

Biology 211
CELL BIOLOGY
The Department of Biological Sciences
The University of Mary Washington

Fall Semester, 2007

I. COURSE INSTRUCTOR & OFFICE HOURS

Stephen Gallik, Ph. D.
Professor of Biology
331 Jepson Science Center
(540) 654-1419
e-mail: sgallik@umw.edu

Office Hours:
M, W, F: 9:00 - 11:00 AM
all other times by appointment

II. COURSE MEETING TIMES

Lecture:	MWF, 8:00 - 8:50 AM, 100 Jepson Science Center
Lab:	Section 01 Tuesday, 9:30 - 12:15, 317 Jepson Science Center
	Section 02 Tuesday, 2:00 - 4:45, 317 Jepson Science Center
	Section 03 Wednesday, Noon - 2:50, 317 Jepson Science Center

III. GENERAL COURSE DESCRIPTION

Biology 211 is an introductory cell biology course designed for sophomore & junior-level students who have completed general biology and general chemistry. **The course is a lecture and laboratory-based course** that examines mechanisms of cellular function and the molecular and biochemical basis of those mechanisms. The lecture series consists of 42 lectures that cover the principles of cell function. **The laboratory exercise series consists of 10 experiments** that explore fundamental concepts of cell biology and biochemistry and provide students with experience in the use of basic techniques commonly employed in modern cell and molecular biology laboratories.

IV. PREREQUISITES

Course content demands an understanding of general biology and general chemistry. Therefore, Biology 121 and 122 and Chemistry 111 and 112, or their equivalents, are prerequisites for the course. **No exceptions will be made.**

V. REQUIRED TEXTS & MATERIALS

1. Becker, Kleinsmith, and Hardin. The World of the Cell. Sixth Edition. (with CD-ROM) Benjamin Cummings. San Francisco, 2006.
2. Becker. The Solutions Manual for The World of the Cell (Packaged with the text).
3. Gallik, S. A Manual of Laboratory Exercises in Cell Biology. Fifth Edition, 2006.
4. One Lab Notebook (Quad-ruled), 152 pages. Roaring Spring Paper Products (only in campus bookstore).

(While there is no explicit requirement for a calculator, there are situations in lab and on exams where a calculator is used. It is always suggested that science students carry calculators.)

VI. DISSEMINATION OF COURSE MATERIALS VIA BLACKBOARD®

This course utilizes the university's Blackboard® installation for the dissemination of course materials. The course will be listed on the Blackboard page of all enrolled students. To get to the login page for the university's Blackboard site, go to <http://blackboard6.umw.edu>. If you are enrolled in the course and do not see Biol 211 listed on your Blackboard page, please see the course instructor immediately.

While some course announcements will be posted on the course Blackboard page, some will not, and you cannot regard the course Blackboard page as a reliable source for all course announcements. **The only reliable source for course announcements is lecture. You are responsible for all course announcements and course materials distributed in lecture or lab whether you are in attendance or not.** Absence from lecture is not an excuse for missing important course announcements or handouts.

All lectures are presented in Microsoft Powerpoint®. An outline of each lecture will be posted in Adobe Portable Document Format® (PDF) on the course Blackboard page well in advance of each lecture, and **it is highly recommended that you print out each lecture's handout before the day of lecture so you are not tied-up in printing traffic right before class.** The Powerpoint presentation for each lecture will be posted soon after the lecture has been presented. To access the lecture slides and handouts via blackboard, you will need Adobe Reader® installed on your computer. If you do not have Adobe Reader installed, you can get a free download using the link on the course Blackboard page. If you live off campus and access blackboard via dial-up access, you might find download speeds for some of the lecture handouts to be slow, and you might find it preferable to print materials on-campus.

VII. ATTENDANCE POLICY

While attending lecture is not mandatory, there is no substitute for consistent lecture attendance. The lectures are designed to provide an insight and understanding that no textbook could provide. Repeatedly missing lecture will indicate a lack of commitment to the course or to the discipline in general and will result in the loss of any benefit-of-the-doubt concerning course performance. **You are responsible for all material covered in a lecture, including all announcements and handouts, whether you have attended lecture or not.**

Not having attended lecture is NO excuse for missing important announcements. One other thing, *if you come into lecture late, please find a seat in the back of the classroom.*

Laboratory attendance is absolutely mandatory. The single academic credit attributed to lab relies on your participation in lab, which depends on your attendance. If you do not attend a laboratory session, you are not permitted to enter the related material into your lab notebook, resulting in a 0 grade for that lab notebook grade. Because of the numbers of students and the exhaustive preparation that goes into each lab, make-up labs are very difficult to arrange. If you cannot make your laboratory session for a legitimate reason (see below), you must see Dr. Gallik at least three days before the lab section in question to arrange to attend another lab section that same week.

Labs can only be made-up if you have an official excuse (illness, death in the family, varsity sporting event for which you are a team member). The Honor Code of the University of Mary Washington applies to such excuses. There will be no make-up labs given for illnesses not treated by the university infirmary or a family physician (with note), family-related trips, or sleeping in.

VIII. EXAMINATIONS

Four examinations will be given at regular intervals throughout the semester. Each exam is worth 22% of the final grade. The exams are given during lab periods (the exam dates are indicated on the lab schedule).

Each exam will cover material covered in lecture, in lab, and in the required reading assignments and will consist of a variety of objective-style (multiple choice, matching, fill-in-the-blank, true/false, quantitative problems) and subjective-style (short essay) questions. Please allow one week for the exams to be graded. Exam results will be posted on Blackboard.

Exams can only be made-up if you have a legitimate excuse (illness, death in the family, varsity sporting event for which you are a team member). The Honor Code of the University of Mary Washington applies to such excuses. In those instances where a make-up exam is given, the time of that exam will be determined by the instructor. One might need to miss another scheduled class or appointment to complete the make-up exam. There will be no make-up exams given for undocumented illnesses not treated by the university infirmary, family-related trips, or for sleeping in. Cell phone use during the exam is strictly prohibited!

IX. LABORATORY

The **OLD way** of doing things:

Each student will keep a formal notebook of their laboratory activity, results and answers to all discussion questions. The notebook must be the required quad-ruled lab notebook listed under required course materials. The notebook entries will be graded by the lab instructor. The final notebook grade is 12% of the final course grade.

The course will use the following conventional lab manual:

Gallik, S. A Manual of Laboratory Exercises in Cell Biology. Fifth Edition, 2006.

The **NEW way** of doing things:

The laboratory portion of the course will employ a new on-line laboratory manual entitled Cell BiologyOLM. Organized as a conventional book, with introductory pages, chapters, and appendices, but designed to be used on-line at the laboratory bench, the manual presents to the student, page-by-page, all of the background information, instructions, media resources, database support and analytical tools needed to guide and manage the execution of 10 specific bench-top experiments in cell biology.

The CellBiologyOLM is part of a suite of on-line manuals entitled the BiologyOLS. You are urged to visit the BiologyOLS and survey its pages. However, please DO NOT create an account, DO NOT register with the manual, and DO NOT create a blog at this time. We will cover these things in our first lab session. If you wish to preview the site in advance of the first lab session, go to http://www.gallik.umw.edu/DLS/BiologyOLS_Gateway2.html .

X. GRADING

The final course grade will be determined by combining the exam grade with the lab grade in the following proportions:

4 Examinations	88%
Lab grade	12%

The following grading scale will be applied to the final grade:

93 - 100 %	A	77 - 79 %	C+
90 - 92 %	A-	70 - 76 %	C
87 - 89 %	B+	65 - 69 %	D+
83 - 86 %	B	55 - 64 %	D
80 - 82 %	B-	<55 %	F

The instructor reserves the right to curve the grading scale to meet the needs of the course.

XI. DISABILITY SERVICES

The Office of Disability Services has been designated by the University as the primary office to guide, counsel, and assist students with disabilities. If you receive services through that office and require accommodations for this class, please make an appointment with me as soon as possible to discuss your approved accommodation needs. Bring your accommodation letter with you to the appointment. I will hold any information you share with me in the strictest confidence unless you give me permission to do otherwise.

If you need accommodations (note taking assistance, extended time for tests, etc.), but have not yet documented your disability with Disability Services, please contact the Office of Disability Services at 540-654-1266.

XII. SUGGESTIONS FOR TAKING NOTES IN THIS COURSE

As you sit in lecture, you will find information coming to you from two places: visually from the powerpoint slides and orally from the instructor. You are responsible for all of it. You will likely have a copy of the handout in front of you (remember, the handouts are designed for you to print out and bring to each lecture). Therefore, you have most of the information already. What you will *not* have are any changes I have made to the powerpoint slides (expect a few) nor any important information I add orally. So do not just sit therein class, be prepared to take *additional* notes. Pay attention first and foremost to the instructor. I will present the information on each powerpoint slide in an orderly fashion (hopefully) - so allow me to guide you through the slide. As I do, take any additional notes you need to take in a supplemental notebook or in space available on the handout.

XIII. USE OF THE TEXT IN THIS COURSE

Required reading assignments from the text will be given frequently to supplement lecture. These required reading assignments should be treated as lecture material and be studied as thoroughly as the lecture notes. Suggested reading assignments will be offered from time to time. These suggested reading assignments are entirely optional. Otherwise, it is suggested, but not required, that students read along as the chapters in the book are covered in lecture. Relevant chapters are noted with each unit in the course lecture schedule. It would be extremely valuable to read ahead in preparation for lecture.

XIV. HOMEWORK QUESTIONS AND PROBLEMS

Specific questions and problems from the back of each chapter will often be suggested at lecture. These questions and problems are only suggestions and not required homework assignments. Some of the questions are designed to review some simple concepts, but other questions are designed to be thought provoking, with the answers designed to expand on things we covered in lecture. I recommend you try to answer all the questions and problems on your own. If you are stumped, or to check your work, you should look at the solutions manual. ***Tip: I usually put some of the homework questions or similar questions on the exams.***

XV. MISCELLANEOUS RULES

- 1) If you come in late to lecture, you MUST find a seat in the back of the room. Do not disturb us all by coming down front.
- 2) Eating is absolutely prohibited in lecture. Eat breakfast before or after lecture.
- 3) Computer use in lecture is permitted ONLY for taking course notes. You are not permitted to browse your e-mail or take care of other business while in the classroom!
- 4) If you use a computer to take notes in lecture, please sit in the back of the room so as not to disturb other students.
- 5) The use of a cell phone in class is strictly prohibited. Put your cell phone on vibrate (no ring) when you come into the classroom. If you need to receive a phone call while in class, quietly leave the room first, then answer the phone. You are never allowed to make a phone call from the classroom. Cell phone use during an exam is strictly prohibited.

XVI. THE UMW HONOR CODE

The UMW honor code is in effect at all times. As you study, I encourage you to discuss course material with other students. However, all examinations and assignments must be your work and only your work.

XVII. INSTRUCTOR'S BIOGRAPHY: STEPHEN GALLIK, PH. D.

I received my doctoral degree from the Pennsylvania State University in 1982 in Physiology. My dissertation research was a study of aortic endothelial cell histamine metabolism and permeability in diabetes mellitus. I then spent approximately 2 years at the University of Louisville School of Medicine as an Instructor, where I taught medical physiology to medical, dental and nursing students and completed research of the mammalian microcirculation. I then accepted a post-doctoral research position at the Columbia University College of Physicians and Surgeons, where I studied endothelial cell - white cell interaction. I was hired by Mary Washington College in 1987 at the rank of Assistant Professor to teach cell biology. I was promoted to the rank of Associate Professor in 1992 and to the rank of Professor in 2003. I regularly teach Biol 211 (Cell Biology), Biol 331 (Histology) and a new course in the biology and biochemistry of proteins. I supervise an active undergraduate research program involved in the study of water permeability through biological membranes. I am also involved in the development of instructional technology tools for teaching labs in the life sciences.

XVIII. STRIVING FOR SUCCESS IN THIS COURSE

Biology 211, Cell Biology, is a sophomore-level biology major's course, and all students in the course have completed one year of general biology and one year of general chemistry. The course is designed to build on the foundation established in general biology and general chemistry. You are expected to know the basic biology and chemistry covered in the general biology and chemistry courses and apply that knowledge in Biol 211. If your foundation in biology and chemistry is weak, you might find yourself having to work a little harder. Don't be afraid to go back to your introductory biology and chemistry texts to review concepts if needed.

To achieve success in this course, as well as any undergraduate biology course, you must understand and remember that you, the student, have the primary and ultimate responsibility for what you learn in this course. While the instructor is responsible for presenting an up-to-date body of course material in a clear, organized, interesting, and challenging manner, the student is responsible for learning that material. So be an active learner; one who recognizes that the responsibility for learning the material rests on the students' shoulders and is prepared to approach studies actively.

The standard of learning for any biology course, including this one, is NOT simply being *familiar* with the material. Familiarity may have been good enough in high school, but in college simple *familiarity* usually connotes failure, and simply memorizing the notes to achieve some level of familiarity with little understanding of the material will ensure a disappointing performance. The standard of learning for this course is genuine knowledge and understanding: you should strive to achieve a superior level of knowledge and understanding of the material.

What needs to be done to achieve a superior level of understanding often differs among students. One mistake many students make is to equate the amount of time spent studying with performance. Students who use the amount of time studying as a predictor of their performance fail to grasp that the endpoint of their effort is not how long they studied but how *effectively* they studied. While you might get some advice from other students, please recognize that particular study methods do not work for all.

The amount of new scientific facts about cell biology grows enormously every year. Therefore, cell biology courses traditionally cover large volumes of material. The large volume of material covered in this course often challenges students, so please keep up with the material. Study a given lecture and complete reading assignments before coming to the next lecture.

Finally, don't be afraid to ask questions. As you study, recognize what you do not understand, develop questions, and ask those questions. Moreover, do not wait to ask those questions at the very last minute before an exam. I encourage you to ask questions as you keep up with the material. Ask questions during lecture, after lecture, or in office hours. Don't be afraid to come see me during office hours to discuss what ever questions you have or problems you are having with the material.

TENTATIVE LECTURE SCHEDULE

(Numbers in parenthesis are text chapters that contain material covered in lecture)

Unit I. Introduction to the Design and Properties of Cells

1	Aug	27	Introduction to Cell Biology (Chapter 1).
2		29	Characteristics of Prokaryotic and Eukaryotic Cells (Chapter 4).
3		31	Bioenergetics, Chemical Equilibrium, and Free Energy (Ch. 5).

Unit II. Enzymes

4	Sep	03	Protein Nature of Enzymes (Chapter 3).
5		05	Thermodynamics & Kinetics of Enzyme Action (Chapter 6).
6		07	Characteristics of the Enzyme Active Site (Chapter 6).
7		10	Allosteric Regulation of Enzyme Activity (Chapter 6).
8		12	Protein Phosphorylation (Chapter 6).

Unit III. Membrane Structure and Biochemistry

9	Sep	14	Membrane Lipids (Chapter 7).
10		17	Membrane Fluidity (Chapter 7).
11		19	Membrane Proteins and Carbohydrates (Chapter 7).

Unit IV. Membrane Permeability and Transport.

12	Sep	21	Permeability Characteristics of the Lipid Bilayer (Chapter 8).
13		24	Carrier Protein Transport: Facilitated Diffusion (Chapter 8).
14		26	Carrier Protein Transport: Active Transport (Chapter 8).
15		28	Channel Protein Transport (Chapter 8).
16	Oct	01	Channel Protein Transport (Chapter 8).

Unit V. Biology and Biochemistry of Chemotrophic Energy Metabolism

17	Oct	03	Overview of Chemotrophic Energy Metabolism in the Cell (Ch. 10)
18		05	Cell Respiration 1: Oxidative Decarboxylation of Pyruvate (Ch. 10)
19		08	Cell Respiration 2: The Citric Acid Cycle (Ch. 10)
20		10	Cell Respiration 3: Mitochondrial Electron Transport (Ch. 10)
21		12	Cell Respiration 4: Chemiosmotic Mechanism (Ch. 10)
22		17	Glycolysis (Ch. 9)

Unit VI. Biology and Biochemistry of Photosynthesis

23	Oct	19	The Chloroplast / The Light-dependent Reactions (Chapter 11).
24		22	The Biology of Photosystems (Chapter 11).
25		24	The Chemiosmotic Mechanism of Photophosphorylation (Ch. 11)

Unit VII. Gene Expression in the Cytoplasm: Protein Synthesis, Folding and Sorting

26	Oct	26	Structure of the Nucleus (Chapter 18).
27		29	Messenger RNA and the Genetic Code (Chapters 21 & 22)
28		31	Transfer RNA, Ribosomal RNA and Ribosomes (Chapter 22)
29	Nov	02	General Mechanism of Translation (Chapter 22)
30		05	Post-Translational Processing in the Cytosol (Chapter 22)
31		07	Translation on the RER: Cotranslational Import (Chapter 22)
32		09	The Golgi Apparatus and the Secretory Pathway (Ch. 12)
33		12	The Biology of Vesicular Transport (Chapter 12)
34		14	Endocytosis (Chapter 12)

Unit VIII. The Molecular Basis of Cell Movement and Cell Adhesion

35	16	Intermediate Filament-based Cell Adhesion (Chapter 15) .
36	19	Microtubule-based Cell Movement (Chapters 15 & 16).
37	26	Microfilament-based Cell Movement (Chapters 15 & 16).

Unit IX. Intercellular Signaling

38	28	Intercellular Signaling I (Chapter 14) .
39	30	Intercellular Signaling II (Chapter 14) .
40	Dec 03	Intercellular Signaling III (Chapter 14) .

Unit X. The Cell Cycle

41	05	An Overview of the Cell Cycle (Chapter 19) .
42	07	Regulation of the Cell Cycle (Chapter 19) .

LABORATORY SCHEDULE

<u>Week of</u>	<u>Exercise</u>
Aug 27	Introduction to the Cell Biology Laboratory
Sep 03	Exercise #1. Pipetting and Spectrophotometry
Sep 10	Exercise #2. A Study of the Chemistry of Amino Acids Using Paper Chromatography.
Sep 17	Exercise #3. A Study of Enzyme Specificity: A Kinetic Analysis of Glucose Oxidase.
Sep 24	Exam #1
Oct 01	Exercise #4. The Kinetics of the Water Permeability Pathway of RedBlood Cells.
Oct 08	Exercise #5. Cell Fractionation: Isolation of Mammalian Red Cell Plasma Membranes Using Differential Centrifugation
Oct 22	Exam #2
Oct 29	Exercise #6. Cell Fractionation: Isolation of Rat Hepatocyte Nuclei Using Density Gradient Centrifugation
Nov 05	Exercise #7. Determination of Protein Composition of Mammalian Red Cell Plasma MembraneUsing SDS-PAGE.
Nov 12	Exam #3
Nov 26	Exercise #9. To be announced.
Dec 03	Exercise #10. To be announced.

There will be no labs the weeks of fall break and Thanksgiving.

The final exam will be given during the final exam period.