A Graduate Guide for Students Matriculating in the Ph. D. Program in Bioenvironmental Sciences

Kadir Aslan, Ph.D.
Assistant Dean for Research and Graduate Studies

Alvin P. Kennedy, Ph.D.
Interim Dean and Professor

September 2015
Table of Contents

UNIVERSITY STATEMENT OF MISSION* .................................................................4
HISTORY ..............................................................................................................................5
The University .....................................................................................................................5
Biology Department ...........................................................................................................5
Chemistry Department .....................................................................................................6
PROGRAM GOALS AND OBJECTIVES ......................................................................7
GENERAL PROGRAM DESCRIPTION ........................................................................8
GENERAL PREPARATORY REQUIREMENTS .................................................................8
ADMISSION REQUIREMENTS ......................................................................................8
PROGRAM REQUIREMENTS CORE ..........................................................................8
AREAS OF CONCENTRATIONS .................................................................................9
Environmental Biology ...................................................................................................9
Environmental Chemistry .............................................................................................9
Electives (by area of concentration) ................................................................................9
DEGREE PROGRAM REQUIREMENTS GENERAL ......................................................10
SATISFACTORY PROGRESS ......................................................................................10
PROGRAM OF STUDY .................................................................................................11
TIME LIMIT ....................................................................................................................11
CONTINUOUS REGISTRATION ..................................................................................11
THE COMPREHENSIVE WRITTEN AND THE ORAL EXAMINATIONS ......................11
ADMISSION TO CANDIDACY ...................................................................................12
TEACHING REQUIREMENT .......................................................................................12
RESEARCH ADVISOR AND DISSERTATION COMMITTEE .......................................13
DISSERTATION REQUIREMENT ...............................................................................13
SUMMARY OF PROCEDURES FOR DOCTORAL DEGREE ......................................13
Biology Concentration Core Courses ........................................................................14
Chemistry Concentration Core Courses .......................................................................16
Research Interview Form ............................................................................................18
Record of PhD Research Committee Meetings ..........................................................19
First Research Semester ............................................................................................20
Second Research Semester .......................................................................................21
Third Research Semester ..........................................................................................21
Instructions for Graduate Assistants .........................................................................22
Code of Student Conduct and Disciplinary Procedure ..............................................24
COURSE DESCRIPTIONS- BIOLOGY .......................................................................26
COURSE DESCRIPTIONS- CHEMISTRY .................................................................32
FACULTY AND THEIR RESEARCH INTEREST: .........................................................36
BIOLOGY .......................................................................................................................36
CHEMISTRY ..................................................................................................................39
UNIVERSITY STATEMENT OF MISSION

Morgan State University is a historically black institution with the unique designation as Maryland's public urban university. As an urban university, Morgan serves an ethnically and culturally diverse student body, among which are some of Maryland's best and brightest students as well as representative numbers of high school graduates from urban communities who would not otherwise pursue the baccalaureate degree. Similarly, the student body reflects the traditional college-going cohort as well as part-time and adult learners.

The University's curricula are designed to meet the educational needs of city residents and the needs of the city and the state for professionals trained in a variety of areas. Academic offerings consist of major programs in the arts and humanities, the social sciences, science, engineering, education, business, and a selected number of professional areas. A major focus of the curriculum is on the social, economic, and political characteristics of the city so that the capacity to understand urban life and phenomena is a central part of the education of the students. Also, the comprehensiveness of Morgan's programs reflects the commitment of the University to have major impact upon the problem of the under representation of blacks and other minorities in the professional labor force within the city, state, and nation.

Consistent with the diversity of the student body, the University has as supplements to the standard curriculum an honors program for high academic achievers and a network of academic enrichment programs, academic advising and counseling services for students needing special assistance. Also, it employs a variety of methodologies, pedagogic approaches, and delivery systems, which facilitate achievement among traditional and nontraditional students, at on-campus and off-campus sites.

The research program of the University involves both basic and applied research. Because of the urban emphasis, however, a substantial amount of research is focused on urban life and phenomena with a bent toward education, service and public policy development. The research is oftentimes oriented toward specific urban problems and issues, such as human resource development, economic development and competitiveness, health care, environment, transportation, aging, and substance abuse.

In fulfilling its service function, Morgan is committed to serving the professional communities represented by its academic programs, while also assisting local government, local businesses and community groups in addressing the problems they face in urban Baltimore. Special attention is given to in-service training for public school teachers and enrichment programs and counseling services for students who would not otherwise have an opportunity for pursuing college study. Likewise, the University seeks to promote economic development through its partnerships with business and industry and its focus on minority business development. Finally, Morgan serves as an important cultural and intellectual center for a major segment of the community and contributes much to improving the quality of life for citizens throughout the Greater Baltimore Community.
HISTORY

The University

Founded in 1867 as the Centenary Biblical Institute, the current Morgan State University became Morgan College in 1890 and Morgan State College in 1939. On July 1 of its centennial year, it came under the direction of the Board of Trustees of the State Colleges of Maryland. On July 1, 1975, Morgan was granted university status. Morgan State University was nearly a hundred years old when the School of Graduate Studies, authorized by the General Assembly of Maryland in 1963, came into being.

Graduate instruction began with a few courses and programs designed primarily for public school teachers. As the curriculum expanded, particular care was taken to ensure that the long liberal arts tradition of Morgan was maintained by constructing programs which were content-oriented. Attention was also given to the needs of persons interested in study beyond the master’s degree.

From the very beginning, the knowledge that the Maryland State Department of Education and the Middle States Association approved Morgan’s graduate program gave assurances that the work would be accepted for certification and recognized by other graduates schools. The low teacher-student ratio, heavy reliance on resident faculty, and careful academic counseling have contributed to the steady growth the School of Graduate Studies has experienced.

Although the School of Graduate Studies continues the emphasis of the University on its historic identity and mission and its special responsibilities as an urban institution, the student body is distinctly cosmopolitan and heterogeneous. The list of undergraduate schools from which students obtained their degrees include over four hundred colleges and universities in the United States and foreign countries.

Biology Department

The Department represents one of the historical department within the university. Presently, it is one of the largest departments at the university. The Department has maintained a high graduation rate among HBCUs. The Department of Biology became a major department within the new School of Computer, Mathematical, and Natural Sciences (SCMNS) at the end of the Spring semester 1998. Prior to that time, the department was located within the College of Arts and Sciences. Its mission is to provide high quality instruction coupled with research experiences to augment the fundamental principles of the biological sciences. The Department offers a Masters of Science (M.S.) Degree in Biology In addition, the Department offers a Ph.D. Degree in Bioenvironmental Science with a concentration in Biology.
Chemistry Department

The Department was founded in 1932 and received accreditation by the American Chemical Society in 1955. Morgan was the fourth HBCU to have an ACS accredited department in the country. The Department has the second highest graduation rate among public HBCUs in the nation, and is ranked first in the state of Maryland in the graduation of African-American students. The department of chemistry is in the school of Computer, Mathematical and Natural Sciences. Its major emphasis is to afford thorough instructions strengthened by active scientific research in the fundamental theories and principles in the basic science. Recently its curricula have tended to be cross-disciplinary embracing biology, environmental and material sciences. The Department offers a Masters of Science in Science Chemistry degree. It also offers a PhD in Bioenvironmental Sciences with a concentration in chemistry. Both graduate programs involve interdisciplinary research and strategically aligned with the Center for Biological and Chemical Sensors Research.
PROGRAM GOALS AND OBJECTIVES

Goal:

To produce highly skilled scientists who will apply knowledge derived from basic and applied research to address the multifaceted concerns of the Bioenvironmental Science community in a changing global society. The doctoral program in Bioenvironmental Science uses an integrated interdisciplinary approach designed to offer flexibility in areas of specialization and training to meet the changing Bioenvironmental needs of the nation and global community in the 21st Century.

Program Objectives

1. To provide graduate students with essential academic knowledge, research and practical skills needed for successful careers in Bioenvironmental Science related jobs at various private institutions, government agencies, academia, and industry

2. To train students on the interaction between various components/systems of the environment and how to protect the health of humans in the changing environment

3. To provide interdisciplinary and multidisciplinary research training that addresses the understanding of the underlying mechanism by which physical, chemical, and biological agents cause alterations in ecosystem integrity and cause morbidity and mortality in humans, animals, and other organisms, especially those of commercial value

4. To develop cost-effective methodologies whereby the impact of various environmental pollutants and toxic substances may be detected, prevented and/or controlled

5. Establish partnerships with other research-intensive universities, government agencies, museums, international organizations and the private sector that will provide training and internships to facilitate applied research activity and future career opportunities for students

6. To establish community outreach programs that provide awareness regarding the impact of physical, chemical, biological, and toxic agents generated by natural or anthropogenic events on human health
GENERAL PROGRAM DESCRIPTION

Bioenvironmental Science is defined as “the systematic study of the interactions between biological systems and the environment using innovative applied research tools and fundamental research”. The biological systems include, human beings, animals, plants and bacteria, where water, air, ground, space and indoors are defined as the environment. Morgan State University’s Ph.D. program in Bioenvironmental Science is the one of the two Ph.D. programs at the School of Computer, Mathematical and Natural Sciences (SCMNS) and is the only such program in Maryland’s higher education system. The Ph.D. program in Bioenvironmental Science program at Morgan integrates strong academic training, fundamental and applied research practices through interdisciplinary efforts with participating faculty from the Departments of Biology, Chemistry, Physics, Mathematics, and Computer Science into a cohesive program of study that focuses on an array of environmental issues that affect biological systems.

GENERAL PREPARATORY REQUIREMENTS

Students interested in the Ph.D. Program in Bioenvironmental Science must have a strong background in basic sciences including biology courses, physics, chemistry, and mathematics through calculus. Course work in statistics and competence with computers are particularly important for perspective students.

ADMISSION REQUIREMENTS

Each applicant is also required to take and demonstrate satisfactory performance on the Graduate Record Examination (GRE) General Test (verbal, quantitative, and analytical), and GRE Subject Test (biology, chemistry, or another science). Scores on the GRE General and Subject (Biology) tests are essential for TA or fellowship consideration. Letters of recommendations from at least three academic referees should address the students’ motivation, ability to conceptualize and deal quantitatively with biological problems, and research potential. Evidence of research capability should be included. International students must submit a TOEFL score of at least 550.

PROGRAM REQUIREMENTS CORE

<table>
<thead>
<tr>
<th>COURSES</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 525 Cellular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 639 Fundamentals of Bioenvironmental Sciences</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 607 Toxicology of Biological Systems</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 625 Seminar in Bioenvironmental Science (4 X 1 Credit)</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 631 Bioethics &amp; Communications</td>
<td>3</td>
</tr>
<tr>
<td>COURSES</td>
<td>CREDITS</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>CHEM 600 Advances in Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 601 Environmental Chemistry</td>
<td>3</td>
</tr>
</tbody>
</table>

**ELECTIVES**

*Please note, some of these electives are not offered on a regular, semesterly level but are scheduled on an “as needed” basis to students who require them for their specific paths of study.*

**Environmental Biology**

<table>
<thead>
<tr>
<th>COURSES</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 522 Modern Research Techniques</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 533 Environmental Toxicology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 602 Environmental Immunotoxicology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 626 Environmental Physiology of Plants</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 628 Environmental Carcinogenesis</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 629 Developmental Neurotoxicology</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 602 Pollutants in the Environment</td>
<td>3</td>
</tr>
</tbody>
</table>

**Environmental Chemistry**

<table>
<thead>
<tr>
<th>COURSES</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 533 Statistical Methods in Analytical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 551 Advanced Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 581 Techniques in Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 602 Pollutants in the Environment</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 603 Physical Chemistry of Environmental Sciences</td>
<td>3</td>
</tr>
</tbody>
</table>

**Environmental Ecology**

<table>
<thead>
<tr>
<th>COURSES</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 521 Bioecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 531 Environmental Science</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 602 Pollutants in the Environment</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 603 Marine and Aquatic Biology</td>
<td>4</td>
</tr>
<tr>
<td>Course</td>
<td>Credits</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>BIOL 521 Bioecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 531 Environmental Science</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 602 Pollutants in the Environment</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 601 Molecular Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 604 Ecosystem Analysis</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 626 Environmental Physiology of Plants</td>
<td>3</td>
</tr>
</tbody>
</table>

**Environmental Health Science**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 520 Biological Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 522 Modern Research Techniques</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 524 Advance Molecular Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 527 Microbiology of Emerging Pathogens</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 528 Immunobiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 536 Molecular and Behavioral Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 620 Environmental Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 628 Environmental Carcinogenesis</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 629 Developmental Neurotoxicology</td>
<td>3</td>
</tr>
</tbody>
</table>

In addition to this menu of classes, students may cross-register into graduate classes in the School of Community Health and Policy, School of Engineering, School of Business or other as indicated by their individual training needs. Registration into courses outside of the SCMNS must be approved by the student’s research mentor and or advisory committee and must so be noted in writing.
DEGREE PROGRAM REQUIREMENTS GENERAL

Students are bound by the requirements stated in the catalog in effect when they enter the graduate program. The department in which the student specializes and the student's advisory committee may, at their discretion, recommend additional requirements for the students.

SATISFACTORY PROGRESS

To continue in a degree program a student must make satisfactory progress towards the degree. If the Graduate Committee determines that satisfactory progress is not being made, a student may be required to withdraw because of academic deficiency. Students may appeal this decision with the appropriate Morgan State University Academic and Status Degrees Committee.

PROGRAM OF STUDY

The student's program of study is subject to Graduate Council policies and individual program requirements. Doctoral programs include a major field or area of concentration. A candidate for the Ph.D. must complete a minimum of 33 hours of graduate coursework beyond the master's degree which is prerequisite for entry into most doctoral programs and a minimum of 60 hours of graduate course work beyond the baccalaureate degree. A minimum of 18 semester hours of the student's coursework must be Morgan courses at the 600 levels, exclusive of dissertation hours.

TIME LIMIT

The statute statute of limitation for completing the degree is seven (7) years. Comprehensive examinations must be taken and completed within one (1) year following initial enrollment in the Ph.D. program.

CONTINUOUS REGISTRATION

The student must register continuously for courses, 600 level or above, (minimum of 3 hours) from the time the doctoral research proposal is approved, admission to candidacy is accepted, registration for 600 level courses is begun, whichever comes first, including Summer semester and the semester in which the dissertation is approved and accepted by the School of Graduate Studies. A minimum total of 55 hours is required before the dissertation is accepted.

THE COMPREHENSIVE WRITTEN AND THE ORAL EXAMINATIONS

The Comprehensive Examination will consist of written and oral portions. The written examination will cover four (4) subject areas: Biochemistry, Environmental Chemistry,
Cellular Biology and Toxicology of Biological Systems. In addition to a common pool of questions for all students, there will be specific questions for each student depending upon their designated area of concentration. Also, students will be expected to provide responses to several integrated questions across disciplines. Examination results will be available immediately following the exams. Examination results may be used by the student’s advisory committee to guide the student’s selection of additional courses to complete the program. Copies of the examination questions along with the candidate's answers will be placed in the student's department file.

Oral examination will consist of a defense of the written research proposal for the student’s dissertation topic and a public presentation. Oral examinations are open to all faculty but closed to other students; only the candidate's advisory committee members will be responsible for scoring the candidate on the oral portion of the comprehensive examination. The examination will be held at a convenient time during the year for the Committee and the student and preferably should not be held during regular examination periods. An announcement must be distributed at least two weeks prior to the oral examination. The results of the oral examination will be announced immediately following the exam. The results will be pass, conditional pass, or fail. A conditional pass is accepted to mean pass, providing the student subsequently eliminates inadequacies by means stipulated by the committee. In the event of a failure, the Committee may elect to allow a single repetition of the examination.

**ADMISSION TO CANDIDACY**

Admission to candidacy reflects agreement among the student, Graduate Committee, and the School of Graduate Studies that the student has demonstrated the ability to do acceptable work and that satisfactory progress has been made toward the degree. This action usually connotes that all prerequisites to admission have been completed and a program of study has been approved. A student may be admitted to candidacy for the doctoral degree after: (1) formation of the Advisory Committee, (2) passing the comprehensive examination, (3) maintaining at least a “B” average in all graduate coursework, and (4) obtaining the Supervisory Committee's approval of the dissertation proposal and course program.

A public oral defense of the proposal, constituting the general examination (described above) is included in step (4). Each student is responsible for filing the admission to candidacy form, which lists all courses required for the degree, including courses taken at Morgan State University or at any other institution. Prior to admission to the doctoral program, the admission to candidacy form must be signed by the Doctoral Committee. Admission to candidacy must be applied for and approved by the Graduate Committee and the School of Graduate Studies at least one full semester prior to the date the degree is to be conferred.
TEACHING REQUIREMENT

As a requirement for graduation, all Ph.D. candidates must satisfactorily complete at least one academic year of teaching assistant (TA) duties in a department appropriate to the student's area of concentration. Discharge of this requirement will be scheduled by mutual agreement between the student, major adviser, and the Department Chair. The Chair will make assignments based on the Department's anticipated teaching need. The Department Chair will also certify that the TA assignment fulfills the requirements. The instructor of the course in which the student is involved will certify that the student has satisfactorily discharged the TA duties and has met the teaching requirements as listed below. The completed original certification form is kept in the student's file. The TA requirement may be discharged by activities related to either undergraduate labs or recitations in which the principal activity of the TA is instruction rather than grading or logistical support. The ideal TA experience would integrate a number of aspects of teaching including lectures and/or demonstrations, student evaluations (testing), and grading.

RESEARCH ADVISOR AND DISSERTATION COMMITTEE

During the first year a graduate student will select a research director and project, select a thesis committee, be assigned space in a research laboratory, and do preliminary literature search and background reading.

The procedure for the selection of a research adviser requires the student to review the areas of interest of the faculty member and select a minimum of three persons with whom to discuss research projects of possible mutual interest. Based on these interviews, the student should submit their selection of research director to the Graduate Coordinator. The student should determine that the person selected is willing to serve as the research director. The selection of a research adviser must be accomplished by the end of the student’s first year.

Once the selection of the research adviser has been finalized, the research committee is selected via consultation with your research adviser. The research committee will consist of your research adviser and at least two other faculty members whose backgrounds would make them useful resource persons in reviewing your research progress and who are willing to serve on your thesis committee. Additional persons (up to 2) from outside, the Department may serve as research committee members.

DISSERTATION REQUIREMENT

A dissertation is expected to treat a topic related to the candidate's specialty in the major subject, show the results of original research, provide evidence of high scholarship, and make a significant contribution to knowledge in the field. A general rule of thumb is that a typical dissertation is the equivalent of three publications in peer-reviewed journals. A dissertation defense must be scheduled. After revisions are made subsequent to the defense and approved by the student's Advisory Committee, the final draft of the dissertation must be submitted to the Dean of the School of Graduate Studies.
<table>
<thead>
<tr>
<th>PROCEDURES</th>
<th>UNDER THE DIRECTION OF</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission as a potential degree candidate</td>
<td>School of Graduate Studies and Major Department</td>
<td>Prior to completing 15 hours of graduate courses</td>
</tr>
<tr>
<td>Appointment of Doctoral Committee</td>
<td>The School of Graduate Studies on recommendation of Department Chair</td>
<td>Preferable during first year of graduate study, but at the latest, prior to application for admission to candidacy</td>
</tr>
<tr>
<td>Comprehensive Examinations</td>
<td>Major Department</td>
<td>Prior to admission to candidacy</td>
</tr>
<tr>
<td>Language Requirement(s)</td>
<td>Major Department</td>
<td>Prior to admission to candidacy</td>
</tr>
<tr>
<td>Submission and approval of application for admission to candidacy</td>
<td>Doctoral Degree and the School of Graduate Studies</td>
<td>At least one semester prior to graduation</td>
</tr>
<tr>
<td>Submission of application for graduation</td>
<td>School of Graduate Studies</td>
<td>According to the School of Graduate Studies Academic Calendar</td>
</tr>
<tr>
<td>Payment of graduate fees</td>
<td>Bursar's Office</td>
<td>According to the School of Graduate Studies Academic Calendar</td>
</tr>
<tr>
<td>Submission of dissertation to the Doctoral Committee</td>
<td>Student</td>
<td>At least two weeks prior to the Defense of Dissertation Examination</td>
</tr>
<tr>
<td>Scheduling of Defense of Dissertation Examination</td>
<td>Student, Committee and Office of Graduate Admissions and Records</td>
<td>No later than three (3) weeks prior to Defense of Dissertation Examination</td>
</tr>
<tr>
<td>Defense of Dissertation Examination</td>
<td>Doctoral Committee</td>
<td>Scheduled in conjunction with the School of Graduate Studies Academic Calendar</td>
</tr>
<tr>
<td>Approval and Acceptance of final copy of Dissertation and Doctoral Forms</td>
<td>Doctoral Committee and the School of Graduate Studies</td>
<td>According to the School of Graduate Studies Academic Calendar</td>
</tr>
<tr>
<td>Removal of incomplete(s)</td>
<td>Instructor of the course</td>
<td>No later than three (3) weeks prior to Commencement</td>
</tr>
</tbody>
</table>
Flowchart for Ph.D. Program in Bioenvironmental Science

Year 1

Graduate student matriculation
Year 1: Fall Semester

1. Morgan New Student Orientation
   August 2nd week
2. SCMNS Graduate Student Workshop
   August 3rd week

3 Core Courses + Seminar
Year 1: Fall Semester

GPA > 3.0?
No

Offer TAship to selected candidates
2 sections Chem / Bio 101 / 110 Labs
Year 1: Fall / Spring Semesters and Summer Fellowship

Graduate Committee Review
No

Choose Advisor
No

Research Rotations (0-2)
Year 1: Fall Semester

Yes

Choose Advisor
Yes

Start Initial Research

Yes

Written comprehensive qualifying examination
(5 core courses)

PASS?
No

Dismiss
MS Program

Yes

Condition Pass
Retake <1 month

Become a Ph.D. Candidate

No

Dismiss
MS Program
Year 2

- GPA > 3.0?
  - No: Graduate Committee Review
  - Yes: Literature Search and Develop Research Proposal with Dissertation Committee
    - Year 2: Fall/Spring/Summer

- 3-4 Elective Courses + Seminar
  - Year 2: Fall/Spring Semester

- Ph.D. Candidacy
  - Year 2: Fall Semester
    - Organize Dissertation Committee and Get Approvals
      - Year 2: Fall Semester
    - Start Initial Ph.D. Dissertation Research

Year 3

- Research Proposal / Oral Examination
  - Year 3: Fall Semester
    - Conduct scholarly research; Attend professional meetings; Publish in peer-reviewed journals; Meet with dissertation committee
      - Year 3-4-5

- Graduate Committee Review
  - No: Dismiss
  - Yes: PASS
    - No: Conditional Pass
      - Retake <1 month
    - Yes: MS Degree

Year 4-5

- Dissertation Committee Meetings
  - No: Approve?
  - Yes: Yes

- Write or revise dissertation
**Biology Concentration Courses**

A candidate for the Ph.D. degree must complete a minimum of 33 hours of graduate course work beyond the master’s degree and a minimum of 60 hours of graduate course work beyond the Baccalaureate degree. A minimum of 18 semester hours of courses at the 600 level, exclusive of dissertation hours. In addition, a minimum of 9 hours per semester of 800 level courses (Doctoral Research and Dissertation) is required during the last two years of the student’s tenure.

The first two semesters are for all students.

The fifth and subsequent semesters: 9 credits Dissertation Research (Full-time Load).

<table>
<thead>
<tr>
<th>First Semester (Year 1)</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 525: Cellular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 631: Bioethics and Communications</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 639: Fundamentals of Bioenvironmental Science</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 625: Seminar in Bioenvironmental Science</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second Semester (Year 1)</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 600: Advances in Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 601: Environmental Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 607: Toxicology of Biological Systems</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 625: Seminar in Bioenvironmental Science</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summer 1 (Year 1) optional</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Research 800-level (802/803)</td>
<td>3 credits each</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Third Semester (Year 2)</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 520 or BIOL 522 or BIOL 528</td>
<td>3</td>
</tr>
<tr>
<td>Advised Elective Course</td>
<td>3</td>
</tr>
<tr>
<td>Research 800-level</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 625: Seminar in Bioenvironmental Science</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fourth Semester (Year 2)</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advised Elective Course (Biol 524, 526 or 531 or 536)</td>
<td>3</td>
</tr>
<tr>
<td>First Semester (Year 1)</td>
<td>Credit Hours</td>
</tr>
<tr>
<td>------------------------------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Advised Elective Course</td>
<td>3</td>
</tr>
<tr>
<td>Research 800-level (or BIOL 997 Dissertation Guidance, if qualified)</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 625: Seminar in Bioenvironmental Science, if necessary</td>
<td>1</td>
</tr>
<tr>
<td><strong>Summer 2 (Year 2) optional</strong></td>
<td></td>
</tr>
<tr>
<td>*Research 800-level (802/803) or if qualified BIOL 997</td>
<td>3 credits each</td>
</tr>
</tbody>
</table>

* recommended for students entering without the MS degree
Chemistry Concentration Core Courses

A candidate for the Ph.D. degree must complete a minimum of 33 hours of graduate course work beyond the master’s degree and a minimum of 60 hours of graduate course work beyond the Baccalaureate degree. A minimum of 18 semester hours of courses at the 600 level, exclusive of dissertation hours. In addition, a minimum of 9 hours per semester of 800 level courses (Doctoral Research and Dissertation) is required during the last two years of the student’s tenure. The first two semesters are for all students. The fifth and subsequent semesters: Dissertation Research (Full-time Load).

<table>
<thead>
<tr>
<th>First Semester (Year 1)</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 525: Cellular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 631: Bioethics and Communications</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 639: Fundamentals of Bioenvironmental Science</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 625: Seminar in Bioenvironmental Science</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second Semester (Year 1)</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 600: Advances in Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 601: Environmental Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 607: Toxicology of Biological Systems</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 625: Seminar in Bioenvironmental Science</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Third Semester (Year 2)</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>* CHEM 551: Advanced Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>* CHEM 603: Physical Chemistry of Environmental Science</td>
<td>3</td>
</tr>
<tr>
<td>* CHEM 602: Pollutants in the Environment</td>
<td>3</td>
</tr>
<tr>
<td>** Research 800-level</td>
<td>5 or 8</td>
</tr>
<tr>
<td>BIOL 625: Seminar in Bioenvironmental Science</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fourth Semester (Year 2)</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>* CHEM 581: Advanced Techniques in Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>Research 800-level</td>
<td>5 or 8</td>
</tr>
<tr>
<td>BIOL 625: Seminar in Bioenvironmental Science, if necessary</td>
<td>1</td>
</tr>
</tbody>
</table>

* Only for students with BS degree
** Only for students with MS degree
To: Graduate Coordinator

From: ________________________________ Date: ____________

Subject: Selection of Research Adviser and Dissertation Research Project.

Based on my personal preference for the following area(s) and my study of written resumes of the faculty research interest, I have interviewed the following faculty members concerning a dissertation project.

Faculty name   Signature (After interview)

1

2

3

4

Having completed these interviews, I have made the following selection:

RESEARCH ADVISOR: I have discussed the dissertation research with the above student. I have agreed to accept the direction of their thesis research.

ADVISOR’S SIGNATURE   DATE
MORGAN STATE UNIVERSITY
Ph.D. Program in Bioenvironmental Sciences

Record of PhD Research Committee Meetings

Student: _______________________

Research Adviser: _______________

Semester in which the research project was chosen: _______________________

PhD Dissertation Committee Members:

1. _______________________________

2. _______________________________

3. _______________________________

4. _______________________________

5. _______________________________

*******************************************************************************
First Research Semester

1. Call a committee meeting for purposes of discussing your preliminary research proposal.

Committee Signatures

1.  

2.  

3.  

4.  

5.  Date:  

2. Submit your research proposal to the Graduate Coordinator, with copies to each committee member.

***************************************************************************************
**Second Research Semester**

Submit a written progress report on your research to the graduate coordinator by the last day of classes. Send copies to each committee member.

**Third Research Semester**

1. Near the end of the semester call a meeting of your committee to advise them of the status of your research, set forth the final goals of the project and the anticipated completion date for the work.

**Committee Signatures**

1.  
2.  
3.  
4.  
5. Date:

2. Submit a written progress report on your research to the graduate coordinator by the last day of classes. Send copies to each committee member.
Instructions for Graduate Assistants

Introduction

An important part of graduate education is the experience of teaching undergraduate laboratories. Graduate students often claim that they learn as much from their teaching experience as they do from taking courses. Therefore new graduate tare expected to do their very best.

General Duties

The duties of graduate assistants encompasses laboratory safety instruction, laboratory teaching and supervision, the grading of weekly experiments, and proctoring and grading exams. The assistant is expected to be on hand without fail before the beginning of the laboratory period and remain in the laboratory until the last student has left. The laboratory coordinators will monitor prompt attendance.

Laboratory Operation

1. The Laboratory Coordinator will meet with those graduate assistants assigned to their lab course sections several days prior to the meeting of the first lab.

2. It is your responsibility to be sure that all chemicals, equipment and materials needed for the experiment are available for students to use. Check the lab at least 15 minutes before the period begins so you can correct any deficiencies.

3. Insist on approved techniques of performing common operations such as weighing, folding filter paper, cutting and inserting glass tubing, holding bottles and pipettes.

4. Require that student keep their working spaces tidy and especially that they clean the table top and sinks before leaving. Do not permit them to throw litter of any sort into the sinks.

5. Do not permit paper cups and other extraneous materials to accumulate in the laboratory. If you find them there when you arrive, remove them yourself.

6. Be constantly alert for instance of “dry labs”, coping, adjusting data, etc. Take appropriate action immediately and report all such incidents to the laboratory coordinator.
7. At the close of each lab section:
   
a. Check balances, sinks, and tabletops to see that they are clean. Correct anything that is not as it should be.
   
b. Check all gas and water outlets. This requires a desk-by-desk inspection.
   
c. Impound equipment left out of lockers and return it to the stockroom.
   
d. See that reagent bottles are in place and enough of a supply for the next lab section is there. Correct deficiencies.
   
e. Turn off the lights and lock the door if a lab does not directly follow.
**Code of Student Conduct and Disciplinary Procedure**

This is an amended University policy regarding the code of student conduct and the attendant disciplinary procedures. It is important that all graduate students be aware of this and more so for those who will be involved in student teaching. The amended code is as follows:

**Prohibited Conduct**

All misconduct, including, but not limited to, the prohibited conduct listed hereafter, is subject to disciplinary action. Attempts to commit acts prohibited by this code shall be punished to the same extent as completed violations.

**Disruptive, Disorderly or Reckless Conduct**

1. Intentionally or recklessly causing physical harm or intentionally or recklessly causing reasonable apprehension of such harm.

2. Intentionally and substantially interfering with the freedom of expression of others.

3. Intentionally or recklessly destroying or damaging the property of others and/or the University.

4. Trespass or unauthorized entry to any University premises, facility, property or at a University-sponsored event.

5. Engaging in disorderly or disruptive conduct, which interferes with the activities of others.
6. CLASSROOM DISRUPTION. The primary responsibility for managing the teaching and learning environment rests with the instructor, which includes faculty, teaching assistants, laboratory assistants, librarians or any other person acting in a supervisory capacity over the instructional form. Students who engage in unlawful or prohibited conduct in those of, which includes any behavior prohibited by the instructor (including but not limited to use of cellular phones, bringing unregistered persons to class, smoking, persistently speaking without being called upon, refusing to be seated, disrupting the class by leaving and entering without authorization, etc.), may be directed by the instructor to leave the class for the remainder of the class period. Depending on the severity and frequency of the conduct, the University may impose any other sanction available to it at law, or under section 8 of this code.

For further details, consult the University’s handbook on Code of Student Conduct and Disciplinary Procedures, which may be obtained from the Division of Student Affairs.
COURSE DESCRIPTIONS- BIOLOGY

BIOL 520 Biological Chemistry Three Hours; 3 Credits Covers topics in protein structure and function, enzyme kinetics and mechanisms of enzyme action, metabolism of carbohydrates, lipids, amino acids and nucleotides, bioenergetics and energy considerations in biochemistry, and analyzes various techniques and instrumentations used in biochemical studies.

BIOL 521 Bioecology Three Hours; 3 Credits This course is designed to develop an in-depth understanding of the major principles connected with the interrelationships of organisms and organisms and their environment. The major chemical, physical and biotic factors of the environment will be analyzed for their influence on the distributor and functional processes of plant and animal communities.

BIOL 522 Modern Research Techniques Three Hours; 3 Credits This course provides the first-year graduate student with an intensive hands-on approach to modern techniques and methodologies of biomedical research. Students will be introduced to theories and practices of qualitative and quantitative analysis of proteins, gel electrophoresis, enzyme assays, column chromatography, nucleic acid blot-and-probe techniques, differential centrifugation, cell culturing, and radioisotope methodology.

BIOL 523 Seminar Topics in Modern Biology & Environmental Sciences Two Hours; 2 Credits This course explores in-depth reviews of modern scientific topics in biology and environmental sciences. It enables students engaged in this course to review the literature and provide discussions on the topics.

BIOL 524 Advance Molecular Genetics Three Hours; 3 Credits This is a lecture course designed as a logical extension of the Introductory Genetics and Population Biology courses encountered in the undergraduate curriculum. The relatedness of life forms through the central dogma concept is the fundamental driving force in explaining the how and why of studying simpler organisms as a prelude to an understanding of the more complex systems. This course is therefore designed to continually enhance the knowledge base in the ever-changing field of molecular genetics both as to theory and practice.

BIOL 525 Cellular Biology Three Hours; 3 Credits This course is designed to integrate basic concepts of cellular biology with general topics in the areas of biochemistry, genetics and molecular biology. The major topics of discussions will be: structure, function and biogenesis of macromolecules and cellular organelles, cell membrane and the cytoskeleton, membrane transport mechanisms, cell surface and intracellular communication, energy requirements for cellular activities, synthesis and sorting, distribution of specific organelular proteins and their major role in overall cellular function. Taken together, specific topics from these four major disciplines will provide the students with an understanding of how cells function. Also, the major experiments that led to the discovery of some of these important facts in cellular biology will be emphasized.
BIOL 526 Molecular Biology Three Hours; 3 Credits This is a lecture course that will provide students with the theoretical basis for appreciating and understanding the basic principles and methodologies of modern molecular biology through lectures and discussions of the current scientific literature and textbook assignments on selected topics in molecular biology. The course is designed to integrate basic concepts of molecular biology with fundamental topics in other areas of cellular biology, biochemistry, microbiology, and molecular genetics. Special emphasis will be given to topics covering the following themes: structure and properties of nucleic acids; DNA replication, repair, and recombination; molecular biology of gene expression and its regulation in prokaryotes and eukaryotes; protein structure and translational control; and molecular biotechnology with an emphasis on recombinant DNA technology, protein engineering, vaccines and therapeutics, immunodiagnostics, and genetic engineering of mammalian and plant organisms.

BIOL 527 Microbiology of Emerging Pathogens Three Hours; 3 Credits This is a lecture course that will address the microbiology of emerging pathogens with the hope of understanding the factors involved in disease emergence, prevention, the public health impact, and control. The course will cover selective pathogen topics such as Hantavirus, emerging food borne pathogens, HIV/AIDS and multidrug resistant tuberculosis among high-risk groups etc. The course will follow instruction and discussion of recent publications on particular topics.

BIOL 528 Immunobiology Three Hours; 3 Credits This course will emphasize the significant new advances in the field of immunology, immunobiology and immunotherapy. This multidisciplinary field of study integrates molecular biology, cell biology and physiology. Students will acquire an in-depth understanding of basic research in immunology that is applicable to the diagnosis and the development of treatments for immunodeficiencies, autoimmune disease, cancer and AIDS. The course will also emphasize new biotechnological strategies for the development of novel vaccines.

BIOL 531 Environmental Science Three Hours; 3 Credits This course is designed to provide students with an in-depth understanding of fundamental scientific principles and concepts necessary for a better understanding of environmental science, environmental problems, causes and solutions. Emphasis is placed on urban environmental problems, issues and solutions together with the impact of man on the environment. Prerequisites: BIOL 521.

BIOL 536 Molecular and Behavioral Neuroscience Three Hours; 3 Credits This course will investigate the fundamental concepts of the nervous system, brain, and behavior by emphasizing the interrelationships between neurobiology and cognitive science. Part of the course will focus on the nervous system structure, function and development and will be used in understanding the biological basis of learning, memory, and behavior in both normal and altered states. Current research, such as the latest discoveries in the genetics and molecular biology of behavior and the social implications of these discoveries will be used in graduate level discussions and presentations. Critical thinking and analysis of
relevant scientific literature will also be emphasized.

**BIOL 540 Computational Biology/Bioinformatics** Three Hours; 3 Credits The course will facilitate the use of computational tools in studying diverse biological problems including developing population growth and prey models, utilizing statistical models in explaining biological concepts, analyzing fundamental problems of DNA and protein structure and function, performing biological database searches and information retrieval, and providing real time three-dimensional images and high resolution graphics displays.

**BIOL 601 Molecular Biotechnology** Six Hours; 4 Credits This is predominantly a laboratory course with direct hands-on laboratory experiences using state-of-the-art techniques and experimental approaches in the production of heterologous proteins in prokaryotic and eukaryotic cells utilizing bacterial (prokaryotic) as well as insect, yeast, and mammalian (eukaryotic) expression vectors. Students will use molecular biology approaches, including techniques in recombinant DNA and genetic engineering technology to clone, express, affinity-purify, and characterize the recombinant proteins produced in the prokaryotic and eukaryotic host cells. The theoretical component of the course introduces the student to the fundamental principles, applications, strategies, and societal concerns of Molecular Biotechnology, and will facilitate an understanding of important theoretical concepts which will be complemented by the methodologies and experimental strategies covered in the laboratory portion of the course.

**BIOL 602 Environmental Immunotoxicology** Three Hours; 3 Credits Studies the adverse effects of environmental chemicals and toxins on the immune system. The course will examine the influence of environmental or toxic agents on immune function and the cellular and molecular mechanisms that lead to alterations in the immune response.

**BIOL 603 Marine and Aquatic Biology** Four Hours; 4 Credits This course examines the broad and multidisciplinary approach to marine and aquatic life and the biological processes in shallow coastal waters and the open ocean. It examines and quantifies organismal physiological response to the abiotic and biotic environment. Aspects of population and community structure, reproduction and larval biological reproduction systems are also examined. Prerequisite: Bioecology, Basic Statistics.

**BIOL 604 Ecosystem Analysis** Four Hours; 4 Credits This course exposes students to ecosystem-level questions; demonstrates field-data collection and laboratory analysis; emphasizes data manipulation on microcomputers; and introduces professional data presentation techniques (graphing, transparencies, slides, multi-media, etc.). Some student projects are expected to generate large enough data sets to test hypothesis and develop publishable conclusions. Class sessions comprise lecture and field/ laboratory components. Prerequisite: core courses.

**BIOL 609 Environmental Microbiology** Three Hours; 3 Credits Covers current topics in selected areas of environmental microbiology, with an emphasis on the genetics and pathophysiology of microorganisms.
BIOL 610 Molecular Epidemiology of Infectious Diseases Three Hours; 3 Credits Application of molecular typing techniques to study of microbial pathogens to increase understanding of epidemiology of infectious diseases. Evaluation of methods used in outbreaks and epidemics reported in literature. Prerequisite: Advanced Cell & Molecular Biology.

BIOL 620 Environmental Genetics Three Hours; 3 Credits Studies the effects of exposure to various environmental chemicals and carcinogens on genetic diseases. The course examines the alteration of the genetic make-up of model organisms by environmental chemicals and other carcinogens, and the influence of such environmental factors on the alteration of target gene expression and development of carcinogenesis.

BIOL 624 Environmental Biotechnology Three Hours; 3 Credits The course examines the use of biotechnology techniques and methods for the analysis and solution of environmental problems. Areas of particular interest include the use of novel microorganisms for applications in the removal of pollutants, toxic chemicals, and hazardous wastes from the environment.

BIOL 625 Seminar Topics in Modern Biology and Environmental Sciences Two Hours; 1 Credit Gives an in-depth review of modern topics in the biological and environmental science fields. It enables students to review the research literature and provide discussions on the topics. These seminars emphasize contextual and integrated understanding, analysis and synthesis, conflicts and ethical issues, enhanced communication and teamwork.

BIOL 626 Environmental Physiology of Plants Three Hours; 3 Credits The course examines the regulation of plant growth and development, nutrition, and the effects of environmental stress, chemicals, and pollutants on the physiology and development of crop plants of economic importance.

BIOL 628 Environmental Carcinogenesis Three Hours; 3 Credits Biochemical and molecular basis of carcinogenesis induced by chemical and physical agents in the environment, including detailed discussion of multi-stage process of carcinogenesis, mechanisms of action of specific chemical and physical carcinogens; current approaches to identification of carcinogens, and chemoprevention strategies.

BIOL 629 Developmental Neurotoxicology Three Hours; 3 Credits This course will introduce students to the full spectrum of environmental effects on the developing nervous system. This includes pre-and postnatal effects of toxicants on the developing nervous system along with the discussion of physical, psychological and sociological constraints of nervous system development. Special emphasis will be given to effects on the development of the mammalian Central Nervous System [CNS], however, Peripheral Nervous System [PNS] effects and other vertebrate models will be discussed where and when relevant.

BIOL 631 Bioethics and Communications Three Hours; 3 Credits Students in this
course analyze, discuss and write on traditional philosophical theories regarding the nature of the moral good. They then apply these theories to critical issues and selected cases involving experiments with human subjects, organ transplantation, in vitro fertilization, the use of animals in research, the collection and publication of research data, peer review, conflicts of interest, and other topics of current concern. The course also emphasizes how to write scientific papers for peer-reviewed journals, for in-house scientific progress reports, for lay audiences, and for grant applications. Approaches to making formal oral presentations and posters are also presented. Class discussions center around writing and speaking skills and the author/speakers responsibility to present accurate accounts of results, applications, and implications of their research. Students have weekly writing and reading assignments.

**BIOL 788-789 Supervised Research (MS program only)** Four Hours; 4 Credits each course These are research courses designed to enable students to participate in research in the areas of their competence under the supervision of qualified faculty members. Students are required to submit oral presentations of research findings in seminars and to submit a written thesis report to the graduate faculty.

**BIOL 797 Thesis Guidance (MS program only)** Two Hours; 2 Credits

**BIOL 799 Thesis Seminar (MS program only)** Three Hours; 3 Credits

**BIOL or CHEM 800-804 (Ph.D. Program only; 800 is offered in the spring, 801 is offered in the fall and 802 and 803 are offered during summer session) Supervised Doctoral Research** Three Hours; 3 Credits each course These courses are designed to allow students to participate in doctoral research in areas of their choosing under the supervision of a research mentor. Students are required to submit their research findings in a seminar topics series. The 800 series of courses is designed for students who have not yet reached Ph.D. candidate status.

**BIOL 995 (fall) 996 (spring) Dissertation Research 6** lab Hours; 6 Credits This class supplants the 800 level supervised doctoral research credit after a student has successfully ascended to Ph.D. candidacy. These 6 credit classes are designed specifically for students who have completed most of their elective courses and are working predominantly on their dissertation research. The. BIOL 995/996 credits may be repeated as needed during the student’s work on his/her dissertation.

**BIOL 997 Dissertation Guidance** Three Hours; 3 Credits This class supplants the 800 level supervised doctoral research credit after a student has successfully ascended to Ph.D. candidacy. The BIOL 995/996 credits may me repeated as needed during the student’s work on his/her dissertation. BIOL 997 may be combined with BIOL 995/996 for students who have completed all formal coursework.

**BIOL 998 Dissertation Seminar Six Hours; 6 Credits** Per requirement of the SGS the dissertation seminar must be taken once, by all students at
least one year prior to defending their dissertation.
COURSE DESCRIPTIONS - CHEMISTRY

CHEM 531. Advanced Analytical Chemistry I (3 Credits). Prerequisite: Chem. 314. The course covers the principles and methods at advanced level in modern chemical analysis. Topics will include separation techniques, GC, HPLC, Spectrometry, lasers and electrophoresis.

CHEM 532. Advanced Analytical Chemistry II (3 Credits). Prerequisite: Chem. 314. Advanced topics in Chemical equilibrium and kinetics in analytical chemistry, Thermal and Electrochemical methods will also be covered in this course.

CHEM 533. Statistics in Analytical Chemistry (3 Credits). Prerequisite Chem. 314. This course covers a variety of computer-aided model to treat and interpret laboratory experimental data. Topics to be covered include: Errors in measurement, bi-and multivariate data analysis, analysis of variance (ANOVA) and ancillary techniques including Monte Carlo techniques and simulation.

CHEM 534. Advanced Analytical Chemistry III (3 Credits). Prerequisite: Chem. 314. Selected topics in electronics and computer applications in analytical chemistry. Signal processing, computer-aided analysis, electronic gates in signal processing in analytical chemistry.

CHEM 541. Chemical Kinetics (3 Credits). Prerequisite: Chem. 308. This course will cover the fundamental understanding of chemical reaction rates and mechanisms, orders of reaction and their application to biological systems, thermochemical kinetics, catalysis and fast reactions in gases and condensed phases.

CHEM 542. Colloids and Surface Chemistry (3 Credits) Prerequisite: Chem. 308. Discussion of colloid materials and their applications, surfaces, interface and reactivity on material surfaces and interphases. Stability of colloids, rheology, emulsions and foams.

CHEM 543. Chemical Thermodynamics (3 Credits). Prerequisite: Chem. 307. Thermodynamics and its applications; solutions and phase equilibria for one and multicomponent systems, equilibrium considerations in thermodynamics.

CHEM 544. Molecular Spectroscopy (3 Credits). Prerequisite: Chem. 308 and 407. Rigorous study of chemical structures at the atomic and molecular levels. It uses quantum mechanical principles and the accompanying symmetry and molecular point groups methodology to understand the fundamental basis of the interaction of electromagnetic radiation with matter and the interpretation of the resulting atomic and molecular spectra and their relationship to chemical reactivity.

CHEM 545. Special Topics in Analytical/Physical Chemistry. (2 Credit) Prerequisite: Graduate Standing with consent of Instructor. Special topics course in analytical/physical
chemistry, which may be taken as an independent course by graduate students with concentration in analytical or physical chemistry. It covers current/frontier areas in analytical or physical chemistry, which may include electrochemistry, separation techniques, quantum mechanical treatment of molecules and structural determination.

**CHEM 546. Quantum Chemistry. (3 Credits).** Prerequisite: Chem. 308 and Chem. 407. Rigorous study of the basic tenets of quantum mechanics as applied to chemical systems; variational and perturbation theory, Hartree-Fock and Franck-Condon principle, the electronic structure of atoms and molecules and their energy systems.

**CHEM 547. Computational Chemistry. (3 Credits)** Prerequisite: Chem. 308, Chem. 407 and COSC 237. Modern theoretical (classical and quantum) methods used in the study of molecular structure, bonding and reactivity. Determination of molecular spectra, relationship to experimental techniques and concepts of practical applications.

**CHEM 551. Advanced Organic Chemistry (3 Credits).** Prerequisite: Chem. 204, 408. Emphasis will be on the structure, synthesis and bonding in organic compounds, reaction mechanisms (ionic, free radical and concerted).

**CHEM 552. Organic Synthesis (3 Credits).** Prerequisite: Chem. 204, 408. Principles of reactions leading to carbon-carbon formation, functional group transformation, protecting groups and masked groups introduction. Strategies of skeletal structures of main classes of biologically interesting compounds will be covered.

**CHEM 553. Polymer Chemistry (3 Credits).** Prerequisite: Chem. 204, 408. Principles of structural and physical properties of polymers, copolymers and block copolymers, characterization, degradation and stabilization of polymeric materials.

**CHEM 555. Natural Products (3 Credits).** Prerequisite: Chem. 204, 408 and 551. Topics covered will include structure, biosynthesis and reactions of the major classes of natural products: alkaloids, antibiotics, polyketides and shikimates.

**CHEM 561. Advanced Inorganic Chemistry (3 Credits).** Prerequisite: Chem. 312, 309. Principles of chemical bonding in metals and nonmetals, ligand field theory, applications of group theory to chemical bonding, inorganic reaction mechanism.

**CHEM 562. Organo-metallic Chemistry (3 Credits).** Prerequisite: Chem. 312. Principles and chemistry of compounds containing carbon-metal bonds, their synthesis and reaction mechanisms.

**CHEM 563. Bioinorganic Chemistry (3 Credits).** Prerequisite: Chem. 312 and Chem. 204. Structure and bonding of inorganic material with biological systems. Functional relationship and reactions.

**CHEM 565. Special Topics in Inorganic/Organic Chemistry or Biochemistry. (2 Credit).** Prerequisite: Graduate standing with consent of Instructor. Special topics
course in inorganic, organic or biochemistry, which may be taken as an independent course. It covers current/frontier areas in inorganic, organic or biochemistry which may include specific areas in transition metals and non-metal chemistry, application of group theory to reaction mechanisms, trends in stereochemical synthesis, pericyclic reactions, linear free energy relationship in organic chemistry, proteins and their structure-activity relationship, nucleic acid and their interactions with other biomolecules and their relationship to biomedical technology.

CHEM 571. Advanced Biochemistry (3 Credits). Prerequisite: Chem. 304. Principles and chemistry of living matter, their metabolism and energetic transformations, lipid structure and membranes.

CHEM 572. Enzymology (3 Credits). Prerequisite: Chem. 304, 571. Structure and functions of enzymes, enzyme kinetics, competitive, noncompetitive and cooperative binding of substrates to enzymes, reversible and irreversible binding of substrates to enzymes.

CHEM 573. Protein and Amino Acids (3 Credits). Prerequisite: Chem. 304 and Chem. 571. Advanced study of proteins, their building blocks and structure. Function and chemistry of amino acids and proteins, synthesis and purification.

CHEM 581. Advanced Techniques in Chemistry (4 Credits). Prerequisite: Chem. 314, 408 and 312. Topics to be covered include modern synthetic methods in inorganic and organic chemistry, qualitative and quantitative analysis of reaction products using absorbptiometric, fluorometric, electrochemical, separation and various other optical techniques. This is a hand on course that emphasizes the proficiency of students in the general research techniques/instrument usage in chemical sciences.

CHEM 600. Advances in Biochemistry (3 Credits) Rigorous treatment of molecules of biological importance, their fundamental applications to the understanding of human function and the environmental effects on their activity. Topics covered include the general structure, function and energetics of proteins, enzymes, carbohydrates and the nucleic acids with emphasis on their utilization by living organisms, their impact on environment and other recent health related applications. Prerequisites: Chem. 570/573 or Consent of Instructor.

CHEM 601. Environmental Chemistry (3 Credits) This environmental chemistry course is a course designed to introduce students to the importance of chemistry in solving the myriad of environmental problems in the universe – the atmosphere, biosphere, geosphere, hydrosphere and the anthrosphere. Most of the pollutants are man-made during the normal cause of daily activities. Environmental chemistry studies the production of pollutants, their distribution in the environment, overall health effects and their remediation using chemical knowledge and its attendant techniques. Prerequisite: Chem. 204, Math 114 or equivalent, CHEM. 207 or permission of the Instructor.
CHEM 602. Pollutants in the Environment (3 Credits) This course involves a rigorous treatment of materials and particulates that contribute to environmental hazards. Their origin and production will be covered in great depth. Rigorous quantitative methods of analysis and the general instrumental techniques will be covered. Prerequisite: Chem. 314 and/or CHEM 601.

CHEM 603. Physical Chemistry of Environmental Sciences (3 Credits) This course will cover the importance of fundamental thermodynamics and kinetics in the treatment of environmental problems. Topics covered will include first, second and third laws of thermodynamics, phase transformations, free energy changes, equilibrium, transport phenomena, catalysis. Prerequisite: CHEM 308 or equivalent.

CHEM 604. Analytical Techniques in Environmental Chemistry (3 Credits) This course covers the fundamental analytical methods used in the determination of both trace and bulk materials of chemical interest. Such techniques include errors in analysis and their propagation. Significance testing and ANOVA and Monte Carlo technique, optimization and computer simulations will be covered. Emphasis will be on the analysis of environmental pollutants. Prerequisite: Chem. 314 and/or Chem. 533.

CHEM 605. Atmospheric Chemistry (3 Credits) Chemistry of the lower atmosphere (troposphere and stratosphere) including photochemistry, kinetics, thermodynamics, box modeling, biogeochemical cycles and measurement techniques for atmospheric pollutants; study of important impacts to the atmosphere which result from anthropogenic emissions of pollutants, including acid rain, the greenhouse effect, urban smog and stratospheric ozone depletion. Prerequisite: CHEM 602 and CHEM 603.

CHEM 788, 789. Chemical Research (8.0 Credits)

CHEM 790. Graduate Seminar (2.0 Credits).

CHEM 797 Thesis Guidance

CHEM 799 Thesis Seminar (3.0 Credits.)
FACULTY AND THEIR RESEARCH INTEREST:

**BIOLOGY**

Kenneth Samuel, Professor, Ph.D., Georgetown University: Biochemistry. Postdoctoral Fellow, Columbia University and National Cancer Institute, NIH.

Research Interest: Molecular Biotechnology and HIV/AIDS Research, Molecular Biology and Biochemistry of HIV-1 and HIV-2; the mechanism of Nef HIV-1 induced-T cell signaling dysfunction.

Jonathan Wilson, Associate Professor, Ph.D., Duke University: Zoology/Marine Ecology. Postdoctoral Fellow, Duke University, Raleigh.

Research Interest: Environmental and aquatic toxicology: response of various life stages of marine and estuarine invertebrates to pollutants, especially pesticides.

Christine Hohmann, Professor, Ph.D. Brown University: Neurobiology. Postdoctoral Fellow, Johns Hopkins University Medical Center.

Research Interest: Brain development; Development of mouse model for mental retardation; structure-function relationships in brain; cognition; learning and memory.

Cleo Hughes-Darden, Associate Professor, Ph.D., Clark Atlanta University: Molecular Biology. Postdoctoral Fellow, USDA, Beltsville.

Research Interest: Molecular Biology/Genetic Engineering with emphasis on the regulation of plant genes involved in nitrogen utilization; Signal transduction mechanisms, gene regulation, and protein phosphorylation in hypertension.

Dwayne Hill, Associate Professor, Ph.D., University of Arizona: Pharmacology & Toxicology. Postdoctoral Fellow, Michigan State University.

Research Interest: Pulmonary toxicology, toxicology of inflammation, hepato-, immuno-, and developmental toxicology; mechanism of immune responses *in vivo* and *in vitro*.

Saroj Pramanik, Associate Professor, Ph.D., Indian Agricultural Institute: Biochemistry. Postdoctoral Fellow, University of Guelph, Ontario.

Research Interest: Translational control of gene expression during cellular differentiation; cancer research.

Frank Denaro, Associate Professor, Ph.D., State University of N.Y., Stoney Brook:
Neuroscience. Postdoctoral Fellow, UCSD Medical Center, San Diego.

Research Interest: Neuropathology and neuroscience techniques including histological-, and Electron Microscopy.

Michael Koban, Associate Professor, Ph.D., University of Illinois, Urbana: Cell & Molecular Physiology. Postdoctoral Fellow, Johns Hopkins University.

Research Interest: Molecular Physiology; Homeostatic responsiveness of vertebrates to stress, in particular, heat shock proteins.

Gabrielle McLemore, Associate Professor, Ph.D., Pennsylvania State University: Pharmacology. Postdoctoral fellow: Cornell University.

Research Interest: Effects of multiple neurochemical systems on behavioral symptoms associated with cannabinoid withdrawal.

James Wachira, Associate Professor, Ph.D., University of London: Molecular Biology. Postdoctoral Fellow, University of Maryland.

Research Interest: Molecular Biology of hypertension: the role of neural melanocortin signaling system in salt sensitive hypertension and in the alteration of cardiovascular function by systemic stress; Biotechnology and genomics.

Lisa A. Brown, Associate Professor, Ph.D., University of Connecticut: Physiology. Postdoctoral Fellow, University of Maryland School of Medicine.

Research Interest: Muscle plasticity; activity-dependent changes in gene expression in adult skeletal muscle fibers.

Chunlei Fan, Associate Professor, Ph.D

Research Interest: Aquatic microbial ecology and biogeochemistry in marine and estuarine environments with the focus on nutrients, eutrophication and harmful algal blooms (HAB). Human impacts and eutrophication: monitoring the eutrophication process and HABs events on the watershed scale by using GIS/remote sensing.

Robert Javonillo, Assistant Professor, Ph.D.

Research Interest: Molecular evolution, morphological phylogenetics, reproductive biology of vertebrates (especially teleost fishes), STEM education (especially environmental and evolutionary biology).

Simon Nyaga, Assistant Professor, Ph.D.

Research Interest:
Yun Chi Chen, D. Phil. Oxford University, UK

Research Interest:

Gloria Hoffman, Professor, Ph.D.

Research Interest:

Mathumati Rajavel, Associate Professor, Ph.D.: Madurai Kamaraj University, Post-doctoral fellow: Temple University School of Medicine and Johns Hopkins University Bloomberg School of Public Health

Research Interest: Molecular Microbiology. Manipulation of bacteriophages to combat infections caused by bacterial pathogens, alternate to antibiotic treatment, bacterial/bioagent detection, therapeutics, environmental bacterial decontamination as well as novel vaccine delivery vehicles.

Viji Sitther, Assistant Professor, Ph.D. University of Madras,

Research Interest: Biofuel production in brackish waters using a salt tolerant Fremyella diplosiphon cyanobacterium. Alternative energy.
CHEMISTRY

Kadir Aslan: Assistant Dean for Research and Graduate Studies and Professor, Ph.D. Illinois Institute of Technology: Chemical Engineering.


Research Activity: Molecular spectroscopy, Electrochemistry/Electrocatalysis of the reactions at solid electrodes in micelle and microemulsion systems, Fluorescence polarization/anisotropy of biomimetic membranes, surface chemistry and interfacial relations, physical characterization of bicontinuous microemulsions and their use in chemical reactions. Development and characterization of emulsions for tertiary oil recovery technology. Sol-gel techniques in chemical and biosensors.

Pumtiwitt McCarthy: Assistant Professor, Ph.D. Biochemistry, University of Delaware

Research Activity: Enzymology, protein structure-function relationships, carbohydrate biosynthesis, chemoenzymatic synthesis, carbohydrate-based biomaterials, redox and cysteine chemistry, glycomimetics, vaccine development, bioenvironmental assay development.

Alvin P. Kennedy: Interim Dean and Professor: Ph.D. Caltech, Physical Chemistry

Research Activity: Microwave systems, Biosensors, Thermodynamics of multi-phase systems, Polymers.


Research Activity: Synthesis and anticancer properties of novel organometallic compounds.

Yongchao Zhang: Associate Professor, Ph.D. Chemistry, University of Texas at Austin

Research Activity: Development of biological and environmental sensors, development of stimuli-responsive materials based on bio-polymers and bio/nano composite materials and their applications in biosensors, drug-delivery systems and biofuel cells.

Richard J. Williams: Asst. Professor, Ph.D. Georgia State University: Analytical Chemistry.

Research Activity: Laser spectroscopy, applications of phase resolved and time
resolved fluorescence; applications of near-infrared fluorescence, development of fluorophores for use as labels and/or probes in fluorescence, cell sorting, immunoassays and environmental monitoring.


Research Interest: Synthesis, modification, characterization and biological applications of near-infrared cyanine dyes.