Graduate Programs in Sciences

Doctor of Philosophy in Engineering and Applied Science

The Doctor of Philosophy in Engineering and Applied Science is an interdisciplinary, integrative degree involving faculty from the College of Engineering and the College of Sciences. The program is particularly suited to the emerging trends in the scientific and engineering communities.

Student Learning Outcomes

College of Sciences
Ph.D. in Engineering and Applied Science

1. Ability to apply basic engineering concepts as demonstrated by the results of the Qualifying Procedures
2. Ability to apply advanced concepts, both Colleges to develop Ph.D. Research
3. The candidate will have the approval of the Ph.D. Dissertation Committee for the scope of the Ph.D. Dissertation
4. Ability to perform advanced engineering and/or science research
5. Ability to publish research
6. Final approval of the Ph.D.

Admission Requirements

Admission to the doctoral program is based on reasonable evidence that the applicant will prove capable of scholarly research on a broad intellectual foundation. All students enrolling in the program must have a Master’s degree from an accredited college or university in engineering, physics, mathematics, earth and environmental sciences, computer science, or a closely related field, or be willing to complete coursework required in an existing Master’s program in one of the participating departments at UNO while pursuing the Ph.D. Admission decisions will be based primarily on grade-point average, Graduate Record Examination scores, and letters of recommendation. Foreign applicants (non-English speaking countries) must also provide proof of English proficiency (see Graduate School).

Doctor of Philosophy in Engineering and Applied Science Degree Requirements

Students enrolled in the program must satisfy all general requirements of the UNO Graduate School. Following are the formal procedural requirements for students to receive the Ph.D. degree in
Engineering and Applied Science. Ph.D. candidates must complete a minimum of 51 semester credit hours of graduate course work in an approved program beyond the Bachelor’s degree, not including dissertation research. The credit hours may include up to 30 semester hour credits obtained in a Master’s degree program, if the area of the Master’s degree is relevant to the doctoral program. Up to six of these 30 credits may be for thesis research. In addition, a doctoral dissertation based on the results of original research under the guidance of a faculty committee and defended in a public examination is required for the doctoral program. At least 30 semester hours of dissertation research credit must be earned.

Units participating in the program are Civil and Environmental Engineering, Electrical Engineering, Engineering Management, Naval Architecture and Marine Engineering, Computer Science, Earth and Environmental Sciences, Mathematics, and Physics. The student’s dissertation advisory committee will consist of at least five members. No more than three can be from any one department. There must be at least one committee member from each of the colleges of Engineering and Sciences. Program qualification is administered by the department of the principal advisor(s). It is based on material in a typical departmentalized master’s degree program, or equivalent. Courses are chosen with the consent of the dissertation advisory committee. The committee shall consider the interdisciplinary nature of the program when they approve the courses. A minimum of nine credits (three courses) must be taken in each college. A General (comprehensive) Examination will be administered by the dissertation advisory committee. The examination will be based on material in the student’s program of study. After passing the General Examination, the Ph.D. student is expected to write a dissertation prospectus and defend it before the dissertation advisory committee. After a successful defense and committee approval of the prospectus, the student may pursue research leading to the dissertation. The dissertation should reflect the interdisciplinary nature of the program. There must be a final public defense of the dissertation administered by the dissertation advisory committee.

**Financial Aid**

Teaching and research assistantships are available to qualified graduate students on a competitive basis.
Biological Sciences

Programs of Study

The Department of Biological Sciences offers a Doctoral Degree in Integrative Biology and a Master of Science in Biological Sciences. The Integrative Biology doctoral program is designed to prepare students for careers in biology through a rigorous program of coursework and research. Integrative biology combines approaches from diverse areas, from molecular biology to ecology, to illuminate how organisms function and operate in their environment. The Master of Science in Biological Sciences prepares students for employment in a variety of careers (biomedical technician, natural resource manager, biology education) or for further study towards graduate or professional degrees. The program features coursework and research opportunities in areas ranging from cellular and molecular biology to ecology and environmental biology.

Admission

Applicants are evaluated by the Department of Biological Sciences graduate committee. The committee will consider the student’s previous academic record, Graduate Record Examination scores, and letters of recommendation. Acceptance usually requires a commitment from a faculty member to serve as temporary advisor for the first academic year. Entering students may be required to take undergraduate courses to correct deficiencies in basic areas of biology.

Financial Aid

Financial support in the form of stipend and waiver of tuition may be provided to Ph.D. and M.S. students. There are commonly three forms of financial support: teaching assistantships, research assistantships, and fellowships.

Doctor of Philosophy in Integrative Biology

Student Learning Outcomes

College of Science
Ph.D. in Integrative Biology

1. Learn concepts and experimental approaches in a variety of areas of biology.
2. Be able to present effective oral and visual summaries of independent research.
3. Orally present a proposal for dissertation research to a general scientific audience.
4. Present and defend a written proposal for dissertation research to a specialized audience.
5. Learn, apply, and integrate concepts and experimental approaches from specific areas of biology appropriate to the student's interests.

**Degree Requirements**

Doctoral students are required to complete a minimum of 60 credit hours beyond the baccalaureate degree. The course requirement is meant to provide students with basic understanding and skills in Integrative Biology, while allowing individuals to tailor the specific coursework to meet their needs. Courses are selected in consultation with the student's advisor and must satisfy the following requirements:

1. Three credit hours of Topics in Integrative Biology (BIOS 6093).
2. Nine credit hours of other graduate-level coursework.¹
3. Two credit hours of Scientific Communication (BIOS 6022).
4. Four credit hours of Graduate Seminar (BIOS 6091).²
5. Twelve credit hours of Dissertation Research (BIOS 7050).³
6. The remaining 30 credit hours may include additional seminar (BIOS 6091) or research (BIOS 7000, 7050).⁴

¹A minimum of 3 credit hours must be at the 6000-level. May not include BIOS 6091, 7000, 7050 or more than 3 credit hours of BIOS 6090.
²Students are expected to enroll in BIOS 6091 every regular semester in residence.
³Students are expected to enroll in BIOS 7050 every regular semester in residence after advancing to candidacy.
⁴Other specific courses may be required to address deficiencies in student preparation.

Students must maintain a cumulative GPA of 3.0 (on a 4.0 scale) in all required coursework. Any course in which a student earns a C will be reviewed by the graduate committee to determine whether it will count toward the degree requirement. In no case, will more than 6 credit hours of C be applied to the degree requirements. At least half of the total credits earned by doctoral students must be at the 6000 or 7000-level.

**Advisory Committee**

All students admitted to the doctoral program will be assigned an interim advisor. During the first year in the program, the student will select a research advisor (who may be the same as the interim advisor) and assemble an advisory committee. The advisory committee consists of five associate or full members of the graduate faculty, three of whom must be faculty of the Department of Biological
Sciences. Other committee members may be from other departments at UNO or other institutions. The advisory committee provides guidance on coursework and research.

A Plan of Study that includes coursework completed, in progress, and planned, must be approved by the graduate coordinator and submitted to the graduate school by the end of the first year in the program. Continuation in the program is contingent upon evidence of progress in the degree program provided in the form of annual reports submitted to the graduate committee.

**General Exam**

Students must take a general exam before the end of their second year in the program. The major requirement of the general exam is the preparation of a well-constructed and complete research proposal describing the dissertation project in sufficient detail to judge feasibility, novelty, and relevance of the project. The proposal is presented at a public seminar and defended in a closed meeting with the advisory committee. Students need to demonstrate a high degree of proficiency in their research area, appropriate general knowledge, and readiness to perform dissertation research. Upon passing the general exam, and with the approval of the Department Chair and Dean of the College, the student is admitted to doctoral candidacy.

**Dissertation**

The most important requirement of the doctoral degree is a dissertation summarizing original, independent research, which is both significant and novel. Hence, the final years of study are dedicated to conducting research and preparing the dissertation. Advisory committee meetings are convened annually to monitor progress and address problems if they arise. The research is evaluated regularly and adjusted in scope or direction as needed to ensure progress toward the degree. The doctoral program culminates with the preparation, public presentation, and defense of the dissertation in front of the advisory committee. After the defense, the dissertation is revised according to committee recommendations and approved by the Graduate School.

**Teaching Requirement**

Students are required to have teaching experience prior to the completion of their graduate career at UNO. The experience may be attained prior to enrollment in the program (e.g., by serving as a teaching assistant during undergraduate or MS programs) or during the student's tenure in the doctoral program.
Master of Science in Biological Science

Student Learning Outcomes

College of Science
M.S. in Biological Sciences

1. Be able to present effective oral and visual summaries of independent research.
2. Orally present a thesis to a general scientific audience.
3. Present and defend a written thesis to a specialized audience.
4. Learn and apply concepts and experimental approaches in a specific area of biology appropriate to the student’s interests.

Master of Science students are required to complete a minimum of 30 credit hours beyond the baccalaureate degree. The course requirement provides students with basic understanding and skills in the Biological Sciences, while allowing individuals to tailor the specific coursework to meet their needs. Courses are selected in consultation with the student’s advisor and must satisfy the following requirements:

1. 6 credit hours of Thesis Research (BIOS 7000).¹
2. 6 credit hours of 6000-level coursework.²³
3. 4 credit hours of Graduate Seminar (BIOS 6091).⁴
4. The remaining 14 credit hours must be 5000 or 6000-level.²
5. A minimum of 12 of the 24 non-thesis credit hours must be in the Department of Biological Sciences.

¹Students generally enroll in BIOS 7000 every regular semester in residence, but only 6 credit hours may count toward the 30 credit hour degree requirement.
²A maximum of 3 credit hours of BIOS 6090 may count toward the degree.
³May not include BIOS 6091.
⁴Students are expected to enroll in BIOS 6091 every regular semester in residence.

Students must maintain a cumulative GPA of 3.0 (on a 4.0 scale) in all required coursework. Any course in which a student earns a C will be reviewed by the graduate committee to determine whether it will count toward the degree requirements. In no case, will more than 6 credit hours of C be applied to the degree requirements.
Up to 10 hours of graduate-level credit taken previous to admission into the M.S. program may be applied towards the 30 hours required for the M.S. degree, subject to approval by the student's advisory committee, the graduate coordinator, and the Graduate School.

**Advisory Committee**

Each M.S. student has an advisory committee that directs the course work and research. In the first semester in the M.S. program, the student selects a faculty member from the Department of Biological Sciences to serve as chair of the advisory committee. By the end of the second semester, the advisory committee is expanded to a minimum of three members. Members of the advisory committee must be members the graduate faculty and at least half must be from the Department of Biological Sciences.

Students will submit annual reports documenting progress in the program, which will be evaluated by the graduate committee. A *Candidate Plan of Study* that includes coursework completed, in progress, and remaining, must be approved by the graduate coordinator and submitted to the graduate school no later than the semester prior to the completion of the degree.

**Thesis**

The Master of Science degree requires a thesis embodying original research in a specialized area. The thesis must be presented in a seminar open to the public, defended in an oral final examination, and approved by the student's advisory committee. After the defense, the thesis is revised according to committee recommendations and approved by the College of Sciences and the Graduate School.

**Chemistry**

**Programs in Chemistry**

The Department of Chemistry offers both Masters’ and Doctoral programs. Both the M.S. and the Ph.D. are research degrees and require an original investigation by the student. Students may choose to pursue the Ph.D. degree directly from the baccalaureate degree, or after earning an M.S. degree.

**Admission**

Applicants to the Masters or Ph.D. programs are evaluated by the Department of chemistry Graduate Recruitment Committee. The committee will consider the student’s previous academic
record, previous research experience, Graduate Record Examination (GRE) scores, and letters of recommendation. Foreign applicants must also have a satisfactory TOEFL score. Written and oral competence in English are required.

Financial Aid

Teaching assistantships are available to qualified graduate students. Research assistantships supported by grant funds of individual faculty members are also available. Summer support is available in each type of assistantship. The amount paid is proportionately scaled to the academic year stipend.

Master of Science in Chemistry

Student Learning Outcomes

College of Science

M.S. in Chemistry (Thesis Option)

1. Graduate students will acquire an advanced understanding of concepts in areas related to their thesis research and area of specialty.
2. Graduate students will acquire an advanced understanding of concepts in physical chemistry and a minimum of 2 subdisciplines outside of physical chemistry (Analytical, Biochemistry, Inorganic, Organic, Materials, Medicinal) through completion of graduate level coursework.
3. Graduate students will develop skills to be competent instructors of undergraduate students.
4. Graduate students will be able to explain in technical written and oral formats an advanced understanding of a current topic in the chemical literature.
5. The department will maintain high graduate student satisfaction with the program.

College of Science

M.S. in Chemistry (Non-Thesis Option)

1. Graduate students will acquire an advanced understanding of concepts in physical chemistry.
2. Graduate students will acquire an advanced understanding of concepts in a minimum of 2 subdisciplines outside of physical chemistry (Analytical, Biochemistry, Inorganic, Organic, Materials, Medicinal) through completion of graduate level coursework.
3. Graduate students will be able to explain in technical written and oral formats an advanced understanding of a current topic in the chemical literature.
4. The department will maintain high graduate student satisfaction with the program.
**Degree Requirements**

Upon entrance of the graduate program, each student will be given placement examinations covering undergraduate preparation in the major areas of chemistry. Results of these tests will provide a basis for selection of the courses to be pursued during the student’s first year.

The minimum requirement for the degree of Master of Science is 18 credit hours of graduate course work. At least nine hours must be concentrated in one of the divisions of chemistry. In addition, a minimum of six hours must be taken across two other chemical divisions. With the approval of the student’s thesis committee and the department chair, the additional three hours may be taken in graduate level non-chemistry courses. Also required for the Master’s degree are nine hours of research/thesis (at the 7000 level), and three hours of credit in CHEM 6095 (Seminar) for a total of 30 semester hours. For graduate course work, the candidate must maintain an overall B (3.0) average, a B (3.0) average in the major area, and a 2.75 average outside of the major area. Each student is required to prepare and present one literature seminar, the subject of which is to be taken from the current research literature and is not to be directly related to the student’s present or previous research. A formal abstract, prepared and distributed prior to the date of the seminar presentation, is required. Each student must present the seminar no later than the fourth semester in the program (excluding summer semesters).

Courses at the 4000-level can only be used for graduate credit with the approval of the student’s thesis committee and the department chair.

For those who are working toward the Ph.D. but wish to earn a Master of Science degree, passing grades in three cumulative exams (see next section) are required in addition to the aforementioned 30 hours of credit. In place of the thesis, the department will substitute an article accepted for publication, describing a substantial piece of research done while enrolled in the Graduate School.

**Non-Thesis MS Degree Program**

The Non-Thesis MS Degree Program provides BA and BS degree students with an option of obtaining a MS degree based upon completion of program of academic coursework in advanced chemistry.

**Admission Requirements**
After acceptance by the Graduate School, the Chemistry Department on the basis of undergraduate academic record, three letters of recommendation, and statement of purpose will determine admission to the Non-Thesis MS Program in Chemistry.

Students not meeting these requirements may be admitted to the program on a conditional basis, and must fulfill conditions imposed by the department in addition to the regular requirements for the degree. Students with Bachelor's Degrees in fields other than Chemistry may be admitted on a conditional basis. Please direct graduate admission enquiries to: gradchem@uno.edu

Program Limitations and Constraints

Students admitted to the Non-Thesis MS Degree Program are not eligible for financial support from the Department of Chemistry in the form of a graduate assistantship or fellowship.

Students admitted to the Non-Thesis MS Degree Program may not directly transfer into the PhD program but may apply to the PhD program at any time. Admission into the PhD program will be based on the merit of the applicant as compared to applicant pool for that semester.

Advisor/Committee

An advisor will be assigned to the student based on his or her area of interest. The Advisor will be a member of the Chemistry Department Graduate Affairs Committee and will monitor academic progress. The advisor will guide the student through the academic aspects of the program, serve as liaison to the Department and the Graduate School, and serve as the Chair of the Comprehensive Examination Committee. The Advisor will select two additional faculty members to serve on the examination committee.

Course Requirements

The minimum course work requirement is 33 hours. Graduate credit is awarded for courses numbered 5000 and above. Graduate credit is not awarded for courses numbered 4000 and below. As a minimum, a student must present at least 15 semester hours of work in courses numbered 6000 or above.

Students must complete a minimum of 21 hours in Chemistry. This includes 3 credit hours of CHEM 6095 Seminar. The student must be registered for CHEM 6095 the semester they plan to graduate.
Elective courses must be numbered 5000 or above and may come from areas outside of chemistry. All elective courses to be used for the MS degree in Chemistry must be approved by the Department of Chemistry.

**Curriculum Summary**

<table>
<thead>
<tr>
<th>Courses</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM Courses 5000-7000 level</td>
<td>18</td>
</tr>
<tr>
<td>CHEM 6095 (required may be taken for credit a max of 3 times)</td>
<td>3*1</td>
</tr>
<tr>
<td>Elective Courses (5000 or above)</td>
<td>12</td>
</tr>
</tbody>
</table>

**Application for Candidacy**

Students should apply for candidacy after 15 hours have been completed. Candidacy applications must be submitted the semester prior to semester in which the student will be graduating.

**Non-Thesis Project**

Each student is required to prepare and present a literature seminar, the subject matter of which is to be taken from the current chemical/biochemical research literature. The student's Advisor and Committee must approve the topic. A formal abstract, prepared and distributed prior to the date of the seminar presentation, is required. Students must present their seminar the semester they intend to graduate. The presentation of the seminar will serve as the comprehensive exam and will be judged by the students' Advisor/Committee as pass or fail.

**Application for Degree**

Students must complete the online form that officially adds them to the graduation list. This must be completed on the Registrar's office website no later than the first week of classes in the semester that the student plans to graduate.
Master's Examination Report

A Master's Examination Report must be presented to the Graduate School as evidence of completion of master's degree milestone (comprehensive exam/non-thesis project). The report is due the last week of the month preceding Commencement.

Time Limit

Programs for master's degrees must be completed within six years. A student may request an extension beyond the six-year limit with approval from the program and the dean of the Graduate School, in consultation with the Graduate Council. A Request for Extension of the 6 Year Limit form along with a statement of support from the degree program must be submitted to the Graduate School.

Doctor of Philosophy in Chemistry

Student Learning Outcomes

College of Science
Ph.D. in Chemistry

1. Graduate students will acquire an advanced understanding of concepts in areas related to their dissertation research and area of specialty.
2. Graduate students will acquire an advanced understanding of concepts in physical chemistry and a minimum of 2 subdisciplines outside of physical chemistry (Analytical, Biochemistry, Inorganic, Organic, Materials, Medicinal) through completion of graduate level coursework.
3. Graduate students will develop skills to be competent instructors of undergraduate students.
4. Graduate students will be able to explain in technical written and oral formats an advanced understanding of a current topic in the chemical literature.
5. Students will express a high level of satisfaction with the program

Degree Requirements

The requirements for the Ph.D. degree are as follows:

1. Placement examinations will be given to each student accepted for graduate work in chemistry in each of the major fields of chemistry. The student’s graduate committee will consider the results of these examinations as well as the student’s record in previous course work in determining the student’s qualifications and placement in courses during the first year of study.
2. The minimum requirement for the Ph.D. degree is 18 credit hours of graduate course work. At least nine hours must be concentrated in one of the divisions of chemistry. In addition, a
minimum of six hours must be taken across two other chemical divisions. With the approval of
the student’s thesis committee and the department chair, the additional three may be taken in
graduate level non-chemistry courses. Required reading courses (CHEM 6090, 6091, 6092, and
6093, one hour each) are not counted as part of the 18 hours. Six credits in CHEM 6095
(seminar) and at least 32 research credits in research/dissertation (CHEM 7050) go toward
completion of the 60-semester hour minimum. Courses at the 4000-level can only be used for
graduate credit with the approval of the student’s thesis committee and the department chair. For
graduate course work, the candidate must maintain an overall B (3.0) average, a B (3.0) average
in the major area, and a 2.75 average outside of the major area.

3. To become an applicant for the doctorate, a student must pass the qualifying exam. This
exam is administered through a cumulative exam system in which the student must pass three
separate examinations from a total of nine attempts. All cumulative examinations must be passed
within a two-year period following entrance into the program. Exams are offered six times during
each academic year.

4. Each student is required to prepare and present one literature seminar, the subject of which
is to be taken from the current research literature and is not to be directly related to the student’s
present or previous research. A formal abstract, prepared and distributed prior to the date of the
seminar presentation, is required. Each student must present the seminar no later than the fourth
semester in the program (excluding summer semesters).

5. Before attaining full candidacy for the Ph.D. degree, a student must exhibit excellence, depth
of understanding, and high professional attainment in the field by successful completion of the
general examination for the doctorate. This examination takes place in the fifth semester of
study, and consists of a written report and oral presentation to the thesis committee that
summarizes the student’s research accomplishments and future studies.

Computer Science

The Department of Computer Science offers a program of study leading to the degree of Master of
Science. The program is designed to be flexible enough to accommodate the needs of two kinds of
students: those who have recently completed an undergraduate degree in computer science and
want to further their education, and those practicing professionals who want to acquire specific
academic experience relevant to their work.

The department also participates in the Ph.D. in Engineering and Applied Science program.
Interested students should refer to the beginning of this Graduate Programs in Sciences section for
a description of the program, admission criteria, and curricular requirements.
After acceptance by the Graduate School, admission to the graduate program in computer science will be determined by the department on the basis of undergraduate academic record, three letters of recommendation, statement of purpose, and Graduate Record Examination scores. Admission to the program generally requires a composite score of least 1000 on the verbal and quantitative sections of the Graduate Record Examination; a mathematical background equivalent to Mathematics 2111, Mathematics 2112 and Mathematics 3721; and a computer science background including the equivalent of Computer Science 1583, Computer Science 2120, Computer Science 2125, Computer Science 2450, Computer Science 3301, and two upper-division courses. Students not meeting these requirements may be admitted to the program on a conditional basis, and must fulfill conditions imposed by the department in addition to the regular requirements for the degree. Students with bachelor’s degrees in fields other than computer science may be admitted on a conditional basis.

Master of Science in Computer Science

Student Learning Outcomes

**College of Science**
**M.S. in Computer Science**

1. Acquire knowledge of an advanced area of computing and be able to communicate the acquired knowledge in written form.
2. Acquire knowledge of an advanced area of computing and be able to communicate the acquired knowledge in oral form.
3. Acquire adequate preparation for doctoral study in computer science

Degree Requirements

The department offers both thesis and non-thesis options in the master’s program. All candidates for the master’s degree must satisfy the following background, breadth, and depth requirements. No course may be counted toward the satisfaction of more than one of these requirements.

1. **Background requirement:** the equivalent of Computer Sciences 4401 and 4501. Students who have not completed this requirement prior to enrollment are required to do so, for credit, as part of their curricula.
2. **Breadth requirement:** students must take one 6000-level course that counts toward the degree requirements (three semester hours) in each of three different concentration areas as listed below.
3. **Depth requirement:** students must take three additional courses that count toward the degree requirements (nine semester hours), of which at least two must be at the 6000-level. All courses
must belong to the same concentration area (see list below). This concentration area must be
different from the ones chosen to fulfill the breadth requirement.

The concentration areas, with specific sub-disciplines falling under each area, are given in the
following table. A detailed list of courses included in each area can be obtained from the department.

**Theoretical Computer Science and Programming Languages**
- Computability
- Analysis of Algorithms and Complexity
- Formal Languages and Automata
- Combinatorics and Graph Theory
- Formal Semantics and Type Theory
- Logic
- Programming Languages
- Compiler Construction

**Systems and Network**
- Operating Systems
- Hardware Architecture
- Parallel and Distributed Systems
- Networks
- Protocols

**Software Systems**
- Algorithm Design
- Data Structures
- Programming Methodologies
- Software Engineering
- Distributed Software Engineering
- Software Architectures
- Software Components

**Information Assurance**
- Defense of information and information systems by ensuring their availability, integrity,
  authentication, confidentiality, and non-repudiation.
- Cryptology
- Computer Security
- Information Protection
- Secure Information Exchange
Database Systems and Distributed Applications

- Data Modeling
- Database Systems and Distributed Database Systems
- Data Query Languages
- Programming and Architectures for the Web
- Spatial Database Systems
- Data Mining
- Mobile Computing

Computer Graphics and Visual Computing

- Computer Graphics
- Image Processing
- Data Visualization
- Visual Programming Languages
- Computational Geometry

Artificial Intelligence

- Robotics
- Computer Vision
- Pattern Recognition
- Evolutionary Computing
- Expert Systems
- Machine Learning
- Data Mining

All graduate students completing the master's degree must maintain a minimum of B grade in all 4000-level courses, and a minimum 3.0 average in all courses taken to satisfy the degree requirements excluding thesis research.

Students completing the master's degree with a thesis are required to submit an acceptable thesis and give a satisfactory defense of the thesis. Thirty semester hours are required, no more than six of which may be thesis credit. No more than nine hours may be at the 4000 level. Up to six hours may be taken in graduate courses outside of Computer Science upon prior approval by the department. Students choosing Information Assurance as their concentration must select the thesis option.

Students completing the master's degree without a thesis are required to give a satisfactory performance in a comprehensive examination covering course work. Thirty-six semester hours are
required, no more than 12 of which may be at the 4000 level. Up to nine hours may be taken in approved graduate courses outside of Computer Science upon prior approval by the department.

All graduate assistants are required to participate in the weekly departmental seminar.

Earth and Environmental Sciences

The Department of Earth and Environmental Sciences (EES) offers a multi-disciplinary program of study a wide variety of research options that lead to the degree of Master of Science. The faculty teach about topics relevant to Louisiana’s earth resources and environment, but also participate in internationally recognized research. The multi-disciplinary approach of EES better prepares graduates for a professional setting where different scientists from diverse disciplines work together to achieve common objectives.

Admission criteria and curricular requirements are described below.

The Department also participates in the Ph.D. in Engineering and Applied Science program. As an interdisciplinary graduate degree program, the student will need to review the requirements for the Engineering and Applied Sciences Ph.D. which is administered jointly by the College of Sciences and the College of Engineering at UNO. The degree is administered through this program while dissertation research is conducted in EES.

Admission

Admission requirements for entering either the EES Master of Science or an EES-based Ph.D. in Engineering and Applied Science programs are:

1. an undergraduate GPA > 3.0;
2. completion of the Graduate Record Examination, with a minimum total score of 1000 (Verbal + Quantitative) being highly preferred;
3. submission of a letter of intent to EES;
4. submission of three letters of recommendation; and
5. identifying an EES Faculty member who will agree to be your advisor/mentor prior to being accepted into the Department. Minimum scores for international students are 550 (paper); or 80(iBT) on the Test of English as a Foreign Language (TOEFL) or 6.5 overall band score on the International English Language Testing System (IELTS).
Financial Aid

Both teaching and research assistantships are available through EES. Teaching assistantships are somewhat competitive with preference given to those qualified applicants with experience in teaching basic geology and/or environmental science laboratory courses. Graduate students (M.Sc. and Ph.D.) may also be supported by research assistantships provided by their advisor. Potential students are encouraged to discuss the possibilities with your advisor prior to applying. Finally, there are numerous scholarships available to EES graduate students through the Department and the University. See the respective websites for further detail.

Master of Science in Earth and Environmental Sciences

Student Learning Outcomes

College of Science
M.S. in Earth and Environmental Sciences

1. EES Graduate students will acquire an advanced understanding of concepts in areas related to their thesis research and area of specialty.
2. EES Graduate students will be able to construct and effectively competently present Earth and Environmental Science information and concepts visually and verbally through oral PowerPoint presentations.
3. EES Graduate students will be able to explain in technical written format an advanced understanding of concepts in areas related to their thesis research and area of specialty.
4. The department of EES will maintain high graduate student satisfaction with the program.

Degree Requirements

The minimum requirement for the degree of Master of Science (M.Sc.) in EES is 24 credit hours of course work and six hours of thesis research credit for a total of 30 credit hours. Nine of the 24 hours of coursework must be earned in courses numbered above 6000. Each graduate student is expected to participate in the weekly seminar, EES 6090. All Master of Science graduate students will be required to:

1. secure a thesis advisor from available EES graduate faculty prior to acceptance into the program;
2. form a thesis committee within his or her first semester consisting of at least three committee members with graduate faculty status;
3. submit a prospectus or research work plan to the thesis committee within her or his first year; and
4. submit and publicly defend a thesis upon completion of course work and research.

Mathematics

The Department of Mathematics offers a program of study leading to the degree of Master of Science. The program is designed to provide a sound preparation for continued study toward a Ph.D. degree as well as prepare students for careers in business, government, industry, and teaching. The program provides courses for those interested in the modern applications of mathematics, the pure aspects of mathematics, or statistics, or actuarial mathematics.

The department also participates in the Ph.D. in Engineering and Applied Science (ENAS) Ph.D. program. Interested students should refer to the description of the ENAS program, admission criteria, and curricular requirements.

Admission

Admission to graduate study in mathematics will be determined by the Graduate School and the Department of Mathematics. Students who wish to enter the graduate program should prepare themselves by successfully completing an undergraduate program that includes the equivalent of at least Mathematics 3511 and 2134. In addition, it is strongly recommended that students have taken the equivalent of the Mathematics courses 3512, 4511 (Linear Algebra) and Math 4101 (Advanced Calculus). See Requirements below for more information. Applicants to the program are required to take the Graduate Record Examination (GRE) General Test. Admission to the program requires a total score of 300 or more and 150 or more on the Quantitative Reasoning and 140 or more on the Verbal Reasoning of the GRE.

Financial Aid

Graduate Assistantships are available to a limited number of qualified applicants. Students who would like to apply for a Graduate Assistantship should contact the Graduate Coordinator in the Mathematics Department.

Master of Science in Mathematics

Student Learning Outcomes
College of Science
M.S. in Mathematics

1. Graduate students will acquire an advanced understanding of concepts in areas related to their thesis research and/or area of specialty.
2. Graduate students will be able to construct and effectively present information and concepts visually and verbally through oral presentations.
3. Graduate students will be able to explain mathematical concepts in technical writing format to demonstrate their advanced understanding of concepts in areas related to their thesis research and/or area of specialty.
4. The department will maintain high graduate student satisfaction with the program.

Degree Requirements

The general regulations of the Graduate School, set forth elsewhere in this catalog, apply to the graduate program in mathematics. Any student who has been admitted to graduate study in mathematics but who has not completed the equivalent of Math 3512, 4101 and 4511 must take Math 3512, 5101, and 5511 as early as possible. (Note: Math 3512 and 5101 are required for graduation, but do not contribute towards graduate credit for the MS degree in mathematics. Math 5511 counts towards graduate credit.)

The student must complete one of the following four sets of courses:

1. Mathematics 5411, 5611, 6450, 5512;
2. Mathematics 6201 or 6202, 6230, 6242, 6221 or 6224;
3. Mathematics 6311, 6312, 6301, 6382 or 6385 or 6351;

These four sets of courses represent the following three areas of mathematics:

1. Pure Mathematics
2. Applied mathematics,
3. Statistics,

Within the program as part of the total number of semester hours required, the student must complete at least 18 hours of 6000-level courses in the Mathematics Department. Up to nine non-math hours can be used toward the degree and these courses must be math-oriented or direct applications of math and must be approved by the Graduate Advisory Committee of the mathematics department.
The student must obtain at least a 3.0 average in all graduate level courses, excluding Thesis Research, whether or not the course is offered for degree requirements. The student is given the choice of whether or not to write a Master’s Degree Thesis. The total number of semester hours required is 36 for non-thesis option and 30 for the thesis option. Students who choose to write a thesis must give a satisfactory performance on an oral presentation of the thesis. Students who choose the non-thesis option must give a satisfactory performance on a comprehensive examination that covers courses given for graduate credit.

Programs in Physics

The Physics Department offers the MS degree in Applied Physics. The program is flexible enough to accommodate students planning on continuing graduate studies in applied physics, physics, or an interdisciplinary field, as well as students intending to enter the work force.

The department currently has strong research programs in theoretical and computational aspects of acoustics, geophysics, electromagnetics, continuum mechanics, and astrophysics. Excellent experimental research activities are being conducted in condensed matter and materials physics, magnetism, spintronics, surface physics, and observational astronomy.

The department also participates in the Ph.D. in Engineering and Applied Science program. Interested students should refer to the beginning of this Graduate Programs in Sciences section for a description of the program, admission criteria, and curricular requirements.

Admission

The student should have successfully completed a baccalaureate degree program at a university or college approved by a recognized accrediting agency. The student’s record should indicate a high level of performance and promise, particularly in the field of physics.

After the student has submitted the online application for admission the University, admission to graduate study in physics will be determined by the Department of Physics on the basis of the student’s previous academic record, scores on the general portion of the Graduate Record Examination, and (for financial assistance) letters of recommendation. Requirements for admission without deficiencies are general chemistry, mathematics through differential equations, and satisfactory coursework in the major areas of classical physics.
Financial Aid

Teaching assistantships are available to a limited number of qualified applicants. Research assistantships and fellowships supported by grant funds of individual faculty members are also available.

Master of Science in Applied Physics

Student Learning Outcomes

College of Science

M.S. in Applied Physics

1. Students will have mastery of basic physics appropriate for advanced doctoral study in physics/applied physics or for employment in technical positions in government or industry.
2. Students will be able to communicate scientific knowledge in oral and written form.
3. Student will be able to effectively conduct experimental and/or computational research including data acquisition, computer simulations and analysis.

Degree Requirements

The Department of Physics offers a Master of Science in Applied Physics degree. It is a degree program which has significant flexibility. It is open to students with undergraduate degrees in fields related to physics as well as those with physics degrees. It offers sufficient versatility in its requirements to allow students to prepare for a variety of career paths. Prospective students are urged to contact the Department to learn more.

Entering students can choose to follow a targeted applied physics emphasis or a traditional applied physics emphasis for their degree. Students who choose a targeted emphasis are those preparing for a career which targets specific areas of applied physics such as materials science, optics, acoustics, or geophysics, and those planning to work in interdisciplinary areas such as computational physics (scientific computing), biophysics, chemical physics, physical oceanography, or engineering physics. This emphasis selection provides excellent preparation for interdisciplinary doctoral studies. Entering students choosing this emphasis are not necessarily expected to have completed all the courses that an undergraduate physics major takes, but they should have a good grounding in classical physics or be willing to make up deficiencies. Additional classical physics
courses are expected to form part of the degree program. The student may choose to do twenty-four hours of coursework and a thesis, or thirty-three hours of coursework and no thesis. The graduate work must include at least 18 hours of physics (including thesis if a thesis is done) and 9 hours in a specialty area (which may be applied physics). At least 18 hours of work must be at a level of 6000 or above. The program of study must be approved by the student’s Master’s committee or the Department Graduate Advisory Committee.

The traditional emphasis is for those preparing for a career in which basic physics plays a central role, including those aspiring to employment heavily dependent on physics and those planning to continue into a Ph.D. program in applied physics or in physics. Except in limited unusual circumstances, the student is expected to do a thesis and twenty-four hours of coursework. Of the 24 credit hours of coursework students selecting this emphasis are expected to take a minimum of 18 hours in physics of which at least 12 are taken in courses numbered above 6000. The program of study must be approved by the student’s Master’s committee or the Department Graduate Advisory Committee.

Each graduate student is expected to participate in the weekly seminar, Physics 6198. (A maximum of one hour credit in Physics 6198 may be used to satisfy program requirements.) After coursework is substantially complete, the candidate will be required to take a comprehensive examination. In the case of students who elect to do a thesis, the comprehensive examination will be an oral one in which the questions will be primarily on the thesis and related matters. Both emphasis choices offer excellent preparation for the interdisciplinary UNO Ph.D. program in Engineering and Applied Science, of which Physics is a strong participating department.

Programs in Psychology

Admission

An applicant is accepted for graduate work in psychology upon recommendation by the department and subsequent admission to the Graduate School. The department’s recommendation for admission is based on the student’s performance on the Graduate Record Examination, letters of recommendation, and on the student’s academic performance. The department may recommend full or conditional admission. If admitted on a conditional basis, the applicant must fulfill the conditions imposed by the department.
Programs Offered

The department offers a Master of Science degree in Psychology and a Doctor of Philosophy degree in Psychology with specializations in Applied Biopsychology and Applied Developmental Psychology. The curriculum integrates coursework in basic psychology with research and practicum experience in applied psychology.

Students are expected to:

1. develop competence in one of the two major content areas of behavioral science represented in the department (e.g. biological and developmental psychology),
2. conduct research based theoretically in the student’s major content area but focused on the application of behavioral science, and
3. develop a core of skills in the delivery of psychological and consultative services and gain experience in the roles of the behavioral scientist in medical, biomedical and/or applied-developmental settings.

Financial Aid

A limited number of teaching assistantships are available to qualified students. Research and service assistantships supported by faculty grants or contracts are also available.

Master of Science in Psychology

Student Learning Outcomes

College of Science
M.S. in Psychology

1. Graduate students who complete the MS degree will continue into the UNO doctoral program.
2. Graduate students who complete the MS degree will develop the skills and knowledge to be able to complete a research project of publishable quality.
3. Graduate students who complete the MS degree will develop the ability to communicate psychological knowledge

Degree Requirements

All students must complete requirements for the M.S. degree while working on the Ph.D. requirements. A minimum of 40 credit hours is necessary for the M.S. degree, although some
students may be required to take additional hours to remedy undergraduate training deficiencies or in order to meet particular career goals.

1. General Core: Core courses are required for all graduate students. They include Psychology 6311, 6312, 6050, 6091 (four credit hours), 6350, and 6550.
2. Specialty Core: In addition, each specialty recognized by the department has designated additional courses as core to their programs. All applied developmental students must take Psychology 6101, 6102, and 6610. All applied biopsychology students must take Psychology 6801, 6802, and 6810.
3. Research Courses: All students must register for research, Psychology 6090, each semester (excluding summer) they are not registered for thesis credit. A minimum of six hours of credit for Psychology 6090 is required.
4. Minimum Grades: A student who receives a C or lower in a core course (general or specialty) or who drops a core course while earning lower than a B will be dropped from the program. If a student receives a C or less in a non-core course, that course must be repeated in order to earn graduate credit. All students must maintain a B average for all courses in order to remain in the psychology graduate program.
5. Thesis: Every student is required to complete a thesis based on her or his own original research that clearly demonstrates ability to identify significant problems, design and conduct scientific studies, and report findings in an appropriate fashion. The thesis research must be of publishable quality. A minimum of six credit hours of thesis research, Psychology 7000, is required, although the student must be registered for thesis research each semester he or she is working on it until it is accepted by the thesis committee. An oral defense of the thesis is required.
6. Comprehensive Examination: Every student must pass a Comprehensive Examination after completing the first year core courses.

Doctor of Philosophy in Psychology

Student Learning Outcomes

College of Science
Ph.D. in Psychology

1. Graduate students will develop the skills and knowledge to be able to complete a research project of publishable quality
2. Graduate students will develop the ability to communicate psychological knowledge
3. Graduate training will enable all graduating doctoral students to obtain employment that meets their career objectives.

Degree Requirements
After completion of the masters’ requirements, students must pass a Qualifying Examination in order to continue to work toward a doctoral degree. During the entire period of work toward the doctorate, a student’s program of study is guided by a doctoral advisory committee. The full advisory committee consists of the major professor who acts as chairperson, one or more representatives of at least one minor field outside, and at least three other graduate faculty members of the department. At least two members (including the chairperson) must be full-time members of the department, and at least one member must be a full member of the UNO graduate faculty. The committee is nominated by the chair of the department and is appointed by the Dean of the College.

The student’s doctoral program of study must meet the following standards, which includes a minimum of 51 credit hours beyond those required by the M.S. degree.

1. Doctoral Core Courses: Applied Biopsychology students must take at least two (six hours) of the following courses: Psychology 6820, 6830, 6840, and 6895. Applied developmental students must take Psychology 6195, 6620, and 6801. The advanced seminar, Psychology 6195, must focus on advanced methods in developmental research.

2. Electives: Developmental students are required to take six hours of elective coursework and Biopsychology students are required to take nine hours of elective coursework. The electives must be chosen from content courses; research and practicum beyond the minimum cannot be used as electives.

3. Research: In addition to the dissertation requirements outlined below, all students are required to take six hours of independent research, Psychology 6090. Also, students must register for at least three hours of research credit every semester they are not registered for dissertation hours (excluding summers).

4. Teaching: Three hours of Teaching of Psychology, Psychology 7010, are required of all students.

5. Practicum: Twelve hours of practicum are required for all students (Psychology 6191 or 6891). The purpose of the practicum is to give students first-hand experience in an applied setting. The emphasis is on the application of experimentally-derived principles within the context of a service-delivery system. The practicum experience is arranged to provide an opportunity for students to begin to develop and practice a variety of skills in their areas of specialization.

6. Minor: The department requires that all doctoral students designate a specific minor area of study and to designate a faculty member to serve as the student’s minor advisor. The minor advisor must serve on the student’s Doctoral Advisory Committee. The intent of the minor requirement is to have the student outline a clearly delineated area of training that enhances the student’s ability to find employment after receipt of the doctoral degree. Therefore, the choice of minor area is dependent on the student’s specific career objectives. The minor will require 9 hours of graduate course credit. Three hours of the required nine for the minor may also be used as a general elective. Three hours of practicum can be used toward the minor requirement, if this is approved by the student’s minor advisor and Doctoral Advisory Committee.

7. Social Basis of Behavior: All students must satisfy a requirement of three credit hours or the equivalent in the area of social bases of behavior. This requirement may be satisfied by (1)
coursework, such as Psychology 6400 Social Psychology, Psychology 6170 Socioemotional Development, or a directed readings course in social bases of behavior taken under Psychology 6090; or (2) demonstrating competence in social bases of behavior as part of the Ph.D. qualifying examination. If coursework is selected to satisfy the requirement, the credit hours earned may be considered part of the required six elective hours (unless the course is used to satisfy other requirements).

8. **General Examination:** All students must pass a General Examination which is administered when the student’s coursework is substantially completed. The General Examination consists of the student writing and orally defending a literature review of the research area relevant to the proposed dissertation topic. The literature review and defense must demonstrate competence in the student’s minor and applied areas. The exam will be conducted by the student’s Doctoral Advisory Committee.

9. **Dissertation and Final Defense:** All students must complete a dissertation and register for a minimum of six hours of Psychology 7050. The student must be registered for dissertation research each semester he or she is working on it until the final examination is passed. The dissertation must demonstrate a mastery of research techniques, ability to do original and independent research, and skill in formulating conclusions that in some way enlarge upon or modify the existing knowledge base in psychology. The final examination is the oral defense of the dissertation. The final examination committee is appointed by the dean of the Graduate School. In most cases it will consist of the student’s doctoral advisory committee, although the dean may add additional members.

10. **Internship:** A student may elect to take an internship and the student must be registered for Psychology 7191 or 7891 throughout the internship (minimum of six hours). It must involve the equivalent of 12 months of supervised full-time experience. It must be supervised by a licensed psychologist. To qualify as an internship, a minimum of 1,500 hours at the site must be completed within 24 months and it must be approved by the department. The internship is an intensive, advanced, supervised experience required to be a practicing psychologist. To be eligible for an internship, the student must have completed all coursework and passed the General Examination. Only the dissertation may remain.

11. **Minimum Grades:** A student who earns a C or lower in a core (either general or specialty) or who drops a core course while earning lower than a B will be dropped from the program. If a student receives a C or less in a non-core course, that course must be repeated in order to earn graduate credit. All students must maintain at least a B average in all courses in order to remain in the psychology graduate program.

12. **Additional Reasons for Dismissal:** A student is expected to make normal progress toward the degree to remain in the program and must be registered as a full-time student each semester in the program. A student may be dropped from the program if, in a semi-annual evaluation, the faculty determines that the student does not meet the standards of a Ph.D. candidate.