BIOC 452

Molecular Mechanisms of Metabolic Disorders

COURSE SYLLABUS Spring 2024

Course Introduction

Course Title: Molecular Mechanisms of Metabolic Disorders

Subject Code and Course Number: BIOC 452

Credit Hours: 3

Class Meets: Time: M/Thu 2-3:30 pm; Classroom: HSC-S G287

Prerequisite Courses

BIOC 235 Introduction to Molecular Medicine, Introduction to Biochemistry: either BIOC 339 or AGBI 410, or agreement from course coordinator.

Instructors

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Course Introduction

This course will cover diseases resulting from disorders of human metabolism and the molecular basis behind their symptoms and etiology. Students will gain in-depth knowledge of carbohydrate, lipid, and protein metabolism and the perturbations of metabolic pathways leading to some of the most common disorders: atherosclerosis and cardiovascular disease, Diabetes Mellitus, obesity, alcohol dependence. Inborn errors of metabolism leading to glycogen storage diseases, lysosome storage diseases, urea cycle defects will also be discussed. Emphasis will be put on modern approaches to treatment and prevention based on the latest knowledge about the molecular and cellular pathways involved in these diseases. Learning modalities will include didactic lectures along with group discussions, analysis of scientific publications, presentations, and other active learning approaches with a goal of developing critical thinking, teamwork and problem-solving skills. Physicians or industry experts on some of the covered diseases will be invited to provide clinical correlations.

Instructional Materials

Lectures will be delivered through Powerpoint and the files will be posted on the Health Sciences Center SOLE site. All additional materials required for class will also be posted on SOLE.

Textbook (optional): *Lieberman, Michael and Pete, Alisa. Marks' Basic Medical Biochemistry: A Clinical Approach. 6th Edition, Wolters Kluwer (LWW), 2022.*
This textbook, or equivalent, can be used in addition to the lecture files for the portion of course content related to biochemical and metabolic pathways.

Course Learning Outcomes

The Molecular Medicine Minor program outcomes are:

A. Explain the "big picture" concept of molecular medicine, both in terms of current use and future potential.

B. Explain how scientists deal with terabytes of genomic information to understand disease.

C. Apply a knowledge of molecular medicine to the etiology, diagnosis, prevention, and treatment of disease.

D. Analyze molecular mechanisms that are associated with aging and disease processes that are inter-related with human aging.

E. Demonstrate analytical skills and teamwork during real bench research in active laboratories.

These program learning outcomes are reflected in the course learning outcomes. Upon completion of this course, students will be able to:

1. Outline the main steps in the metabolism of fatty acids, proteins, and carbohydrates and the principles of their regulation. (A, C)
2. Identify the specific pathways which are disturbed in various metabolic diseases and link them to the disease symptoms and presentation. (A, C)
3. Compare and contrast modern approaches to treatment of inherited and acquired metabolic diseases (A, C).
4. Analyze scientific literature and experimental data on metabolic disorders (A, E).
5. Research, design, and deliver presentations on a topic related to metabolic diseases (E).

Assessment

Grading Criteria for Major Assignments/Assessments

Student performance in the course will be assessed using exams, quizzes, presentations and participation in class. There will be three exams, each covering material taught in the corresponding course module. The exams will be open book/open notes take-home type: students will have access to written information when answering exam questions. The exams will consist of 2-3 questions to which the students will provide essay-style answers, each approximately 0.5 - 1page long.

There will be ten quizzes in the course: three in modules 1 and 2 and four in module 3. The quizzes will be released on SOLE at the beginning of class and completed in class. Remote completion of a quiz will only be possible with prior agreement of the instructor. Students will be notified in advance of the quizzes' dates. The quiz with the lowest score will be dropped from calculation of the final grade.

Students are expected to contribute to class discussion when reviewing the learning material and/or relevant manuscripts and video recordings. Reading materials and research questions will be assigned occasionally prior to class and will be provided on SOLE. Participation in discussions will be graded at the end of each block using the rubric below:

Criteria	Needs Improvement	Satisfactory	Good	Excellent
Frequency and quality of participation	Needs prompting to participate, not engaged, answers show minimal effort.	Participates occasionally, provides comments related to the discussion, asks questions.	Participates often, asks relevant questions, provides answers and examples for clarification.	Participates often, able to answer questions and make connections between ideas, prompts further discussion and expands the understanding of all participants.
Command of material	Shows gaps in knowledge.	Displays good grasp of the material discussed.	Demonstrates mastery of the material, able to summarize the material and connect ideas.	Statements, questions and opinions show in-depth understanding of key concepts and provide insight and perspective.

The students will complete three projects, one in each module of the course. The projects will involve research on a topic assigned by the module instructor and preparing and delivering a 10-15 min Powerpoint presentation. The presentation will be graded based on the rubric below:

Criteria	Needs Improvement	Satisfactory	Excellent
Subject knowledge	Limited understanding of the material discussed.	Mastery of the key concepts of the discussed material and ability to make connections between them.	In-depth knowledge of the material, ability to integrate knowledge, suggestion of alternative explanations or perspectives on an issue.
Quality of presentation	Slides have key details missing or irrelevant information.	Slides have appropriate	Slides are logically arranged, illustrate key points, are easy to

		information and are well organized.	follow, and prompt discussion.
Supporting materials	Insufficient sources or sources with poor validity.	Sources were sufficient and reputable.	Sources provided different viewpoints and broadened the understanding of the topic discussed.

Weight/Distribution of Course Points

Final grades will be determined from the percentage of possible points earned by the students throughout the semester. The 3 exams will account for 50% of total points. 25% of total points will be derived from grades on the presentations and the remaining 25 % of the points will be based upon quizzes and student participation in group discussions in class.

	Points
Block exams (3 x 50 points)	150
Presentations (3 x 25 points)	75
Discussion participation (3 x 10 points)	30
Quizzes (9 x 5 points)	45
Total points	**300**

Mid-Semester Grade

Mid-semester grades will be reported based upon performance on the first block exam, one presentation, discussion grade for the first module, and four quizzes, and will represent about 30% of total points available.

Final Grading Scale

Final grades will be assigned using the following general scale for percentage of total points:

Letter grade	Percent of Total points	Points
A	100-90%	270 and above
B	89-80%	240 – 269
C	79-70%	210 – 268
D	69-55%	165 – 267
F	<55%	Below 165

Final grades may deviate slightly from the scale above but the cutoffs will never be higher than the numbers indicated in the table.

Tips to assure success in this course

Students will be expected to read course materials, manuscripts, or watch videos prior to some of the classes. Getting familiar with the assignments will make discussion in class easier. Students are expected to contact the instructors in the class with any question or concern about the material taught or the manner in which the class is conducted – by email or in person. Students are also encouraged to communicate with their peers and classmates when they don't understand a specific concept or topic, to ask for peer input on their presentations, or just to study together, when feasible. Taking notes in class will help the majority of students and is also highly encouraged although not required for grading.

Course and Institutional Policies

Attendance Policy

Students are expected to attend classes. Absences without legitimate reason will result in decrease of the participation grade and 0 points on quizzes. Students with a legitimate reason to miss a class should inform the instructors in advance and work with them to make up the assignments.

Late Assignment and Missed Exam Policy

Block exams will be open book take home exams which need to be completed in a certain timeframe. Rescheduling or extra time for completion will be given only for legitimate reasons. Students who miss class will only be able to make up a quiz if they have informed the instructor about the absence in advance. The projects will be presented in class and there will be no possibility for makeup. Students who have a legitimate reason to miss the class presentation will have the possibility to complete an additional assignment for extra credit. Assignments missed without informing the instructor about the absence in advance or with no legitimate reason will result in 0 points or decrease in the participation grade for the respective module.

Inclusivity Statement

The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in your classes, please advise your instructors and make appropriate arrangements with the Office of Accessibility Services.

More information is available at the Division of Diversity, Equity, and Inclusion website as well.

Academic Integrity Statement

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, instructors will enforce rigorous standards of academic integrity in all aspects and assignments of their courses. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the West Virginia University Academic Standards Policy. Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see your instructor before the assignment is due to discuss the matter.

Mental Health Statement

Mental health concerns or stressful events can adversely affect your academic performance, social relationships and quality of life. WVU's BeWell office offers free, confidential counseling services to assist you with addressing these and other concerns that you may be experiencing. You can schedule an appointment in the HSC BeWell clinic by calling 304-293-1292 or 304-293-1353. You can also email the BeWell Coordinator, Layne Hitchcock, at layne.kehl@mail.wvu.edu or request an appointment online at health.wvu.edu/bewell.
BeWell is an extension of the Carruth Center for Counseling and Psychological Services, and you can learn more about mental health resources on their website at carruth.wvu.edu.
If you are in need of crisis services, call the Carruth Center's main number 24/7: (304) 293-4431. You can also text WVU to 741741.

A longer version of this optional statement is available for reference.

Tentative Schedule

The schedule is subject to change due to unforeseen circumstances (inclement weather, public health related events etc).

BIOC452 Molecular Mechanisms of Metabolic Disorders
Spring 2024, Mon/Thu 2-3:30

Date	Topic
	Module 1, Andrew Shiemke
1/8/2024	Introduction To Metabolism & Bioenergetics
1/11/2024	Enzyme Kinetics & Regulation
1/15/2024	Martin Luther King Day - No Class
1/18/2024	Signal Transduction in Metabolism
1/22/2024	Mitochondrial structure & Function
1/25/2024	Mitochondrial Diseases
2/1/2024	Lipid Metabolism
2/5/2024	Atherosclerosis
2/8/2024	Clinical Correlation: Atherosclerosis
	Exam 1
	Module 2, Bradley Webb
2/12/2024	Lysosomal Storage Diseases I
2/15/2024	Lysosomal Storage Diseases II
2/19/2024	Role of pH in Cell Physiology and Pathophysiology I
2/22/2024	Role of pH in Cell Physiology and Pathophysiology II and Review I
2/26/2024	Glycogen Storage Diseases I
2/29/2024	Glycogen Storage Diseases II
3/4/2024	Fructose Metabolism
3/7/2024	Pentose Phosphate Pathway and Review II
3/11/2024	Spring Break
3/14/2024	Spring Break
	Exam 2
	Module 3, Marieta Gencheva
3/18/2024	Diabetes Mellitus - Molecular Mechanisms
3/21/2024	Diabetes Mellitus - Strategies for Treatment and Prevention I
3/25/2024	Diabetes Mellitus - Strategies for Treatment and Prevention II
3/28/2024	Obesity - Molecular Mechanisms
4/1/2024	Obesity - Interventions/Review I
4/4/2024	Diseases of Amino Acid Metabolism I
4/8/2024	Diseases of Amino Acid Metabolism II
4/11/2024	Alcohol Dependence - Molecular Mechanisms
4/15/2024	Alcohol Dependence - Disease Manifestations and Interventions
4/18/2024	Principles of Gene Therapies and Stem Cell Therapies. Recombinant protein Production
4/22/2024	Review Module 3
4/25/2024	No class
4/26/2024	No class (Last day of classes)
	Exam 3