I. Course number and title:  
BIO 111: Principles of Biology I

Instructor: Shelly W. Kapitan  
Office Hours:  
M, W: 10:30 – 11:30  
Th: 10:00 – 11:30  
Other times by appointment

Office S-118  
410-822-5400

Email: Recommended method of contact is by ANGEL course mail

II. Course description:  
A study of basic principles of biology and properties common to living cells. The first of two courses designed specifically for students who plan to major in biology. Content focuses on providing a framework for understanding how biological components and pathways interact and function by applying principles, techniques, and methods of data analysis to biological problems. Three hours lecture, two hours laboratory, (4 credits). (Note: Students cannot receive credit for both BIO 101 and BIO 111.)

III. Course objectives (Broad Goals of the Course):
1. To develop an in-depth understanding and detailed appreciation for the basic principles of the science of biology, starting with the cell.
2. To prepare students for more advanced courses in biology, with an understanding of cell processes.
3. To provide students with knowledge necessary to help solve problems in biological areas, beginning with the cellular level.
4. To introduce students to the scientific method.
5. To provide students with laboratory experiences to develop laboratory skills.
6. To participate in classroom discussions.

IV. Specific objectives:  
Specific objectives are found in 3 places: in the text, the laboratory manual, and this syllabus.

At the end of the course, the student will be able to:

(Science)
1. Describe the characteristics found in all living organisms.
2. Use the scientific method.
3. Name the methods used to study cells and their importance.
4. Discuss the great unifying theory of biology and understand its significance.

(Chemistry)
5. Identify the chemical compounds found in the cell and understand their functions, including small molecules and macromolecules of biologically important compounds.
6. Calculate the atomic number and atomic mass of a given atom.
7. List the properties of water.

(Cells)
8. Identify the organelles found in the cell and know the function of each.
9. Differentiate between the types of cell transport processes.

(Cell Energy Processes: Photosynthesis and Respiration)
11. Name the environmental factors important to photosynthesis.
12. Identify the organelle and site of photosynthesis.
13. Differentiate between the different kinds of respiration occurring in the cell, including the site of respiration and number of ATP molecules produced.
14. Outline the events of glycolysis and cellular respiration.

(Cell Divisions)
15. Identify the steps in mitosis and explain their importance in cell division.
16. Differentiate between mitosis and meiosis including the number of cell divisions and chromosome numbers.
17. Describe the stages of meiosis I and meiosis II.
18. Set-up and successfully work monohybrid, dihybrid test, and sex-linked crosses.
19. Identify dominant, recessive, and incompletely dominant traits in humans.

(Gene structure, function, and activity, with an introduction to bioinformatics)
20. Explain DNA replication.
22. Explain the concept of evolution and how it works.
23. Discuss molecular and morphological evidence for evolution.
24. State the approximate age of the earth, the time life first appeared, and the significant events of life occurring during different geological time periods.
25. Identify the ancestors of anatomically modern humans and identify the traits that define Homo sapiens.

(General)

26. Use key terms from the theory and laboratory components in application to everyday experiences.
27. Prepare and present information in a cooperative/peer learning environment.
28. Complete Internet research as assigned.
29. Complete the above objectives with a minimum passing grade in both the theory and laboratory components of the course.

VI. Methods of teaching:
Lecture, discussion, cooperative learning, laboratory sessions (microscopy, biochemistry, biotechnology, dissection), current topics. A/V materials may include handouts, VHS cassettes, CD-ROM, internet materials, and/or DVDs to supplement content.

VII. Instructional Materials:

Required texts:


VIII. Criteria for Student Grading:

Bio 111 will be graded on a 100-point scale, as follows:

1. Theory: 75%
   3 Exams, 15% each
   1 Final Exam, 15%
   Lecture Quizzes and Exercises, 5%
   1 Writing Assignment, 10%

2. Laboratory: 25%
   2 Practical Exams, 10% each
   Average of 2 lab reports, 5%

Course Grading Scale
The following grade scale will be used:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90-100</td>
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<tr>
<td>B</td>
<td>80-89</td>
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<tr>
<td>C</td>
<td>70-79</td>
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<tr>
<td>D</td>
<td>60-69</td>
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<tr>
<td>F</td>
<td>Below 60</td>
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All examinations will be announced in class and will consist mostly of short answer and essay questions.

Attendance at any test or examination is mandatory.
There will be NO make-up examinations without PRIOR arrangements with the instructor.

If, for any reason, a student is not able to take a test, the student must contact the instructor and receive a reply BEFORE (not during or after) the scheduled test.
V. Course outline (Areas to be Covered in the Course)  *This schedule may change at the instructor’s discretion.*

<table>
<thead>
<tr>
<th>Date</th>
<th>Reading Assignment</th>
<th>Chapter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 23</td>
<td>A view of life: Introduction &amp; the scientific method</td>
<td>1 (skim)</td>
</tr>
<tr>
<td>August 28, 30</td>
<td>Basic Chemistry (inorganic)</td>
<td>2, 3</td>
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<tr>
<td>September 4, 6</td>
<td>Simple organic chemistry, Enzymes, ATP</td>
<td>4, 5, 8.3 - 8.5</td>
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<tr>
<td>September 11</td>
<td>Overflow/review information/Discussion</td>
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<tr>
<td><strong>September 13</strong></td>
<td><strong>EXAM I</strong></td>
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<tr>
<td>September 18</td>
<td>Cell membrane structure; transport processes</td>
<td>7</td>
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<tr>
<td>September 20</td>
<td>Cell structures and functions</td>
<td>6</td>
</tr>
<tr>
<td>September 25, 27</td>
<td>Chemiosmosis, Photosynthesis</td>
<td>10, review Lab 6</td>
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<tr>
<td>October 2</td>
<td>Cellular respiration</td>
<td>9</td>
</tr>
<tr>
<td>October 4</td>
<td>Overflow/review information/Discussion</td>
<td></td>
</tr>
<tr>
<td><strong>October 9</strong></td>
<td><strong>EXAM II</strong></td>
<td></td>
</tr>
<tr>
<td>October 11, 16</td>
<td>Cell Reproduction: Binary fission, mitosis and meiosis</td>
<td>12, 13</td>
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<tr>
<td>October 18, 23</td>
<td>Genes and chromosomes; Mendelian genetics</td>
<td>15, 14</td>
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<tr>
<td>October 25</td>
<td>Molecular genetics: DNA structure and replication</td>
<td>16</td>
</tr>
<tr>
<td>Oct. 30</td>
<td>Gene activity: transcription and translation</td>
<td>17</td>
</tr>
<tr>
<td>Nov.1</td>
<td>Gene regulation; epigenetics; biotechnology</td>
<td>18, 20</td>
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<tr>
<td>Nov. 6</td>
<td>Overflow/review information/Discussion</td>
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<tr>
<td><strong>Nov. 8</strong></td>
<td><strong>EXAM III</strong></td>
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<tr>
<td>November 13</td>
<td>Evolution; natural selection and micro evolutionary processes</td>
<td>21.3-21.6 (skim), 22</td>
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<tr>
<td>November 15</td>
<td>Speciation; extinction; macroevolutionary processes</td>
<td>23, 24</td>
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<tr>
<td>November 20</td>
<td>Evolutionary history of diversity, phylogeny</td>
<td>26</td>
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<tr>
<td></td>
<td><strong>WRITTEN ASSIGNMENT DUE</strong></td>
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<tr>
<td>November 27</td>
<td>Origins of life; major radiations and extinctions</td>
<td>25</td>
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<tr>
<td>November 29</td>
<td>Animal, primate &amp; hominid evolution</td>
<td>34</td>
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<tr>
<td><strong>December 4 – 10</strong></td>
<td><strong>EXAM IV: SCHEDULE TBA</strong></td>
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**NOTE:** Students are expected to spend a minimum of two hours working on BIO111 materials outside of class for each hour of in-class time. This translates to approximately 6 hours of out-of-class work each week. Some assignments will take more time than this!
**Plagiarism:** The Chesapeake College Student Code of Conduct states:

"Academic Dishonesty includes, but is not limited to, the following:
1. Cheating on examinations.
2. Plagiarism, the representing of another’s ideas or writing as one’s own, including but not limited to:
   a. Presenting all or part of another person’s work as something one has written;
   b. Paraphrasing or summarizing another’s writing without proper acknowledgement;
   c. Representing another’s artistic or technical work or creation as one’s own.”

In this course, students will be doing a lot of typing, weaving their ideas and others’ ideas together into coherent arguments. WHEN IN DOUBT, CITE YOUR SOURCES.

*Bio111 will follow a “zero tolerance” policy for plagiarism, which is punishable by failure of the assignment/examination, or failure of the course. In extreme cases, students may be dismissed from the College for academic dishonesty.*

- The complete Academic Dishonesty policy can be found in the Chesapeake College Catalog.
- Standards for a “C” paper can also be found in that Catalog.

**IX. Attendance:** As stated in the Chesapeake College catalog, learning is facilitated with student involvement, interest and motivation and attendance. Therefore, students are expected to attend all classes and laboratories. In the event that a class is missed, it is the student’s responsibility to make up any missed work, as the student will be held responsible for all materials covered.

   **The student is responsible for all work, labs, assignments, and announcements whether present or not.**

   *Experience has shown that a student who misses more than four 75-minute classes will have an extremely difficult time passing Bio 111.*

All electronic devices (pagers, cell phones, PDAs, etc.) will be turned off during instructional times. Laptop computers may be an exception as long as they are actively used in the educational mission on a given day.

**Special Needs Students:** Student with special needs or disabilities who believe they may need accommodations in this class are encouraged to contact the ADA Coordinator at extension 5808 to arrange any needed accommodations.

**Academic Instruction Emergency Management Plan**

In the event that Chesapeake College needs to close for an extended period of time due to a flu pandemic, severe weather event, or other emergency situation, consideration will be given to the timing and duration of the closure as follows:

1. Closure during the semester for up to one week – there will be an opportunity to make up work missed without significant alteration to the semester calendar.

2. Closure extending beyond one week (or in situations where classes are cancelled on the same days/evenings over multiple weeks) – the College may extend the length of the semester. Depending on the timing of the closure, scheduled breaks, end of semester dates, and/or the processing of final grades might be impacted.

Students can acquire information about closures on the College website or by calling 410-822-5400 or 410-228-4360. Chesapeake College courses held at off campus sites will follow the protocol of the host facility.
# BIO 111: Laboratory Schedule

**Instructor:** S.W. Kapitan  
**Fall, 2012**

<table>
<thead>
<tr>
<th>Week #</th>
<th>Laboratory experiment</th>
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</thead>
<tbody>
<tr>
<td>1 (Aug 28)</td>
<td>#1,#2: Introduction: Safety; The Scientific Method; Metric Measurement</td>
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<tr>
<td>2 (Sept 4)</td>
<td>#2: Metric Measurement; Microscopy</td>
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<tr>
<td>3 (Sept 11)</td>
<td>#3: Chemical Composition of Cells</td>
</tr>
<tr>
<td>4 (Sept 18)</td>
<td>#5: <strong>Enzymes</strong></td>
</tr>
</tbody>
</table>
| 5 (Sept 25) | #4: Cell Structure and Function  
**(Lab Report Due)** |
| 6 (Oct 2) | #6: Photosynthesis |
| 7 (Oct 9) | Lab Practical I |
| 8 (Oct 16) | #8: Mitosis and Meiosis |
| 9 (Oct 23) | #10: Human Genetics |
| 10 (Oct 30) | #11: Molecular Genetics  
(Gel electrophoresis) |
| 11 (Nov 6) | Handouts: **Natural selection, Lethal gene** |
| 12 (Nov 13) | Handouts: DNA Extraction lab  
**(Lab Report Due)** |
| 13 (Nov 20) | #24: The Vertebrates: Kingdom Animalia dissections |
| 14 (Nov 27) | Lab Practical II |

* Labs must be read **before** coming to the lab. Be ready to start the lab promptly.

** Indicates laboratory report/s must be **Documented (Literature Cited)**. Handouts and Appendix A in the lab manual will provide the format for writing the report.

**PROPER ATTIRE IS MANDATORY TO BE ALLOWED IN THE LABORATORY:**
- LONG PANTS or DRESSES/SKIRTS
- CLOSED-TOED SHOES

**NO SHORTS OR FLIP-FLOPS ARE ALLOWED IN THE LABORATORY.**
**NO EATING OR DRINKING IS ALLOWED IN THE LABORATORY.**
X. **Selected Bibliography. GREAT BOOKS OF BIOLOGY: A chronological approach.**

The Origin of species, by Charles Darwin, 1859.
Voyage of the H.M.S. Beagle, by Charles Darwin, 1909.
Microbe Hunters, by Paul DeKruif, 1926.
What is Life?, by E. Schroedinger, 1956.
Silent Spring, by Rachel Carson, 1962.
The Two Cultures, by C.P. Snow, 1964.
Science and Human Values, by Jacob Bronowski, 1965.
The Sand County Almanac, by Aldo Leopold, 1968.
The Structure of Scientific Revolutions, by Thomas S. Kuhn, 1970.
Rosalind Franklin and DNA, by Anne Sayre, 1975.
Sociobiology, by E.O. Wilson, 1975.
Growth of Biological Thought, by Ernst Mayr, 1982.

Many human diseases or disorders have a genetic component, and we understand the genetic underpinning of some diseases quite well. Gene therapy is, conceptually, a potential route to treatments and ultimate cures for these diseases. However, gene therapy is an emerging discipline, and there is potential controversy about its application in human medicine.

Your task is to identify a medical condition that has a genetic cause or component, describe it thoroughly, and critically examine the possibility of using gene therapy to treat, and perhaps cure, the disease.

In a typed report (minimum 4 pages, or at least 1000 words), you should:

A. Describe the medical condition you chose, in a clear, comprehensive fashion. Deliver all of the information your reader will need to understand the condition at a semiprofessional level.
   1. Identify the medical condition you chose, and the genetic cause associated with it.
   2. Describe the history of its discovery, if possible.
   3. Describe the gene and its product(s):
      a. Describe what the gene does, assuming normal function.
      b. Describe the medically important mutation(s), and the effect(s) caused by the mutation(s).
   4. Outline treatments for those conditions, including treatments currently in use or in development.

B. Describe gene therapy:
   1. Develop a definition for gene therapy based upon at least three independent sources.
   2. Critically evaluate those sources for their clarity, precision, relevance, breadth, depth, significance, logic and fairness. Identify, if you can, the underlying assumptions made by those sources, and expose any bias you find.

C. Identify the potential for gene therapy to treat the disease or condition you chose.
   1. Assess the technological feasibility of the idea. Is the disease you chose a good target for gene therapy? Why, or why not?
      a. Clearly identify your own reasoning. Build your argument carefully, identify the assumptions you make, and lead your reader through the logic of your argument.

D. Take a stand: should gene therapy be considered as a treatment for this disease? Why or why not?
   a. What information supports your viewpoint? What information opposes it? Is that information fact, or opinion? What is the relevance of opinion and intuition in decisions like this?
   b. What questions, if any, need to be answered before gene therapy can (or should) be developed for this condition? Do those questions fit into the “observation” phase of the scientific process, or do they constitute testing hypotheses?
   c. Do you have any personal experience that helps shape your position?
   d. What information, if any, might change your position?

E. What are the implications of your recommendation? What does your recommendation mean for the population of patients affected by this disease or disorder?

Format:
- The essay should be, at minimum, four to five pages, or at least 1000 words.
- The essay should be typewritten, double spaced, in a font of reasonable size.
- You must include 5 recent references (no more than two years old) in your report. ONE of those references must be from the primary peer-reviewed literature.
- The critical essay should be supported by proper citations. Citation format should follow APA 6 format. Check with the Learning Resource Center for a sheet detailing APA format. Essays without citations will earn 0 points.

The essay should also include a title page. The title page should include:
- A title
- Your name
- The course number and section (BIO 111, Section ___),
- The date
- Word count (MS Word will do this for you! Look in the “Review” ribbon menu.)

ASSIGNMENTS SHOULD BE TURNED IN BY November 20, 2012.
Purpose: To gain a thorough working knowledge of a distinct plant problem important to horticulture or agronomy and to consider genetic modification approaches which might solve the problem.

Educational Objective: The objective of this assignment is to demonstrate the student’s ability to evaluate issues, think critically, communicate effectively, and argue persuasively.

In recent years, unique problems in agriculture have been addressed using genetic engineering. The use of genetic modification techniques to insert foreign DNA into the genome of existing plant species has been successful in addressing some problems while inadvertently causing others. Genetic engineering of plants is, conceptually, a potential route to solutions for both plant protection and agricultural product enhancement. However, genetic engineering remains an emerging discipline, and there is potential controversy concerning its application, both in developing and developed nations.

Your task is to identify a potential horticultural or agronomic problem or an improved horticultural or agronomic product, describe it thoroughly, and critically examine the possibility of using genetic engineering to produce an improved outcome.

In a typed report (minimum 4 pages, or at least 1000 words), you should:

F. Describe the crop and its problem or desired product in a clear, comprehensive fashion. Deliver all of the information your reader will need to understand its importance at a semiprofessional level.
   5. Identify the crop and the current level of understanding of its genetics.
   6. Describe the impact of the problem or the significance of an improved product for a crop.
   7. Locate and describe a gene from a separate organism which could potentially address the problem or improve the product.
      a. Describe what the gene does, assuming normal function, and the organism in which it is found.
   8. Outline a method for genetically modifying and producing the specific crop

G. Describe genetically modified organisms:
   3. Develop a definition for genetically modified organisms based upon at least three independent sources.
   4. Critically evaluate those sources for their clarity, precision, relevance, breadth, depth, significance, logic and fairness. Identify, if you can, the underlying assumptions made by those sources, and expose any bias you find.

H. Identify the potential for genetic engineering to address the problem or product you chose.
   2. Assess the technological feasibility of the idea. Is the problem or product you chose a good target for genetic engineering?
      Why, or why not?
      a. Clearly identify your own reasoning. Build your argument carefully, identify the assumptions you make, and lead your reader through the logic of your argument.

I. Take a stand: should genetic engineering be considered as a way to address the problem or improve the product?
   Why or why not?
   a. What information supports your viewpoint? What information opposes it? Is that information fact, or opinion? What is the relevance of opinion and intuition in decisions like this?
   b. What questions, if any, need to be answered before genetic modification can (or should) be developed for this crop?
      Do those questions fit into the “observation” phase of the scientific process, or do they constitute testing hypotheses?
   c. Do you have any personal experience that helps shape your position?
   d. What information, if any, might change your position?

E. What are the implications of your recommendation? What does your recommendation mean for people this genetically modified crop would impact? Consider current growers in both developed and developing nations, consumers of the product and the companies that undergo the research and development and own the patents.

Format:
- The essay should be, at minimum, four to five pages, or at least 1000 words.
- The essay should be typewritten, double spaced, in a font of reasonable size.
- You must include 5 recent references (no more than two years old) in your report. ONE of those references must be from the primary peer-reviewed literature.
- The critical essay should be supported by proper citations. Citation format should follow APA 6 format. Check with the Learning Resource Center for a sheet detailing APA format. Essays without citations will earn 0 points.

The essay should also include a title page. The title page should include:
- A title
- Your name
- The course number and section (BIO 111, Section ___),
- The date
- Word count (MS Word will do this for you! Look in the “Review” ribbon menu.)
Please sign the following and keep it for your records.

BIO 111, FALL 2012
INSTRUCTORS' NAME: SHELLY KAPITAN

This is to certify that I, ____________________________, have received a copy of the course outline and that it has been explained to me. I have read the outline and have agreed to the evaluation criteria as stated.

SIGNATURE: _____________________________ DATE: ___________

Student's Copy

Instructor's Copy, RETURN