalent to the JSU chemistry doctoral courses. Students who earned a M.S. degree from JSU chemistry will be required to take at least two more approved lecture courses instead of the required six lecture courses, and the passed comprehensive exams are waved. Other requirements are the same as for those entering the Ph.D. program with a B.S. degree.

Students earning a non-thesis M.S. Degree in Chemistry: Students on the Ph.D. program are given an option to obtain a non-thesis M.S. degree upon completion of the requirements for the degree candidacy for the Ph.D. program (details see "Requirements for Non-Thesis Master's Degree"). Upon receiving the non-Thesis M.S. degree, students will continue on their Ph.D. program without interruption. All credits earned thus far will be counted toward their Ph.D. degree.

Master's Program in Chemistry

Learning Outcomes

1. To train students with in-depth knowledge in one main chemistry field with sufficient background in two related fields through advanced course work and laboratory research.
2. To train students with competency in modern chemical research through data gathering and interpretation and communication of research results through oral and written presentations.
3. To train students for professional employment including industry, teaching at community college and secondary levels, and doctoral programs and professional schools.
4. To train students with an understanding and awareness of the professional, ethical and safety applications of their knowledge.

Admission Requirements

In addition to the requirements of the Division of Graduate Studies, applicants must have the following:

1. B.S. degree in chemistry or a closely related field with passing grades ("C" or better) in the following courses with labs:
   - 2 semesters of General Chemistry
   - 2 semesters of Organic Chemistry
   - 1 semester of Analytical Chemistry
   - 1 semester of Physical Chemistry
   - 1 semester of Inorganic Chemistry
2. Three Letters of Recommendation
3. Statement of Purpose for Graduate Study

Retention Requirements

In addition to satisfying the basic requirements of the Division of Graduate Studies, students are required to maintain a chemistry GPA of 3.00 or higher every semester. Seminar courses, dissertation courses, and other non-chemistry elective courses are excluded from the calculation of the chemistry GPA. Students whose chemistry GPA is below 3.00 will be placed on probation for one semester to fix the deficiencies.

Degree Requirements

A student pursuing a M.S. degree in Chemistry is required to complete a minimum of 30 hours with a thesis in Chemistry.

1. Within the 18 credit hours of lecture courses, students must complete at least three (3) of five (5) core courses for a total of nine (9) hour. It is possible to take some courses in related fields upon recommendation of the advisor. The core courses are:

   CHEM 523 Advanced Analytical Chemistry
   CHEM 541 Advanced Inorganic Chemistry
   CHEM 531 Biochemistry
   CHEM 558 Quantum Chemistry
   CHEM 536 Physical Organic Chemistry

Students will fulfill the remaining 12 hours from Chemistry electives with no more than 11 hours from CHEM 580-Thesis Research.

2. Students are required to take two semesters of chemistry seminar for one (1) credit hour.
3. Pass the Graduate Area Comprehensive Examination in three chemistry areas.
4. The student must participate as a teaching assistant in the chemistry department for at least one semester.
5. Defend a thesis before the Thesis Committee and public audience.
6. Submit an approved thesis for publication of five bond copies, one each to the Division of Graduate Studies, the Department, the University Library, the Faculty Advisor, and the student.

Non-Thesis Master's Degree

Ph.D. students who fulfill the following requirements will be awarded a Non-Thesis Master's degree in Chemistry if the students apply.

1. A minimum of 36 credit hours, including at least 18 hours of approved graduate level lecture courses and two hours of seminar with a GPA of 3.00 or higher. The graduate lecture courses should include at least three of the five core courses: Advanced Analytical Chemistry, Advanced Inorganic Chemistry, Biochemistry, Physical Organic Chemistry, and Quantum Chemistry.
2. Pass the Graduate Area Comprehensive Examination in three areas.
3. Pass an oral defense covering the student's research before a committee of four faculty members.