

## MASTER OF SCIENCE

### Options in:

- Biotechnology  
*(see also independent listing)*
- Cell and Molecular Biology
- Ecology
- Marine Biology

## DOCTOR OF PHILOSOPHY

### HEAD

Gary N. Wells, Ph.D.

### ASSOCIATE HEADS

John G. Morris, Ph.D.

Richard L. Turner, Ph.D.

### PROFESSORS

Mark B. Bush, Ph.D.

Charles E. Helmstetter, Ph.D.

Alan C. Leonard, Ph.D.

Junda Lin, Ph.D.

### RESEARCH PROFESSORS

Arvind M. Dhople, Ph.D.

John J. Thomas, Ph.D.

### ASSOCIATE PROFESSORS

Michael S. Grace, Ph.D.

Julia E. Grimwade, Ph.D.

John G. Morris, Ph.D.

Charles D. Polson, Ph.D.

Jonathan M. Shenker, Ph.D.

Richard A. Tankersley, Ph.D.

Ralph G. Turingan, Ph.D.

Richard L. Turner, Ph.D.

Russell C. Weigel, Ph.D.

Robert van Woesik, Ph.D.

### ASSOCIATE PROFESSOR

David J. Carroll, Ph.D.

### RESEARCH SCIENTIST

Lisa K. Moore, Ph.D.

## MASTER OF SCIENCE DEGREE PROGRAM

The master of science degree in biology can be earned in one of three options: ecology, marine biology, or cell and molecular biology. The purpose of each option is to prepare the student either for a professional career or for further graduate study. This goal is achieved through a balance of course work and research activities.

### ADMISSION REQUIREMENTS

General admission requirements and the process for applying are presented in the *Graduate Information and Regulations* section of the *University Catalog*. For this program, Graduate Record Examination scores (General Test only), three letters of recommendation and a statement of objectives are required. Admission decisions for fall semester enrollment are made by March 15, and for spring semester enrollment by October 1.

### DEGREE REQUIREMENTS

The master of science degree requires the successful completion of 34 credit hours, including formal course work, presentation of a graduate thesis seminar, and preparation and oral defense of a thesis. The thesis involves the completion of original research of publishable quality.

The student's thesis research and program of study reflect the emphasis of the option. All thesis research is conducted under the direction of an adviser and an advisory committee. The advisory committee is composed of at least three members: two from the department (including the adviser) and one from another academic unit.

## DOCTOR OF PHILOSOPHY DEGREE PROGRAM

The doctor of philosophy degree is offered for students who want to carry out advanced research in the biological sciences. A student's research can encompass any area represented by a faculty member. The objective is to prepare the student at the highest academic level for a productive career in research, teaching and/or administration.

### ADMISSION REQUIREMENTS

A doctoral applicant must have a bachelor's or master's degree. For admission, a student should have a superior academic record, with a minimum of 3.0 (on a scale of 4.0) in undergraduate work or 3.2 in graduate work, three letters of recommendation and scores from the Graduate Record Examination (both the General Test and the Subject Test in biology).

Admission decisions for fall semester enrollment are made by March 1, and for spring semester enrollment by October 1.

### DEGREE REQUIREMENTS

The doctor of philosophy degree is primarily a research degree and is conferred in recognition of research accomplishments as well as completion of a program of study. Each student must complete an approved program of study, pass a comprehensive written and/or oral examination, write an acceptable research proposal and file a petition for admission to candidacy, complete a program of significant original research, prepare and defend a dissertation concerning the research and present a dissertation seminar. Each candidate is expected to publish major portions of the dissertation in refereed national or international journals.

Each doctoral student must prepare a program of study within one year after entering the program. To assure that the student possesses a satisfactory knowledge of biological principles, the student might be required to take certain courses in biological sciences and related disciplines. The student has an advisory committee appointed by his or her adviser with the approval of the department head. The committee is composed of at least five members: four faculty members (including the adviser) from the department and one faculty member from another academic unit.

The proposal represents the research plan that the student will pursue for the dissertation. It should be written under the close supervision of the adviser, and the proposal must be presented to and approved by the advisory committee.

Doctoral research represents a significant contribution to the knowledge of a particular problem. A student must be prepared to devote considerable time and effort to research. With the adviser's approval, the student presents the preliminary copies of the dissertation to the advisory committee for critical evaluation. Once the dissertation satisfies the advisory committee, the student then orally defends the work. If the defense is satisfactory, the advisory committee will approve the dissertation once the final revisions are completed.

Prior to graduation, the student must present a dissertation seminar to the faculty and graduate students.

## M.S. CURRICULUM

The adviser assists the student in devising a program of study. The latter requires approval by the program of study committee and the department head. The student must complete courses appropriate for the option. These can be chosen from the offerings of any academic unit in the College of Science, College of Engineering and College of Psychology and Liberal Arts. Students wanting to acquire special research skills should enroll in Biological Research Rotation (BIO 5998). A master's student must elect the Biological Sciences Seminar (BIO 5990) every semester it is offered, except for the semester in which the student presents a thesis seminar. During this semester, the student will register for both Thesis (BIO 5999) and Biological Research Seminar (BIO 5991). Each student must present a departmental thesis seminar before graduation.

### Summary of Program Requirements

Formal Course Work (minimum) .....	18
Biological Research Seminar .....	1
Biological Research or Biological Research Rotation .....	0-9
Thesis (maximum) .....	6
<b>TOTAL CREDITS REQUIRED</b>	<b>34</b>

## PH.D. CURRICULUM

The adviser assists the student in devising a program of study, which requires approval by the program of study committee and the department head. The committee and department head must also approve any revision of the program of study.

In developing a program of study, considerable latitude is allowed for course selection and research interests. Appropriate courses can be selected from the offerings of any academic unit in the College of Science, College of Engineering or College of Psychology and Liberal Arts. The student may register for Biological Research Rotation (BIO 5998) to learn specific skills and techniques available from the faculty. All doctoral students must elect the Biological Sciences Seminar (BIO 5990) every semester it is offered, except for the semester the student presents a dissertation seminar (Biological Research Seminar, BIO 5991).

### Summary of Program Requirements

Formal Course Work Beyond Bachelor's Degree (minimum) .....	24
Biological Research Seminar .....	1
Biological Research* .....	0-24
Doctoral Dissertation (maximum) .....	30

\*Inclusion of *Biological Research Rotation (BIO 5998)* is recommended.

A minimum of 79 credits beyond the bachelor's degree is required.

For students entering with a master's degree, former course work completed for the master's degree can fulfill a significant portion of the 24 credit hours of required doctoral course work. Nonetheless, the student should be prepared to complete some additional course work.



*Florida Institute  
of Technology*

College of Science  
Department of  
Biological Sciences

150 West University Boulevard  
Melbourne, Florida 32901-6975  
(321) 674-8034  
www.fit.edu

## RESEARCH ACTIVITIES AND FACILITIES

The department faculty are conducting research in the following general areas:

### Biochemistry, Molecular Biology and Molecular Genetics

A variety of molecular and biochemical approaches are used in the department to answer questions related to regulation of cell duplication, signal transduction in early development, circadian rhythms and sensory systems, microbial pathogenesis, plant growth, and the assembly of subcellular structures. A major effort is underway to develop novel cell culture systems for production of synchronously growing populations of human cells. Intracellular complexes of DNA and protein are under study to elucidate the regulatory mechanisms that trigger DNA replication and cell division in bacteria. The role of signal transduction pathways induced by calcium in the fertilization step of embryogenesis is another active area of research. Drug discovery efforts are focused on the genetics of the polyketide synthesis pathway in a variety of uncharacterized microorganisms collected from extreme environments. Development and analysis of new bacterial growth inhibitors is also underway for *Mycobacterium*, *Escherichia* and other important bacterial pathogens. Another expanding research area is the neurophysiological and molecular analysis of photoreceptors, particularly the infrared receptors in snakes. The diversity of biochemical and molecular research conducted by members of the biological sciences department provides for a rich and interactive environment for graduate students.

### Marine Biology

The marine biology faculty maintain active research programs in finfish, crustacean, molluscan, coral and echinoderm biology. The evolution and ecological physiology of organismal design are investigated using high-speed videography, electromyography, and biomechanical and ecomorphological analysis of feeding in field-caught and laboratory-reared fish. Fisheries research includes analyses of early-life history and recruitment patterns of estuarine-dependent sport fish species. Crustacean research centers on the ecology and physiology of adult and early-life history stages, especially the migratory behavior of spawning female crabs and the recruitment and habitat selection of post larvae. Research on suspension-feeding invertebrates examines the mechanisms responsible for food capture, selection and processing. Remote sensing, as well as laboratory and field investigations of corals, explores the effects of global-climate change on coral reefs. Studies of echinoderms have concentrated on their reproduction, anatomy, systematics and ecology by using physiological, histological, morphological and field techniques. Aquaculture programs are investigating the reproductive and feeding biology of ornamental shellfish and finfish species.

### Molecular Marine Biology

Collaborative research among diverse faculty and students enables the application of molecular biological techniques to marine biology topics such as genetic identification of fishery and manatee populations, biochemistry of molluscan shell growth, response of marine organisms to anthropogenic pollutants, genetic engineering in aquaculture and the relationship of enzymes to rates of calcification and skeletogenesis in commercially significant marine organisms.

### Plant Physiology and Plant Tissue Culture

Studies are conducted on the initiation of in vitro plant cultures of various plant species, and on the changes that accompany in vitro differentiation. Research on the identity of genes that are specific to particular stages of differentiation, and attempts to propagate rare species with tissue culture techniques, are in progress.

### Ecology and Conservation Biology

Research activities include studies of coral reef ecology, paleobotany, biogeography, biodiversity, freshwater and marine aquaculture, fisheries ecology, population ecology of marine mammals, ecomorphology and the life history and ecology of selected crustaceans and echinoderm species. Study locations range from local to international, including the Indian River Lagoon, sites along the Atlantic seaboard and offshore from New Jersey to Florida, the Bahamas and Amazonia.

### FINANCIAL AID

Graduate student assistantships for instruction and research are available to well-qualified master's and doctoral degree students. Assistantships carry stipends plus a tuition waiver. In some cases, a tuition waiver alone may be awarded for a limited amount of service. Assistantships for master's degree students are normally for an academic year; assistantships for doctoral students are renewable on a yearly basis.

### THE UNIVERSITY

Florida Institute of Technology is a distinctive, independent university, founded in 1958 by a group of scientists and engineers to fulfill the need for specialized, advanced educational opportunities of Florida's Space Coast.

Florida Tech is the only comprehensive, independent scientific and technological university in the southeast. Supported by both industry and the community, Florida Tech is the recipient of many research grants and contracts, a number of which provide financial support for graduate students.

### LOCATION

Melbourne is located on the central east coast of Florida. The area offers a delightful year-round subtropical climate and is 10 minutes from the ocean and beaches. Kennedy Space Center and the massive NASA complex are just 45 minutes north of Melbourne. The city of Orlando, Walt Disney World, EPCOT and many other attractions are one hour west of Florida Tech's main campus.

### FOR MORE INFORMATION

To obtain more detailed information about this Graduate Program or to obtain application materials, visit our home page at [www.fit.edu/grad](http://www.fit.edu/grad) or the *University Catalog* at [www.fit.edu/catalog](http://www.fit.edu/catalog), or contact:

Florida Institute of Technology  
Office of Graduate Admissions  
150 W. University Blvd.  
Melbourne, FL 32901-6975  
(321) 674-8027  
(321) 723-9468/Fax  
(800) 944-4348