# Purdue University

**REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF A GRADUATE COURSE**

(50000-69999 LEVEL)

**DEPARTMENT:** Biology  
**EFFECTIVE SESSION:** Spring 2013

**INSTRUCTIONS:** Please check the items below which describe the purpose of this request.

- [x] New course with supporting documents (Complete proposal form)
- [ ] Add existing course offered at another campus
- [ ] Expiration of a course
- [ ] Change in course number
- [ ] Change in course title
- [ ] Change in course credit type
- [ ] Change in course attributes
- [ ] Change in instructional hours
- [ ] Change in course description
- [ ] Change in course requisites
- [ ] Change in semester offered
- [ ] Transfer from one department to another

**PROPOSED:**

<table>
<thead>
<tr>
<th>Subject Abbreviation</th>
<th>BIOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Number</td>
<td>52410</td>
</tr>
<tr>
<td>Long Title</td>
<td>Prokaryotic Diversity and Molecular Identification</td>
</tr>
<tr>
<td>Short Title</td>
<td>Prokary Diversity Molec Ident</td>
</tr>
</tbody>
</table>

Abbreviated title will be entered by the Office of the Registrar if omitted. (20 CHARACTERS ONLY)

**EXISTING:**

- [ ] Subject Abbreviation
- [ ] Course Number
- [ ] Long Title
- [ ] Short Title

**CREDIT TYPE**

<table>
<thead>
<tr>
<th>1 Fixed Credit:</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Variable Credit Range:</td>
<td></td>
</tr>
<tr>
<td>Minimum Cr. Hrs.</td>
<td></td>
</tr>
<tr>
<td>(Check One)</td>
<td>To</td>
</tr>
<tr>
<td>Maximum Cr. Hrs.</td>
<td></td>
</tr>
<tr>
<td>Equivalent Credit:</td>
<td>Yes</td>
</tr>
<tr>
<td>4 Thesis Credit:</td>
<td></td>
</tr>
</tbody>
</table>

**SCHEDULE TYPE**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Recitation</th>
<th>Presentation</th>
<th>Laboratory</th>
<th>Lab Prep</th>
<th>Studio</th>
<th>Distance</th>
<th>Clinic</th>
<th>Experiential</th>
<th>Research</th>
<th>Ind. Study</th>
<th>Prac/Observ</th>
</tr>
</thead>
<tbody>
<tr>
<td>_________</td>
<td>-------------</td>
<td>---------------</td>
<td>------------</td>
<td>----------</td>
<td>--------</td>
<td>----------</td>
<td>--------</td>
<td>--------------</td>
<td>----------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>_________</td>
<td>-------------</td>
<td>---------------</td>
<td>------------</td>
<td>----------</td>
<td>--------</td>
<td>----------</td>
<td>--------</td>
<td>--------------</td>
<td>----------</td>
<td>------------</td>
<td>------------</td>
</tr>
</tbody>
</table>

**COURSE ATTRIBUTES:**

<table>
<thead>
<tr>
<th>1. Pass/Not Pass Only</th>
<th>6. Registration Approval Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Satisfactory/Unsatisfactory Only</td>
<td>Department</td>
</tr>
<tr>
<td>3. Repeatable</td>
<td>Instructor</td>
</tr>
<tr>
<td>4. Credit by Examination</td>
<td></td>
</tr>
<tr>
<td>5. Special Fees</td>
<td></td>
</tr>
<tr>
<td>7. Variable Title</td>
<td>8. Honors</td>
</tr>
</tbody>
</table>

**COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):**

BIOL 52410: Prokaryotic Diversity and Molecular Identification. Cr. 3. P: BIOL 21800; C: BIOL 43700 or permission of instructor. This course will address modern techniques in prokaryotic identification and phylogenetic analysis. Molecular methods in culture-dependent and culture-independent prokaryotic identification will be discussed and students will learn how to integrate such results into a large phylogenetic context. Advanced characterization of several prokaryotic phyla will also be discussed.

**CUNOTED DEPARTMENT HEAD:**

**Date:** 10/27/14  
**Signature:** [Signature]

**CUNOTED SCHOOL DEAN:**

**Date:** 11/21/14  
**Signature:** [Signature]

**CUNOTED UNDERGRAD CURRICULUM COMMITTEE:**

**Date:**  
**Signature:** [Signature]

**CUNOTED CHANCELLOR:**

**Date:**  
**Signature:** [Signature]

**UNDERGRAD CURRICULUM COMMITTEE:**

**Date:**  
**Signature:** [Signature]

**DATE APPROVED BY GRADUATE COUNCIL:**

**Date:**  
**Signature:** [Signature]

**GRADUATE COUNCIL SECRETARY:**

**Date:**  
**Signature:** [Signature]

**WEST LAFAYETTE DEPARTMENT HEAD:**

**Date:**  
**Signature:** [Signature]

**WEST LAFAYETTE COLLEGE/SCHOOL DEAN:**

**Date:**  
**Signature:** [Signature]

**WEST LAFAYETTE REGISTRAR:**

**Date:**  
**Signature:** [Signature]

**OFFICE OF THE REGISTRAR**
Supporting Document for a New Graduate Course

To: Purdue University Graduate Council

From: Faculty Member: Tanya Soule
Department: Biology
Campus: Fort Wayne

Date: October 27, 2011

Subject: Proposal for New Graduate Course-Documentation Required by the Graduate Council to Accompany Registrar’s Form 40G

Contact for information if questions arise:
Name: Tanya Soule
Phone Number: 260-481-0229
E-mail: soulet@pfw.edu
Campus Address: SB 344, 2101 E Coliseum Blvd, Fort Wayne, IN

Course Subject Abbreviation and Number: BIOL 52410
Course Title: Prokaryotic Diversity and Molecular Identification

A. Justification for the Course:

• Provide a complete and detailed explanation of the need for the course (e.g., in the preparation of students, in providing new knowledge/training in one or more topics, in meeting degree requirements, etc.), how the course contributes to existing majors and/or concentrations, and how the course relates to other graduate courses offered by the department, other departments, or interdisciplinary programs.

• Justify the level of the proposed graduate course (500- or 600-level) including statements on, but not limited to: (1) the target audience, including the anticipated number of undergraduate and graduate students who will enroll in the course; and (2) the rigor of the course.

B. Learning Outcomes and Method of Evaluation or Assessment:

• Describe the course objectives and student learning outcomes that address the objectives (i.e., knowledge, communication, critical thinking, ethical research, etc.).

• Describe the methods of evaluation or assessment of student learning outcomes. (Include evidence for both direct and indirect methods.)

• Grading criteria (select from dropdown box); include a statement describing the criteria that will be used to assess students and how the final grade will be determined.

Criteria [Papers and Projects]
• Identify the method(s) of instruction (select from dropdown box) and describe how the methods promote the likely success of the desired student learning outcomes.

Method of Instruction [Lecture]

C. Prerequisite(s):

• List prerequisite courses by subject abbreviation, number, and title.

• List other prerequisites and/or experiences/background required. If no prerequisites are indicated, provide an explanation for their absence.

D. Course Instructor(s):

• Provide the name, rank, and department/program affiliation of the instructor(s).

• Is the instructor currently a member of the Graduate Faculty? — Yes ☑ No
(If the answer is no, indicate when it is expected that a request will be submitted.)

E. Course Outline:

• Provide an outline of topics to be covered and indicate the relative amount of time or emphasis devoted to each topic. If laboratory of field experiences are used to supplement a lecture course, explain the value of the experience(s) to enhance the quality of the course and student learning. For special topics courses, include a sample outline of a course that would be offered under the proposed course.

F. Reading List (including course text):

• A primary reading list or bibliography should be limited to material the students will be required to read in order to successfully complete the course. It should not be a compilation of general reference material.

• A secondary reading list or bibliography should include material students may use as background information.

G. Library Resources

• Describe the library resources that are currently available or the resources needed to support this proposed course.

H. Example of a Course Syllabus (While not a necessary component of this supporting document, an example of a course syllabus is available, for information, by clicking on the link below, which goes to the Graduate School’s Policies and Procedures Manual for Administering Graduate Student Programs. See Appendix K.)

Supporting Document for a New Graduate Course- Addendum
Tanya Soule, Spring 2013
Proposed Course: BIOL 52410- Prokaryotic Diversity and Molecular Identification

A. Justification for the Course:

In a world of advanced technology, the identification of organisms through molecular methods has not only become widely accepted, but almost a requirement for most taxonomic studies. In particular, prokaryotic organisms are especially difficult to identify through traditional morphological and biochemical methods, thus the ability to identify them through molecular methods has greatly improved the field and our understanding of microbial diversity. Current course offerings in the department have laboratory components where students learn how to work with microorganisms and must identify unlabeled cultures of microorganisms through staining and biochemical tests. While these skills are essential to any microbiologist, the ability to refine them through more advanced and modern molecular identification techniques is not addressed. As such, it would be appropriate to offer a course that would teach our students how to identify microorganisms by their molecular signatures (DNA sequences) from both axenic and non-axenic sources. To further expand on this knowledge and apply their results in a broader context, students will interpret how the identified microorganisms integrate into the prokaryotic tree of life and provide advanced reports on the major prokaryotic phyla. These skills will prove essential for any modern microbiologist, as similar techniques are currently used, and quickly replacing traditional methods, in clinical laboratories, food quality analyses, environmental assessments, and basic research. Additionally, this course will complement current courses in the department such as Medical Microbiology (BIOL 53300), where the identification and description of pathogens is essential, and General Microbiology (BIOL 43700), which would serve as a prerequisite to the advanced topics covered in this course. Furthermore, the methods taught in this course could also be applied towards the identification or phylogenetic classification of eukaryotic organisms with some minor modifications. Thus, these skills will be beneficial to any student of biology, regardless of their immediate focus or interest.

This course would qualify as a 500-level graduate course because it expands on introductory concepts and topics learned in earlier courses such as General Microbiology (BIOL 43700) and Genetics and Molecular Biology (BIOL 21800). It will introduce students to additional applications of the knowledge learned in these courses as well as enhance understanding and comprehension. The interpretation of peer-reviewed journal articles for reporting in a presentation format is also an advanced skill that will be reinforced in this course.

B. Learning Outcomes and Method of Evaluation:

Course Objectives:

- Describe the prokaryotic tree of life and the list the genes commonly used to construct similar phylogenies.
- Explain how genomic DNA is extracted and quantified from both a pure culture and environmental source.
• Explain the purpose and theory of PCR, the necessary reagents (including the design of primers), thermal cycling, and how to assess the products.
• List and describe the various methods used to sequence DNA.
• Demonstrate how DNA sequences can be used to identify microorganisms using public databases.
• List and describe techniques for the culture-independent molecular identification of microorganisms from a mixed culture.
• Explain how DNA sequences can be used to construct phylogenies.
• Provide detailed descriptions of major prokaryotic phyla.

Student Learning Outcomes:

• Knowledge of prokaryotic diversity and how it relates to phylogenetic relationships.
• Ability to identify microorganisms through modern molecular techniques.
• Development of library research skills in order to provide a detailed report on a specific prokaryotic phylum.
• Development of presentation skills including public speaking and the use of software programs such as MS PowerPoint.

Methods of Assessment:

• Direct:
  • Homework assignments to practice molecular identification techniques - individual and group formats
  • Presentation on a specific prokaryotic phyla based on a peer-reviewed journal article (may be groups depending on enrollment)
  • Written midterm and final exams

• Indirect:
  • Class participation in-class and through Blackboard Learn online discussions
  • Peer feedback for group work
  • Peer-reviewed presentations
  • Active learning through communication with the instructor

Grading Criteria

• More than one from the drop-down menu:
  • Papers and Projects: Students will be given a recent journal article highlighting a unique characteristic of a specific prokaryotic phylum. They will present the article and introduce the organism in a peer-reviewed in-class presentation. These presentations will be followed-up with classroom discussions.
  • Homework: As concepts and techniques are taught for the molecular identification of microorganisms students will be given assignments to assess their ability to apply those
skills. This could include the ability to diagram the PCR process or design specific primers, identify an organism from public databases given a DNA sequence, or explain how a community of mixed organisms can be identified and quantified as individual taxa without culturing.

- Exams and Quizzes: Students will be assessed through a midterm and final exam. The midterm will focus solely on molecular identification techniques and applications while the final will assess their understanding of prokaryotic diversity from the presentations and follow-up discussions described above.

Methods of Instruction

- More than one from the drop-down menu:
  - Lecture: Introductory topics will be presented in a lecture format while advanced discussions will rely on interactive student participation.
  - Presentation: Students will provide a presentation on an assigned prokaryotic phylum and journal article.

C. Prerequisite(s):

- BIOL 21800 “Genetics and Molecular Biology” - Prerequisite
- BIOL 43700 “Microbiology” - Co-requisite

D. Course Instructor(s):

- Tanya Soule, Assistant Professor, Biology
- Graduate Faculty qualification will be given after attendance of the IPFW Graduate Faculty Mentoring Workshop on November 4, 2011.

E. Course Outline:

First Half of the Semester:

- Phylogenetic analysis definition and approaches
- DNA extraction and quantification
- PCR: process, setup, and assessment of products
- DNA sequencing
- Molecular identification techniques: public databases and BLAST protocols
- Community analysis techniques: cloning, denaturing gradient gel electrophoresis, metagenomics, terminal restriction fragment-length polymorphisms, etc.

Second Half of the Semester:

- Introduction to prokaryotic diversity
• Library research skills and how to read a journal article
• Presentation skills
• Student presentations integrating a description of an assigned phylum and a journal article interpretation that highlights that specific phylum

F. Reading List:

• Primary List: “I, Microbiologist” by Sanders and Miller, 2010 ASM Press
• Secondary List: “The Prokaryotes” (see section G)

G. Library Resources:

Current relevant peer-reviewed articles from a variety of journals will be selected based on availability from the university library system. I will be submitting a Special Needs Grant to the Helmke Library for several volumes of “The Prokaryotes” which provides detailed descriptions of prokaryotic phyla. This would be a nonessential resource, although if the grant were funded it would provide the students with a comprehensive source on prokaryotic diversity.

H. Example of a Course Syllabus:

See attached.
BIOL 52410: Prokaryotic Diversity and Molecular Identification

T/Th from 12:00-1:15pm
Dual-credit course; B elective

Instructor: Dr. Tanya Soule
Office: SB 344 (I can also be found in SB 314)
Phone: 481-0229
Email: soulet@ipfw.edu

Prerequisite:
Required: BIOL 218000 "Genetics and Molecular Biology"

Co-requisite:
BIOL 43700 "Microbiology"

Required Textbook:
Title: "I, Microbiologist" by Sanders and Miller, 2010 ASM Press

Course Description: This course will address modern techniques in prokaryotic identification and phylogenetic analysis. Molecular methods in culture-dependent and culture-independent prokaryotic identification will be discussed and students will learn how to integrate such results into a larger phylogenetic context. Advanced characterization of several prokaryotic phyla will also be discussed.

Grades:

2 Written Exams (100pts) - 50 points each
5 Homework Assignments (100pts) - 20 points each
Presentation with peer-review (40pts)
Peer-review participation and discussion (10pts)

90-100% (225-250) = A
80-89% (200-224) = B
70-79% (175-199) = C
60-69% (150-174) = D
0-59% (<150pts) = F

Blackboard:
Information pertaining to this class will be listed on the course Blackboard site. To access Blackboard go to www.ipfw.blackboard.com and log in with your IPFW username and password. From there you can access your list of available courses. You will want to check the site regularly for announcements and recent posts. Please see me immediately if you cannot access the course Blackboard site.
**Homework:**
Homework assignments will be periodically assigned for material covered up until the midterm. You are expected to complete the assignments individually and turn them in at the beginning of class on the announced due dates.

**Presentations:**
Following a brief introduction to prokaryotic diversity by the instructor you will be assigned a journal article that highlights a particular phylum. You must prepare a 10 minute presentation that introduces this phylum and provide a summary of the journal article. You will be peer-reviewed by your fellow classmates, and these will be considered by the instructor when assigning a grade.

**Written Exams:**
The midterm exam will consist of essay questions which will cover the material from lecture, corresponding textbook sections, and homework as specified. The final exam will be based on the student presentations described above. Partial points will be awarded as appropriate.

**Academic Dishonesty:**
Cheating, including but not limited to copying another student’s work, will not be tolerated. Any offense will result in failing the entire course and will be reported to the student’s major department chair and dean of their school per the Student Handbook.

**Students with Disabilities:**
If you have a disability and need assistance, special arrangements can be made to accommodate most needs. Contact the Director of Services for Students with Disabilities (Walb Union, Room 113, telephone number 481-6658) as soon as possible to work out the details. Once the Director has provided you with a letter attesting to your needs for modification, bring the letter to me. For more information, please visit the website for SSD at [http://new.ipfw.edu/disabilities/](http://new.ipfw.edu/disabilities/)