FACULTY COMMITTEE ON GRADUATE EDUCATION, CONTINUING EDUCATION AND SPECIAL PROGRAMS

GRADUATE COURSE PROPOSAL FORM

Contact Name: Christine Byrum      Email: byrunc@cofc.edu      Phone:  (843) 953-7176

Department Name: Department of Biology      Graduate Program name: Marine Biology Graduate Program

Course Prefix, Number, and Title: BIOL 623/623L – Genomics

I. CATEGORY OF REVIEW (Check all that apply)

NEW COURSE   CHANGE COURSE   DELETE COURSE

☐ New Course (attach syllabus*)   □ Change Number (IV, VII, VIII, IX)   □ Delete Course (IV, VII, IX)

☐ Change Title (IV, VII, VIII, IX)

☐ Change Credits/Contact hours (II, IV, VII, IX)

☐ Prerequisite Change (IV, VII, VIII, IX)

☐ Edit Description (III, IV, VII, VIII, IX)

☐ Approve for Cross-listing (attach Graduate Permission to Cross-list Form)

Date (Semester/Year) the course will first be offered, course changes or deletion will go into effect: Fall 2014

NEW COURSE:

*ATTACH THE SYLLABUS FOR A NEW GRADUATE COURSE to include:

• Course description and objectives
• Method of teaching (e.g., lecture, seminar, on-line, hybrid)
• Required and optional texts and materials
• Graduate School Grading Scale
• Assignments, student learning outcomes and assessment components
• Policies to include attendance, Honor Code, American Disabilities Act statement
• Tentative course schedule with specific topics
List prerequisites and / or other restrictions below

Background in molecular biology or cell biology is recommended.

Will this course be added to the Degree Requirements?

a) [ ] Yes [x] No

b) If yes, explain

II. NUMBER OF CREDITS and CONTACT HOURS per week

<table>
<thead>
<tr>
<th></th>
<th>Lecture</th>
<th>Lab</th>
<th>Seminar</th>
<th>Ind. Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Contact Hours</td>
<td>3</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>B. Credit Hours</td>
<td>4</td>
<td></td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Is this course repeatable? [ ] yes [ ] no. If so, how many credit hours may the student earn in this course?

III. CATALOG DESCRIPTION Limit to 50 words EXACTLY as you want it to appear in the catalog; include prerequisites, co-requisites, and other restrictions. If changing course description, please include both old and new course descriptions.

This graduate course examines key concepts and recent advances in genomics. Students gain an advanced understanding of genome organization, genome sequencing/characterization, transcriptomics, comparative genomics, and proteomics. Laboratory combines wet lab and bioinformatic approaches to perform genomic analysis. Lectures three hours per week, laboratory three hours per week.

IV. RATIONALE / JUSTIFICATION: If course change – please indicate the course change details. If course change or deletion—please provide reasons for change(s) to or deletion of a course. If a new course—briefly address the goals/objectives for the course and the relationship to the strategic plan.

This course has been offered several times as a Special Topics Course (BIOL 502/502L). It teaches students key concepts in genomics and complements other graduate courses in this area such as Comparative Genomics (BIOL 649), Marine Molecular Ecology (BIOL 618/618L), and Bioinformatics (BIOL 690). It is also a required course option for genomics fellows in the Marine Biology Graduate Program.
## V. STUDENT LEARNING OUTCOMES and ASSESSMENT

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Method and Performance Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>What will students know and be able to do when they complete the course?</td>
<td>How will each outcome be measured? Who will be assessed, when, and how often? How well should students be able to do on the assessment?</td>
</tr>
<tr>
<td><strong>1. Students will be knowledgeable about key principles and theories of genomics as well as terminology used in this field.</strong></td>
<td>The instructor will assess learning outcome 1 by evaluating students based on their performance on tests covering materials presented in lecture over the course of the semester.</td>
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<tr>
<td></td>
<td>Grade A = Student acquires an average score of 90% or more on the tests.</td>
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<tr>
<td></td>
<td>Grade B+ = As above with a score of 87-89.9%.</td>
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<tr>
<td></td>
<td>Grade B = As above with a score of 80-86.9%.</td>
</tr>
<tr>
<td></td>
<td>Grade C+ = As above with a score of 77-79.9%.</td>
</tr>
<tr>
<td></td>
<td>Grade C = As above with a score of 70-76.9%.</td>
</tr>
<tr>
<td></td>
<td>Grade F = As above with a score of less than 70%.</td>
</tr>
<tr>
<td><strong>2. Students will be able to perform a scientific study, interpret data, and communicate results in an effective manner.</strong></td>
<td>The instructor will assess learning outcome 2 by evaluating written reports submitted by the student that summarize the results of their class project.</td>
</tr>
<tr>
<td></td>
<td>Grade A = Student acquires an average score of 90% or more on the written assignment(s).</td>
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<tr>
<td></td>
<td>Grade B+ = As above with a score of 87-89.9%.</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>Grade F = As above with a score of less than 70%.</td>
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<tr>
<td><strong>3. Students will gain proficiency in the use of bioinformatic tools.</strong></td>
<td>To assess competency in learning outcome 3, the instructor will assign exercises that require the students to practice utilizing bioinformatic tools introduced earlier during a laboratory session. Many of these assignments also contribute to the student's final research project.</td>
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<tr>
<td></td>
<td>Grade A = Student performs well on the assignment with an average score of at least 90%.</td>
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<tr>
<td></td>
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<tr>
<td><strong>4. Students will become familiar with current literature related to genomics and will learn to communicate this information to others.</strong></td>
<td>To assess learning outcome 4, the instructor will evaluate performances of each student as they lead discussion sessions in which a recent paper is presented to other members of the class. Each graduate student is also expected to write a paper on one of these discussion topics.</td>
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<td>Grade A = Student performs well on the assignment with an average score of at least 90%.</td>
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</tbody>
</table>
How does this course align with the student learning outcomes articulated for the major, program, or general education? What program-level outcome or outcomes does it support? Is the content or skill introduced, reinforced, or demonstrated in this course?

One goal of the College of Charleston Strategic Plan that is addressed by this class is to “Provide students the global and interdisciplinary perspectives necessary to address the social, economic, environmental, ethical, scientific and political issues of the 21st century.” The Genomics course educates students about recent findings and recent developments in technology that are drastically changing perspectives in the field. We learn about historical events that have led to our current understanding of the human genome, discuss development of different technologies, talk about how recent findings have modified our understanding of the genome, explore the societal impact of these findings, and learn how to apply new approaches in the laboratory. All of these goals align with this strategic objective.

In addition, as mentioned in the college’s Strategic Plan, this course provides a high impact learning experience. In lab sections limited to 12, students gain hands-on experience with personalized guidance in the classroom.

This course also supports educational objectives at the program level. This class fulfills several Core Concepts and Core Competencies mentioned in the Department of Biology Plan for Assessment, including the following:

Core Concepts addressed by this course include:
   a) Evolution
   b) Structure and function
   c) Information flow, exchange, and storage

Core Competencies addressed include:
   a) Application of the scientific process (e.g. experimental design)
   b) Examination of the interdisciplinary nature of science (genomics is an excellent example of an interdisciplinary subject)
   c) Increasing awareness of the relationship between science and society (ethical implications of genomic advances)
   d) Ability to apply quantitative reasoning

In summary, the Genomics course supports educational objectives of the college, program, and major in several ways.
1) Students gain an advanced understanding of genomic science and related technologies. They also learn more about cellular and molecular processes.
2) Students are exposed to the multidisciplinary and comparative nature of the field of genomics.
3) They experience doing research first hand and explore different aspects of a specific genome in a laboratory setting.
4) Students improve their verbal and writing skills by leading classroom discussions and preparing lab reports.
5) Students gain an appreciation of the social and ethical complexities that have grown out of new advances in this field through classroom discussions.
VII. IMPACT ON EXISTING PROGRAMS and COURSES: Please briefly document the impact and expected changes of this new/changed/deleted course on other departments, programs and courses: if deleting a course—list all departments and programs that include the course; if adding/changing a course—explain any overlap with existing courses in the same or different departments; if adding or deleting a course that will be part of a joint program identify the partner institution.

Genomics offers an overview of the field of genomics and builds upon core concepts that graduate students may have encountered in undergraduate Molecular Biology or Genetics classes, examining many of these topics in much greater detail. It also provides a strong foundation for advanced coursework in related fields. Information presented will help students prepare for Comparative Genomics (BIOL 649), Marine Molecular Ecology (BIOL 618/618L), and Bioinformatics (BIOL 690). These courses examine related topics in genomics, but go into more detail. Genomics will not affect the number of credit hours required for the Marine Biology M.S. degree.

VIII. COSTS ASSOCIATED WITH THE ACTION REQUESTED: List all of the new costs or cost savings, (including new faculty/staff requests, library or equipment, etc.) associated with the action requested. New courses requiring additional resources will need special justification.

Dr. Christine Byrum (course instructor) was hired in Fall 2007, in part, to develop this course as an addition to the curriculum for the Marine Biology Graduate Program (a proposal has been submitted for this as well). Much of the equipment for the course has already been purchased (including a qPCR machine, a refrigerated centrifuge, and molecular equipment needed to perform mRNA extraction, synthesis of cDNA, and qPCR) using funds from the state, as well as funds provided by the Dean’s office and the department. The Biology department will cover recurring costs (expendables and animals) using standard lab fees. Many of the journals and texts needed for the class have already been purchased using Marine Genomics funding from the state and are available at both the downtown and marine station libraries.
IX. APPROVAL AND SIGNATURES

Signature of Program Director:

[Signature] Date: 10/27/14

Signature of Department Chair:

[Signature] Date: 10/29/14

Signature of Additional Chair*:

[Signature] Date: __________

Signature of Schools’ Dean:

[Signature] Date: 11/3/14

Signature of Additional Schools’ Dean*:

[Signature] Date: __________

Signature of the Provost:

[Signature] Date: 12/22/14

Signature of Budget Director/Business Affairs Office:

[Signature] Date: __________

*For interdisciplinary courses

Return form to the Graduate School Office for Further Processing

Signature of Chair of the Faculty Committee on Graduate Education, Continuing Education & Special Programs:

[Signature] Date: 1/27/2015

Signature of Chair of the Graduate Council:

[Signature] Date: __________

Signature of Faculty Senate Secretary:

[Signature] Date: __________

Date Approved by Faculty Senate: ________________________________

September 2011
Biology 502/502L
Genomics Lecture/Lab

Lectures: MF 11:00 am-12:15 pm, New Science Center, Room 140
Instructor: Dr. Christine Byrum
Email: byrumc@cofc.edu
Phone: (843) 953-7176
Office: 236B RHSC, College of Charleston (Downtown campus)
Office Hours: By appointment

Course Overview:
This graduate course is designed to familiarize students with the field of genomics and current topics of interest in this quickly expanding discipline. We will explore several subdisciplines in the field and learn about a variety of techniques applicable to genomic analysis. Particular attention will be devoted to new advances in the area of marine genomics as well as biomedically relevant areas of genomics. Materials will be presented as lectures, classroom discussions of journal articles, and labs/workshops.

Objectives:
Course goals include the following:
1) Students should become familiar with terminology used by genomics as well as key principles and theories associated with this field.
2) They will be expected to coherently explain genomic concepts and to apply these concepts to new situations or to predict outcomes based on what they have learned in class.
3) Students will learn how to use bioinformatic tools to find/identify genes in a genome and to better characterize gene products.
4) Become familiar with recent genomic research through discussion of the scientific literature.
5) Learn techniques in phylogenetic analysis that are applicable to genomic studies.
6) Become familiar with all aspects of QPCR analysis including sample preparation, primer design, primer testing, calibration of the QPCR machine, controls necessary for QPCR analysis, running QPCR reactions, and analysis of QPCR results.
7) Learn about sequencing technologies, gene expression analysis, and proteomics.
8) Discuss ethical issues relevant to genomics.
9) Become more aware of local genomic resources.
10) Learn how to present genomic information in a talk and/or a paper.
Optional Texts:

**Prerequisites:** Genetics (BIOL 305), Molecular Biology (BIOL 312) / Cell Biology (BIOL 313) or permission of the instructor.

**Course Policies**

**Attendance:** Regular classroom participation is critical in this course. If the student is unable to attend a class, he/she should be sure to get the information from a classmate or from the instructor so that he/she doesn’t fall behind. If an absence is anticipated, the instructor should be informed ahead of time.

**Class Assignments:**

**Quizzes:** There will be seven quizzes during the course of the semester at which the students will be assessed to determine their knowledge concerning recent and/or previous materials. These will typically consist of five to ten short answer/essay questions. This is a significant portion of your grade and you should be sure to prepare thoroughly for each evaluation.

**Discussions:** Students will also lead class discussions about topics in genomics. This will be done in teams of two. Students should introduce the class to the topic and lead a discussion reviewing two papers (30 minutes/person). Students should prepare typed notes for these discussions (notes highlighting key points in the introduction and listing discussion questions with written answers.). These notes will be handed in following the discussion session.

Those not presenting are expected to read the assigned papers before class and to participate in class discussions. Participation grades are based on the following: A) Did the student take the time to carefully read this paper? Is he/she able to answer questions raised during discussions? Can he/she describe what was done in the paper? Has he/she thought about implications of this work? B) Is the student willing to participate and contribute to classroom discussions? Even if you are shy, it is important that you make an effort to actively participate. C) Has the student taken any extra steps to build on what they’ve learned after reading the paper? Does he/she contribute extra information in these discussions?

**Solo Discussion:** In addition to the two team-led discussions, each graduate student will be expected to lead a third discussion session independently. He/she will select 1-2 papers to discuss and will prepare a Powerpoint presentation (20-25 minutes) to present before the
discussion that will give the other students some background on the topic. Following this introduction, the student will lead a classroom discussion about the chosen paper(s).

**Out of Class Exercises:** These are short “homework” assignments. Often these are worksheets to fill out or exercises to do that will improve understanding of a technique previously discussed in class or lab. Students are encouraged to talk to each other about these assignments but should not copy work. Make sure that all work is shown and turn in assignments at the beginning of the next class period. Assignments will not be accepted after all papers have been corrected and turning in an assignment late may result in a penalty.

**Class Projects:** Over the semester, students will work together to complete a course project in the lab during which they analyze expression of a set of genes in the sea urchin. Students will find members of a gene family, identify domains present in the members of that gene family, identify homologues based on gene alignments and perform phylogenetic analysis to characterize the evolutionary relationships of these genes to those in other phyla. They will also design primers and perform QPCR analysis to determine levels of gene expression at different developmental stages. Each individual will submit his/her project as a paper.

**Grading of Assignments:** A single grade based on performance in both the lecture and lab will be assigned for the 4-credit Genomics course. The following criteria will be used to calculate the grade.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tests</td>
<td>30%</td>
</tr>
<tr>
<td>Participation in Class Discussions (lecture)</td>
<td>10%</td>
</tr>
<tr>
<td>Leading Class Discussions in Team of Two (2) (lecture)</td>
<td>15%</td>
</tr>
<tr>
<td>Solo Class Discussion (1) (lecture)</td>
<td>10%</td>
</tr>
<tr>
<td>Out of Class Exercises (lab/lecture)</td>
<td>15%</td>
</tr>
<tr>
<td>Class Project (lab)</td>
<td>20%</td>
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</tbody>
</table>

**Grading Scale:**
- 90 and above: A
- 87-89.9: B+
- 80-86.9: B
- 77-79.9: C+
- 70-76.9: C
- <70: F

**Classroom courtesy:** Students are expected to turn off cell phones, beepers, and any other disruptive devices during lectures and discussions. Exceptions will be made in extreme situations such as spouses anticipating the birth of a child or a serious emergency. Permission to leave an electronic device on should be obtained prior to class.
**Academic Integrity:** Students are expected to behave in an honest and responsible manner. Violations of the honor code are offensive and will generally be dealt with severely. We will adhere to the following policy as quoted from the Honor Council’s recommended guidelines:

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.

In cases where it is determined that a student’s actions were due to a misunderstanding, the situation will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed by both the instructor and the student, will be forwarded to the Dean of Students and placed in the student’s file. Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the X to be expunged. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration—working together without permission—is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information stored on a cell phone), copying from others’ exams, fabricating data, and giving unauthorized assistance.

Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor. Students can find the complete Honor Code and all related processes in the Student Handbook at [http://www.cofc.edu/generaldocuments/handbook.pdf](http://www.cofc.edu/generaldocuments/handbook.pdf).”
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Aug. 23 F</td>
<td>Gene and Genome Structure (Ch. 16)</td>
</tr>
<tr>
<td>Aug. 26 M</td>
<td>Review of Molecular Techniques (Ch. 2)</td>
</tr>
<tr>
<td>Aug. 30 F</td>
<td><em>Discussion</em> - Origins of Genomics (Assigned Reading) – Concepts Test 1</td>
</tr>
<tr>
<td>Sept. 2 M</td>
<td>Sequencing Genomes (Ch. 7, Ch. 17)</td>
</tr>
<tr>
<td>Sept. 6 F</td>
<td><em>Discussion</em> - Genome Sequencing Technologies</td>
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<tr>
<td>Sept. 9 M</td>
<td>Gene Finding/Annotation (Assigned Reading)</td>
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<tr>
<td>Sept. 13 F</td>
<td><em>Discussion</em> – Alternative Splicing – Concepts Test 2</td>
</tr>
<tr>
<td>Sept. 16 M</td>
<td>Measuring Gene Expression (Ch. 20)</td>
</tr>
<tr>
<td>Sept. 20 F</td>
<td><em>Discussion</em> - EST projects</td>
</tr>
<tr>
<td>Sept. 23 M</td>
<td>Personalized Medicine</td>
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<tr>
<td>Sept. 27 F</td>
<td><em>Discussion</em> – Personalized Medicine – Concepts Test 3</td>
</tr>
<tr>
<td>Sept. 30 M</td>
<td>QPCR (Assigned Reading)</td>
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<tr>
<td>Oct. 4 F</td>
<td><em>Discussion</em> – Gene Expression</td>
</tr>
<tr>
<td>Oct. 7 M</td>
<td>Proteomics (Ch. 21-23)</td>
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<tr>
<td>Oct. 11 F</td>
<td><em>Discussion</em> - Proteomics/Metabolomics – Concepts Test 4</td>
</tr>
<tr>
<td>Oct. 14 M</td>
<td>Fall Break</td>
</tr>
<tr>
<td>Oct. 18 F</td>
<td>Microbial Genomics (Assigned Reading)</td>
</tr>
<tr>
<td>Oct. 21 M</td>
<td><em>Discussion</em> – Microbial Genomics</td>
</tr>
<tr>
<td>Oct. 25 F</td>
<td>Studying Genome Variation (Ch. 25)</td>
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<tr>
<td>Oct. 28 M</td>
<td>Comparative Genomics (Ch. 18)</td>
</tr>
</tbody>
</table>
Nov. 1 F  
Discussion – Comparative Genomics – Concepts Test 5

Nov. 4 M  
Sequence Alignment (Ch. 9, Assigned Reading)

Nov. 8 F  
Discussion – RNAi

Nov. 11 M  
Phylogenetic Analysis (Assigned Reading)

Nov. 15 F  
Discussion - Ethical Issues

Nov. 18 M  
Discussion – Epigenetics – Concepts Test 6

Nov. 22 F  
Functional Genomics (Ch. 19)

Nov. 25 M  
Discussion – Functional Genomics

Nov. 29 F  
Thanksgiving

Dec. 2 M  
Discussion/Presentation of Results from Lab Projects – Concepts Test 7

*Schedule may vary subject to scheduling changes and other modifications as needed.

Objectives of the Genomics Lab: In the Genomics Lab, a mixture of computer-based labs and “wet lab” exercises are used to familiarize students with key procedures regularly used to study genomics. We will work together in teams to ask real scientific questions. Students will learn how to:

1) Retrieve nucleotide (transcriptomic and genomic DNA) and protein sequences from scientific databases.
2) Perform simple and advanced BLAST searches.
3) Design standard and QPCR primer sets for reverse transcriptase PCR and QPCR.
4) Extract RNA from an organism and produce cDNA.
5) Perform and analyze the results of reverse transcriptase PCR and QPCR.
6) Extract DNA from a gel after electrophoresis and prepare samples for sequencing.
7) Analyze sequence data.
8) Find homologous genes for phylogenetic analysis.
9) Perform phylogenetic analyses using MEGA5.

Lab Safety and Attire: Before attending the first lab, each student should review the official SSM safety manual posted on OAKS. Many of the labs are computer-based, but others involve the use of hazardous chemicals. During “wet labs”, students should dress appropriately,
wearing pants rather than shorts and closed-toed shoes. These protect more in the case of a chemical mishap.

### Genomics Lab Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Aug. 30</td>
<td>BLAST lab</td>
</tr>
<tr>
<td></td>
<td><em>Goal:</em> Become proficient at performing different types of BLAST searches on NCBI's BLAST site. Learn how to select the correct BLAST program for your question, which databases are available on BLAST, parameters available, and how to perform specialized BLAST searches. <em>Assignment:</em> Complete BLAST worksheet before next lab.</td>
</tr>
<tr>
<td>Sept. 6</td>
<td>Finding Genes in a Genome/Domain Analysis</td>
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<td><em>Goal:</em> Outline lab organization, goals for semester. Learn to search for annotated and unannotated genes. Discuss how to deal with “problematic” sequences. Learn to do domain searches (Pfam, NCBI, SMART, TMHMM) and how to make drawings showing key domains. <em>Assignment:</em> Practice finding genes and characterizing domain structure in these products.</td>
</tr>
<tr>
<td>Sept. 13</td>
<td>Standard and QPCR Primer Design/Review of PCR</td>
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<tr>
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<td><em>Goal:</em> Learn how to make primers for standard PCR and QPCR analysis. <em>Assignment:</em> Design Standard PCR and QPCR primer sets to be used later this semester.</td>
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<tr>
<td>Sept. 20</td>
<td>Collecting Specimens for QPCR Analysis</td>
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<td><em>Goal:</em> Learn how to prepare specimens for QPCR analysis. Induce spawning in sea urchins, culture and collect embryos at specific developmental stages, and prepare for RNA extraction. <em>Assignment:</em> Obtain specimens for QPCR labs.</td>
</tr>
<tr>
<td>Sept. 27</td>
<td>Extracting RNA/Producing cDNA</td>
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<td><em>Goal:</em> Collect/extract RNA and use reverse transcriptase to produce cDNA for RT-PCR or QPCR. <em>Assignment:</em> Isolate mRNA and produce cDNA.</td>
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<tr>
<td>Oct. 4</td>
<td>Performing the Standard PCR Reaction</td>
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<td><em>Goal:</em> Test the standard primers that you made using a standard PCR reaction. <em>Assignment:</em> Obtain PCR products (if possible) using your primer sets before the next lab.</td>
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</tbody>
</table>
Oct. 11  Electrophoresis of PCR products/Gel Extractions for Sequencing  
*Goal:* Evaluate PCR products obtained in last lab using gel electrophoresis and prepare samples for sequencing.  
*Assignment:* Determine whether primers amplified genes of interest and verify by sequencing the product.

Oct. 18  Tour of Genome Core Facilities at Fort Johnson  
*Goal:* Become familiar with technologies available nearby for RNA Seq, microarray studies, and metabolomic analysis.  
*Assignment:* Continue to work on class project paper.

Oct. 25  Optimizing for QPCR/Running Reactions  
*Goal:* Run a QPCR reaction after performing necessary tests.  
*Assignment:* Acquire QPCR data.

Nov. 1   Optimizing for QPCR/Running Reactions  
*Goal:* Continue collecting data for class project.  
*Assignment:* Acquire QPCR data.

Nov. 8   Analyzing QPCR data/ Finding Potential Homologues  
*Goal:* Complete QPCR analysis for class project and related analysis. Also, introduce websites useful for finding homologous genes (Ensembl, Homologene, HUGO, Mouse Genome Informatics, etc.).  
*Assignment:* Analyze QPCR data.

Nov. 15  Sequence Alignment  
*Goal:* Learn to how to do pairwise and multiple sequence alignments. Discuss editing multiple sequence alignments.  
*Assignment:* Perform pairwise and multiple sequence alignments on your project genes to prepare for phylogenetic analysis. Edit the multiple sequence alignment.

Nov. 22  Generating Phylogenies to Identify Homologues  
*Goal:* Learn to generate neighbor-joining and maximal parsimony trees in MEGA.  
*Assignment:* Produce a neighbor-joining tree and a maximal parsimony tree for a family of genes you are working on. Compare your genes to potential homologues in humans. Then perform a second analysis in which the genes are compared to a range of organisms to assess evolution of the gene.

*Schedule may vary subject to scheduling changes and other modifications as needed.*  
**Bold dates:** Lab will be held in RHSC 315