**Florida Institute of Technology**

**ADDING A NEW COURSE TO THE CURRICULUM**

This course is available for student registration only after the approval process has been completed.

**SUBJECT**

B I O

**COURSE NO.**

4 2 0 9

**CREDIT HOURS**

3

**TERM TO BE ADDED TO THE FILE**

Spring 2014

*Justify level if 1000-level and no co- or prerequisites._

**CLASS HOURS**

45/semester

**LECTURE HOURS**

45/semester

**LAB HOURS**


**SCHEDULE TYPE**

Lecture (A)

**DEPARTMENT**

Biological Sciences

(e.g., Computer Sciences)

**COLLEGE OF**

Aeronautics – 23

Psychology and Liberal Arts – 25

Nathan M. Bisk College of Business – 24

Science – 26

Engineering – 1

Extended Studies / Nathan M. Bisk College of Business – 90

**COMPUTER TITLE**

Restricted to 25 characters, including spaces. Plant Molecular Biology

**Dual-Prefix, Bi-Level, Full-Lead?**

Yes  No

**CATALOG TITLE**

Molecular Biology of Plants

**CATALOG DESCRIPTION OF COURSE**

Restricted to 350 characters, including spaces.

Overviews the molecular and cellular mechanisms involved in the growth, development and functioning of plant. Stresses strategies for identifying, probing and manipulating these pathways for their beneficial applications (agriculture, bioremediation, drug production) through reviews of current literature.

This description has been approved by the catalog office:  

Catalog Director  9/17/13

**GRADES TO BE ISSUED**

A, B, C, D, F

A, B, C, D, F, CE/Audit

CEU

S, U

P, F

Other

**ADDITIONAL RESTRICTION**

Meets with graduate-level course BIO 5014 Plant Biotechnology

(e.g., Major, Cross Level, Department Head Approval)

**If this course replaces a course currently offered in BANNER, please indicate old course information and the date/term the course may be removed from the system.**

**REQUIREMENTS**

Prerequisite BIO 4391

Corequisite BIO 4391

**In addition, please attach a course syllabus and/or more detailed description.**

**APPROVALS:** On completion of description and course number verification, affix appropriate signatures as indicated, and submit completed form to Chair, Graduate Council, or Chair, Undergraduate Curriculum Committee for approval.

**Oral or Phone Communication**

Date  9/18/13

**OR**

Date  9/18/13

**Dean or Associate Dean**

Date  9/18/13

**Associate Vice President for Institutional Compliance**

Date

**COURSE DIRECTOR**

(Andrew Palmer)  9/18/13

**Department Head/Program Chair**

(Andrew Palmer)  9/18/13

**Chair, Graduate Council**

Date

**Chair, Undergraduate Curriculum Committee**

Date

**REGISTRAR'S USE ONLY**

SCACISE  SCADETL  SCAPREQ  SCBASE  SCARBES  Operator Init.  Date

**Florida Institute of Technology • Office of the Registrar**

150 West University Boulevard, Melbourne, FL 32901-6975 • (321) 674-8114 • Fax (321) 674-7827

R09814-0102
From: Andrew G. Palmer  
Assistant Professor of Biological Sciences

To: Members of the undergraduate curriculum committee

I am hereby requesting the dual listing of an existing graduate course (BIO5014 Plant Biotechnology) as an undergraduate course entitled ‘BIO4XXX – Plant Molecular Biology’. This cross-listing will immediately increase our limited undergraduate course offerings in the areas of both Cell and Plant Biology. While some topic overlap will occur, this course would be distinct from the existing BIO4210 (Plant Physiology) course which addresses the evolution of plant biodiversity, the plant body plan, the physical mechanisms that drive water and nutrient uptake/transport, as well as reproduction. This new course would focus on the *molecular* elements of plant growth and development, immunity, and symbiotic interactions. As these topics are fundamental to modern plant biotechnology it is clear this course remains a crucial element of our graduate biotechnology program as well. In conjunction with BIO4210, these two courses also lay a preliminary foundation for a potential emphasis in Plant Biology within the department. Graduate students will be expected to complete an additional review paper by the end of the semester which focuses on a particular aspect of applied plant molecular biology (biotechnology). The different name for the course at the graduate and undergraduate level is an intentional effort to market to the appropriate audiences. I feel strongly that this course would be an excellent addition to our program and would provide undergraduates with a valuable opportunity to receive additional training in the areas of both Plant and Cell biology.
FLORIDA INSTITUTE OF TECHNOLOGY
BIO 4XXX Plant Molecular Biology / BIO5014 Plant Biotechnology, Spring 2014

Lecture: MWF  
Instructor: Andrew G. Palmer  
Office hours:  

Prerequisites/Corequisites:  
BIO4301 or BIO5501  

Summary: An integrated overview of the molecular and cellular mechanisms involved in the growth, development, and functioning of plants. Strategies for identifying, probing, and manipulating these pathways for their beneficial applications (agriculture, bioremediation, pharmaceutical discovery, biodiesel, etc.) will be stressed through examples drawn from primary literature. The historic and continuing contribution of plants to our broader understanding of euakaryotic biology will also be a major focus. Students will present on topics intended to introduce or supplement the lecture materials. An emphasis will be placed on group work both for presentations as well as in-class problem solving and discussion. Graduate students will complete an additional review paper to familiarize themselves with a particular topic in applied plant molecular biology (biotechnology). Specific topics include (but are not limited to):  
(i) The synthesis, transport, and perception of phytohormones like ethylene, cytokinins, and auxins  
(ii) Methods for characterizing and manipulating gene expression in plants  
(iii) Plants as reservoirs for secondary metabolites with important functions (new pharmaceuticals, etc.)  
(iv) Plant-microbial and plant-fungal interactions  
(v) Bioremediation using plants  
(vi) ‘-omic’ technologies include genomics, proteomics, and metabolomics in Plants  

Text(s) (Recommended): Biochemistry and Molecular Biology of Plants (Buchanan, Gruissem, and Jones)  
Publisher: Wiley  

Grading (1000pts)  
• (400) 4 Exams ~100 pts each  
• (200) Topic Presentations (100 pts each)  
• (200) Class participation  
• (200) 4 Problem sets (50 pts each)  
• GRADUATE ONLY: Topic review (12 pages)  

Late Assignments/Make-ups  
• There will be a 10% deduction/day for late assignments  
• You are responsible for bringing conflicts to my attention so that proper arrangements can be made.  

Grading Scale: A=100-90%, B=89-80%, C=79-70%, D=69-60%, F= Below 59%  

Attendance: Mandatory  

Conduct: Please be respectful of your fellow students as well as your instructor. Turn off your cellular phone, limit your un-related conversations, and participate in class. Students are expected to adhere to FIT’s policies regarding Academic Integrity (review at: http://www.fit.edu/current/documents/plagiarism.pdf). PLAGARISM OR ANY OTHER FORM OF CHEATING WILL NOT BE TOLERATED. Cheating will result in an automatic ‘F’ for the assignment and additional disciplinary measures will be pursued. Sharing your group’s test questions for an exam will count as cheating.  

Groups: Based on your self-evaluations you will be assigned to a project group for the lecture portion of the course. These groups are designed to include students who share common interests (ecology, biomedical research, molecular biology, etc.).
<table>
<thead>
<tr>
<th>WEEK</th>
<th>TOPICS</th>
<th>Sample papers and Recommended Text readings</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>Chapters 1-3</td>
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<tr>
<td>2</td>
<td>Overview of Plant Biology</td>
<td>Chapters 4-6</td>
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<td>5</td>
<td>Phytohormones: Gibberelic Acid &amp; Ethylene</td>
<td>Plant Physiology (1996) 111, 653-660</td>
</tr>
<tr>
<td>7</td>
<td>Mutualistic Interactions (Nodulation, mycorrhizal fungi)</td>
<td>Cell Microbiology (2009) 3, 381-388</td>
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<td>10</td>
<td>Bioremediation and Biomass Engineering</td>
<td>Int. J. Green Energy (2004) 1, 302-312</td>
</tr>
<tr>
<td>11</td>
<td>Improving carbon fixation (photosynthesis)</td>
<td>J. Exp. Botany (2013) 64, 743-751</td>
</tr>
<tr>
<td>16</td>
<td>FINALS WEEK (EXAM 4)</td>
<td></td>
</tr>
</tbody>
</table>
This course is available for student registration only after the approval process has been completed.

Subject: Biological Sciences  
Course No.: 4 4 1 3  
Credit Hours: 4  
Term to be added to the file: Fall 2014  

Class Hours:  
Lecture Hours: 45/semester  
Lab Hours: 15/semester  
Contact Hours: (CEU only)  

Department: Biological Sciences  
Schedule Type: Undergraduate Research (N)  

- College of Aeronautics - 23  
- College of Psychology and Liberal Arts - 25  
- Nathan M. Bisk College of Business - 24  
- College of Science - 26  
- College of Engineering - 1  
- Extended Studies / Nathan M. Bisk College of Business - 90  

Catalog Title: Applied Geographic Information Systems for Biological Research  

Catalog Description: Restricted to 25 characters, including spaces. GIS for Bio Research  
Dual Prefix Bi-Level?  
Yes  
No  

Focuses on applying geographic information systems and relevant techniques to health sciences, ecology and conservation biology. Includes fundamentals of ArcGIS; database mining; GPS systems; spatial statistics; mapping and modeling disease risk and spread; and connectivity, species distribution and spatio-temporal modeling in a biological landscape.  

This description has been approved by the catalog office.  
Catalog Director:  
Date: 9/20/13  

In addition, please attach a course syllabus and/or more detailed description.  

Restrictions:  
Prerequisite: BIO 2801  
Corequisite:  

Grades to be issued:  
A, B, C, D, F  
A, B, C, D, F, CEU/Audit  
CEU  
S, U  
P, F  
Other  

Additional restrictions:  
Will meet with graduate course BIO 5412 GIS for Bio Research  
(e.g., Major, Class Level, Department Head Approval)  

If this course replaces a course currently offered in Banner, please indicate old course information and the date/term the course may be removed from the system.  

SUBJECT:  
Alpha Prefix: (e.g., CSE)   
Course No. (e.g., 1301)  
Term to inactivate:  

Yes  
No  

Will this course be used to measure program-level student learning outcomes?  
If yes, associate vice president for institutional compliance signature required.**  

APPROVALS: On completion of description and course number verification, affix appropriate signatures as indicated, and submit completed form to Chair, Graduate Council, or Chair, Undergraduate Curriculum Committee for approval.  

Originator:  
Date:  
Chair, Graduate Council:  
Date:  

Department Head/Program Chair:  
Date:  

Dean or Associate Dean:  
Date:  
Chair, Undergraduate Curriculum Committee:  
Date:  

**Associate Vice President for Institutional Compliance:  
Date:  

Catalog Director:  
Date:  

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RDR-166-103
Proposal for a new class

Instructor: Dr. Crystal H. McMichael, Research Scientist, Department of Biological Sciences

Proposed Course Title: Applied Geographic Information Systems for Biological Research

3 credit class: 4413/5413

Background:

Proficiency in Geographic Information Systems is one of the most sought-after skillsets of any potential employer in Biosciences. Geographic Information Systems can be used to examine and analyze a wide range of observed geospatial patterns and processes, including disease risk, outbreak and spread patterns, habitat connectivity in marine and terrestrial environments, ecological and biogeographical patterns, and risk assessment and land prioritization for conservation biology. The primary aim of this course is the application of Geographic Information Systems (GIS) and additional relevant computer software to examine and interpret geospatial patterns and processes in any discipline of Biological or Health Sciences.

Catalog Description:

This course will focus on applying Geographic Information Systems and relevant techniques to Health Sciences, Ecology, and Conservation Biology. Topics covered include: fundamentals of ArcGIS, database mining, GPS systems, spatial statistics, mapping disease, modeling disease risk and spread, connectivity modeling, species distribution modeling, and spatio-temporal modeling within a biological landscape. The course will consist of two lectures and one laboratory each week.

Differences between this class and the existing GIS class (ENS 4010)

The proposed class is meant to be a complementary class to the GIS course offered in the DMES department (ENS 4010). The proposed class (Bio 4413/5413) schedules 2.5 hours of lecture and 3 hours of in-class laboratory training per week. This extended lecture format (absent from ENS 4010) will allow a more in-depth exploration of concepts and case studies that apply GIS analyses to address research questions in any field of biological sciences. This differs from the organization of ENS 4010, which focuses on the use and operational aspects of ArcGIS software. Bio 4413/5413 will heavily utilize peer-to-peer class discussions based on current research from a variety of disciplines that employ GIS techniques. Bio 4413/5413 will also focus on integrating GIS applications with complementary analytical modeling techniques, including species distribution modeling (MaxEnt), connectivity modeling (Circuitscape), and bioclimatic envelope modeling (in R). The proposed class will also be taught in the Fall semester, whereas ENS 4010 is taught in the Spring semester, and this scheduling will allow students to potentially enroll in both classes and develop all-around expertise in GIS fundamentals and applications. However, the first two weeks in the laboratory for Bio 4413/5413 will be spent reviewing operational aspects of ArcGIS software that may or may not have been learned in ENS 4010.

Prerequisites: Biometry (Bio 2801)
**Course text:** The text for this course will be posted on ANGEL, and is derived from ESRI ArcGIS online tutorials. This is the primary text for use in the classroom/laboratory.

**Additional readings:** Two each week, to be selected by students. The readings will cover aspects of applied GIS in Biological Sciences, and will be the primary out-of-class literature. Peer-to-peer class discussions will be based on these readings.

**Course details:**

The course will be structured as two lectures/discussions per week (1 hour 15 min each), and one computer laboratory per week (3 hours). Lecture topics and class discussions each week will pertain to relevant case studies and laboratory details and instructions.

- **Week 1:** Introduction to ArcGIS: Arc Catalog, Arc Map, and Arc Toolbox interfaces, working with documents and data layers
- **Week 2:** Key Toolboxes for biologists: analysis, conversion, and data management tools; Geographic and projected coordinate systems
- **Week 3:** Importing biological data, editing, and exporting; Geoprocessing models using vector and raster data
- **Week 4:** Creating species distribution maps: working with views, data frame properties, data-driven pages, and maps
- **Week 5:** Accessing data in the Global Biodiversity Information Facility plotting via GPS systems
- **Week 6:** Spatial statistics and applications in Health Sciences, Ecology, and Conservation Biology
- **Week 7:** Mapping disease/infection patterns and modeling risk and spread
- **Week 8:** Landscape heterogeneity and connectivity modeling
- **Week 9:** Species distribution modeling
- **Week 10:** Risk assessment and land prioritization
- **Week 11:** Temporal modeling
- **Week 12:** Student research projects - data gathering and preparation
- **Week 13:** Student research projects – modeling and map visualizations and writing
- **Week 14:** Presentations of research projects
- **Week 15:** Presentations of research projects; hand in written reports

**Final Exam**
Requirements:

1) Complete all lectures and laboratory exercises: Students will be required to submit a summary report and maps generated from lab exercises at the end of each week (course will use all electronic submissions – no paper will be generated)
2) Participate in paper discussions
3) Students must score a “C” or better on the final exam
4) Individual research projects: each student will formulate GIS-based research questions that relate to any aspect of biological sciences, and address those questions using the techniques learned in the course. All students will present their projects in short presentations (10-15 min). Undergraduates will write a synopsis of their project, and graduate students will write a full research report in scientific manuscript format. The research topics must be approved by McMichael.

Grading:

15%: Exams (2 during the semester; 7.5% each)
35%: Weekly laboratory exercises
10%: Oral presentation of research project
20%: Research paper
20%: Final exam (comprehensive)

Grading Scale:

90-100% = A
80-89% = B
70-79% = C
60-69% = D
< 60% = F