**BMM 452**

**Molecular Mechanisms of Metabolic Disorders**

**COURSE SYLLABUS Spring 2025**

**Course Introduction**

**Course Title**: Molecular Mechanisms of Metabolic Disorders

**Subject Code and Course Number**: BMM 452

**Credit Hours**: 3

**Class Meets**: Time: W/Fri 1:30 - 3:00 pm; Classroom: Erma Byrd 1st floor conference room (BMRFH 101)

**Prerequisite Courses**

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

**Instructors**

Vazhaikkurichi Rajendran, PhD

Professor

Department of Biochemistry and Molecular Medicine

HSC-N, Rm 3146

Phone: 293-0510

Email: [vazhaikkurichi.rajendran@hsc.wvu.edu](mailto:vazhaikkurichi.rajendran@hsc.wvu.edu)

Bradley Webb, PhD

Assistant Professor

Department of Biochemistry and Molecular Medicine

HSC-N, Rm 3121A

Phone: 293 – 6615

Email: [bradley.webb@hsc.wvu.edu](mailto:bradley.webb@hsc.wvu.edu)

Marieta Gencheva, PhD (Course coordinator)

Teaching Assistant Professor

Department of Biochemistry and Molecular Medicine

HSC-N, Rm 3132B

Phone: 293 – 0738

Email: [mgencheva@hsc.wvu.edu](mailto:mgencheva@hsc.wvu.edu)

[mgencheva@mix.wvu.edu](mailto:mgencheva@mix.wvu.edu)

Office Hours: By appointment with individual instructors

**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. The classes 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 for the course. 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 held in class and will be “open notes” exams: students will have access to two pages of notes when answering exam questions. The exams will include a mix of multiple choice and short-answer questions and will require a Lockdown browser.

There will be six quizzes in the course: two in each of the three modules. 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.

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 group presentations, 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 presentations 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 information and are well organized. | Slides are logically arranged, illustrate key points, are easy to 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 40% of total points. 30% of total points will be derived from grades on the presentations and the remaining 30 % of the points will be based upon quizzes and student participation in group discussions in class.

Points

Block exams (3 x 40 points) 120

Presentations (3 x 30 points) 90

Discussion participation (3 x 10 points) 30

Quizzes (6 x 10 points) 60

**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 three 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 completed in class 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 at the discretion of the instructor and 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](http://accessibilityservices.wvu.edu/).

More information is available at the [Division of Diversity, Equity, and Inclusion](http://diversity.wvu.edu/) 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](http://catalog.wvu.edu/undergraduate/coursecreditstermsclassification/). 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](mailto:layne.kehl@mail.wvu.edu) or request an appointment online at [health.wvu.edu/bewell](https://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](https://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](https://tlcommons.wvu.edu/syllabus-policies-and-statements/mental-health-statement-hsc-campus) is available for reference.

**Tentative Schedule**

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

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|  | **BMM 452 Molecular Mechanisms of Metabolic Disorders** |
|  | **Spring 2025, Wed/Fri 1:30-3:00 pm, HSC Erma Byrd 101** |
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|  | **Module 1, Vazhaikkurichi Rajendran** |
| 1/15/2025 | Protein and Amino Acid Metabolism |
| 1/17/2025 | Defective Amino Acid Metabolism and Disease |
| 1/22/2025 | Signal Transduction |
| 1/24/2025 | Mitochondria Structure |
| 1/29/2025 | Mitochondria Diseases |
| 1/31/2025 | Lipid Metabolism |
| 2/5/2025 | Atherosclerosis |
| 2/7/2025 | Clinical Correlation of Atherosclerosis |
| 2/12/2025 | Exam 1 |
|  | **Module 2, Bradley Webb** |
| 2/14/2025 | Lysosomal Storage Diseases I |
| 2/19/2025 | Lysosomal Storage Diseases II |
| 2/21/2025 | Role of pH in Cell Physiology and Pathophysiology I |
| 2/26/2025 | Role of pH in Cell Physiology and Pathophysiology II and Review I |
| 2/28/2025 | Glycogen Storage Diseases I - class presentations |
| 3/5/2025 | Glycogen Storage Diseases II - class presentations |
| 3/7/2025 | Glucose and Fructose Metabolism |
| 3/12/2025 | Review II |
| 3/14/2025 | Exam 2 |
|  | **Module 3, Marieta** **Gencheva** |
| 3/19/2025 | Spring Break |
| 3/21/2025 | Spring Break |
| 3/26/2025 | Diabetes Mellitus - Signaling Pathways and Disease Manifestation |
| 3/28/2025 | Diabetes Mellitus - Mechanisms of Insulin Resistance and beta-Cell Failure |
| 4/2/2025 | Diabetes Mellitus - Strategies for Treatment and Prevention |
| 4/4/2025 | Obesity - Molecular Mechanisms |
| 4/9/2025 | Obesity - Interventions. Presentations I |
| 4/11/2025 | Obesity - Interventions. Presentations II |
| 4/16/2025 | Alcohol Dependence - Molecular Mechanisms |
| 4/18/2025 | Alcohol Dependence - Disease Manifestations and Interventions |
| 4/23/2025 | Vitamins I |
| 4/25/2025 | Vitamins II |
| 4/30/2025 | Exam 3 |
| 5/2/2025 | Last day of Classes |
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