BIOLOGY 3030

Molecular Genetics

FALL 2014

INSTRUCTOR: David W Jones, Assistant Professor

Office: Science Building 102

Contact: 652-7632/dwjones@dixie.edu

Office Hours: 0900-0950 MTWRF or by appointment

Lecture: MTWF 1000-1050/ SCI 109

Course Description:

Genetic systems are the defining hallmark of life on earth. The processing and transmission of genetic information guide life from the seemingly mundane tasks of the cell to the behavior of organisms to the intricacies of evolution. This course will investigate the fundamental machinations of the genetic material in detail. In addition, this course will include in-depth discussions of our ability to engineer these systems in vitro from a technical perspective, as well as, the ethical consequences of our actions.

Biology 3030 is intended for science majors and is a core requirement for the baccalaureate degree in biology offered by the Department of Biology at Dixie State University. The material presented is an attempt to represent the basics of our current understanding of molecular genetic mechanisms. Because of the complex nature of genetic systems and the highly technical research required for the science, this course will be advanced and intellectually rigorous. This course qualifies as ‘upper division’ and it is my intention that the class work will extend beyond normal instructor/student transaction. Your participation during the class will be necessary to ensure your personal comprehension and success of the class as a whole.

Course Objectives:

• To know and appreciate DNA’s principle position in all biological systems.
• To know and understand the structure and function of the gene.
• To know the primary mechanisms of regulating gene expression.
• To recognize the technologies of genetic analyses.
• To understand the mechanisms of transmission genetics at the individual and population levels.

Biology Program Goals and Student Learning Outcomes:

As a Core Requirement of the Bachelor’s of Science (B.S.) in Biology, BIOL 3030 is intended to reinforce basic concepts of the biological sciences by meeting the following Program Goals:

   Goal 1: Demonstrate breadth of discipline-specific knowledge

• Outcome 1: Students will describe and explain fundamental topics in five principal perspectives of
biology:
1. The chemical and molecular machinations operating within all biological processes
2. The centrality of genetic systems' governance of life's actions from the cellular to the phyletic
3. The coordinated regulation of integrated cellular systems and their effect on the physiological functioning of organisms
4. The dynamic interaction of living systems with each other and their environments
5. The transforming role of evolution in changing life forms and how evolution explains both the unity and diversity of life

Goal 2: Demonstrate the capacity to think independently and critically
- Outcome 2: Students will employ scientific methods to acquire, analyze and apply knowledge of biological phenomena.
- Outcome 3: Students will evaluate scientific ideas and information while maintaining receptivity to potential alternative predications.

Goal 3: Effectively convey scientific literacy through various mediums of communication
- Outcome 4: Reading Comprehension: Students will analyze and critique scientific literature: identifying hypotheses, critiquing methods, interpreting data and results, and articulating the context of discussions.
- Outcome 5: Written Communication: Students will produce well-written reports and/or research papers covering topics in biology. These papers will be presented in the accepted formats of scientific research articles.
- Outcome 6: Oral Presentation: Students will publicly present scientific information covering specific topics in the biological sciences. Presentations will adequately communicate data and information in a clear and logical format.
1. explain and apply major concepts of a view of life, the cell, and the genetic basis of life,
2. demonstrate knowledge of the process of science including asking testable questions, using inductive and deductive reasoning in forming hypotheses and in making reliable predictions,
3. explain the objective of science and research including distinguishing among the natural sciences, liberal arts (humanities and fine arts), social and behavioral sciences and pseudo-science,
4. compute ratios, proportions, percentages, decimals, fractions, frequencies and elementary probabilities.

Student Learning Outcomes will be assessed at the course-level through a series of Take-home examinations comprised of large essay questions and/or small written reports.

Answers are awarded points based on 1) factuality of content and 2) evidence of comprehension (i.e. integrating presented material with concepts/ideas from other sources).

Successfully answering questions indicate that students were capable of retrieving and comprehending scientific literature.
Grading Policy/Evaluation:

<table>
<thead>
<tr>
<th>Test</th>
<th>Weight</th>
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<tbody>
<tr>
<td>MIDTERM I</td>
<td>150</td>
</tr>
<tr>
<td>MIDTERM II</td>
<td>150</td>
</tr>
<tr>
<td>MIDTERM III</td>
<td>150</td>
</tr>
<tr>
<td>FINAL EXAM</td>
<td>150</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>600</strong></td>
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</tbody>
</table>

540 – 600  A - A  (>93%)
480 – 539  B - B+
420 – 479  C - C+
360 – 419  D - D+
<359       F

Prerequisites:

BIOL 1610 and BIOL 1620

Course Text:


In addition, other recommended readings that may/may not be directly applicable too this course but provide important intellectual exercises as you become mature students of biology include –

*The River out of Eden*  Richard Dawkins
*The Selfish Gene*  Richard Dawkins
*The Agile Gene*  Matt Ridley
*Coming to Life*  Chritiane Nusslein-Volhard
*Evolution in Four Dimensions*  Eva Joblonka and Marion Lamb
*What is Life?*  Addy Pross
Any and all other material will be provided by the instructor.

Attendance:

Daily attendance records will not be taken but your performance in this course (as in all course) is directly proportional to your level of attendance. In addition, your participation in class discussions will be considered when calculating your final grades. This is not intended as a negative sanction for a poor attitude but to encourage you to become an engaged and active participant in your own education. The educational process is enriched by the addition of pertinent questions and spontaneous comments.

Cell phones:

Academics are fundamentally an exercise in dialogue and discourse. Constantly communicating with others outside of the discussion dilutes your ability to participate and suggests a lack of 1) intellectual focus and 2) basic manners. It is today’s most ubiquitous display of ‘bad home raising’.

Requirements:

1. Students are expected to abide by the rules and regulations outlined in the Student Handbook.
2. Any additional information will be announced by your instructor. Your instructor retains the right to change policy at any time for any reason he deems valid.

Academic Misconduct:

Academic honesty is expected and required in all classes. All incidents of academic misconduct will result in a grade of ZERO and the Chair of the Department will be notified so that University policy will be enforced which may result in expulsion.

From DSU Policies and Procedures Manual Section 3-34

3-34 ACADEMIC DISCIPLINE

34.1 Cheating: Academic dishonesty in any form will not be tolerated at Dixie State University, including but not limited to plagiarism on written assignments, submitting other person’s work as one’s own, and cheating on exams or quizzes (emphasis added). Teachers at Dixie State College may discipline students proven guilty of academic dishonesty by:

34.1.1 Giving a failing grade on the specific assignment where dishonesty occurred,
34.1.2 Failing the student in the entire course,
34.1.3 Immediately dismissing and removing the student from the course, and/or
34.1.4 Referring the student to Student Affairs, a committee which may reprimand, place on probation, suspend, and/or expel the student.

Disability Service Policy:

Students with medical, psychological, learning or other disabilities desiring reasonable academic adjustment, accommodations, or auxiliary aids to be successful in this class will need to contact the DISABILITY RESOURCE CENTER Coordinator (Baako Wahabu) for eligibility determination. Proper documentation of impairment is required in order to receive services or accommodations. DRC is located at the ground floor of the Financial Aid Office. Visit or call 652-7516 to schedule appointment to discuss the process. DRC Coordinator determines eligibility for and authorizes the provision of services.

College Resources: Several college resources are available to help you succeed. Check out the links for each one to get more information.

If you need help understanding the content of your courses, go to the Tutoring Center located on the 4th floor of the Holland Centennial Commons in Room 431. You can visit them online at http://dsc.dixie.edu/tutoring/

If you need help writing papers, go to the Writing Center on the fourth floor of the Holland Centennial Commons in room 421. You can also visit them online at http://new.dixie.edu/english/dsc_writing_center.php

If you are assigned to take a test in the Testing Center, go to the North Plaza. You can get information on their website at http://new.dixie.edu/testing/

The Library has all kinds of information and resources. Visit the Dixie State College Library on the 2nd, and 3rd floors of the Holland Centennial Commons, or go to the library website at http://library.dixie.edu/

Tentative Schedule of Topics

<table>
<thead>
<tr>
<th>Topic</th>
<th>Chapter (Watson, 2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Genomic Architecture</td>
<td>1, 2</td>
</tr>
<tr>
<td>Introduction</td>
<td>1, 2</td>
</tr>
<tr>
<td>DNA as (a) Genetic Material</td>
<td>3, 4, 8</td>
</tr>
<tr>
<td>Genomic Characteristics and Content</td>
<td>2</td>
</tr>
</tbody>
</table>
II. Faithful Replication (of an ever-changing genome)
DNA Replication 9

MIDTERM I
DNA Repair 10, 11, 12
Genomic Dynamism

III. The Gene Structure and Function
The Gene as Transcriptional Unit 16, 17
The RNA World 13, 14
Protein Synthesis – A Genetic Code 2, 16, 15

MIDTERM II

IV. The Regulation of Differential Gene Expression
The Paradigm of Gene Expression
Prokaryotic Gene Expression 18
Eukaryotic Gene Expression 19, 20, 21, 22

MIDTERM III

FINAL EXAM MONDAY, DECEMBER 15 (1030-1230)
**FALL 2014 Academic Calendar**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Aug. 25</td>
<td>Classes begin</td>
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<tr>
<td>Aug. 29</td>
<td>Last day to ADD without signature</td>
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<tr>
<td><strong>Sept. 1</strong></td>
<td><strong>Labor Day Holiday (no classes)</strong></td>
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<tr>
<td>Sept. 4</td>
<td>DROP/AUDIT fee begins ($10 per class)</td>
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<tr>
<td>Sep. 4</td>
<td>Residency Application deadline</td>
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<tr>
<td>Sept. 9</td>
<td>$50 Late registration/payment fee</td>
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<tr>
<td>Sept. 15</td>
<td>Last day for refund</td>
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<tr>
<td>Sept. 15</td>
<td>Last day to drop without receiving a “W” grade</td>
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<tr>
<td>Sept. 17</td>
<td>Courses dropped for non-payment</td>
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<tr>
<td>Sept. 19</td>
<td>Last day to ADD / AUDIT classes</td>
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<tr>
<td>Oct. 15</td>
<td>Midterm grades due</td>
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<tr>
<td><strong>Oct. 16-17</strong></td>
<td><strong>Semester Break (no classes)</strong></td>
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<tr>
<td>Oct. 20</td>
<td>Last day to DROP individual classes</td>
</tr>
<tr>
<td>Oct. 27</td>
<td>Spring and Summer 2014 class schedules available online</td>
</tr>
<tr>
<td>Nov. 3</td>
<td>Spring 2015 Bachelor’s degree Graduation Application Deadline</td>
</tr>
<tr>
<td><strong>Nov 4-7</strong></td>
<td><strong>No Class</strong></td>
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<tr>
<td>Nov. 11</td>
<td><strong>Career Day (no classes before 2:00 p.m.)</strong></td>
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<tr>
<td>Nov. 14</td>
<td>Last day for complete withdrawal from all classes</td>
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<tr>
<td>Nov. 17</td>
<td>Spring 2015 Registration open to Seniors (90+ credits)</td>
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<tr>
<td>Nov. 18</td>
<td>Spring 2015 Registration open to Juniors (60+ credits)</td>
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<tr>
<td>Nov. 19</td>
<td>Spring 2015 Registration open to Sophomores (30+ credits)</td>
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<tr>
<td>Nov. 20</td>
<td>Spring 2015 Registration open to all students</td>
</tr>
<tr>
<td>Nov. 26-28</td>
<td>Thanksgiving Break (no classes)</td>
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<tr>
<td>Dec. 12</td>
<td>Classes end</td>
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<tr>
<td>Dec. 15-19</td>
<td>Final Exams</td>
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