**Metabolic Systems**

**COURSE OUTLINE**

**Fall 2018**

|  |  |
| --- | --- |
| Course Number  Course Title | IST 441 101 CRN 2612  BSC 481 101 CRN:4679  Metabolic Systems |
| Semester/Year  Credit hours | Fall 2018  3 |
| Days/Time | M,W and F 1:00 pm-1:50 pm |
| Location | M,W WAEC Rm 1203 |
| Instructor | Menashi Cohenford, BSc., MT, Ph. D |
| Office | BBSC Room 241 H |
| Phone | 304-696-2697 |
| E-Mail | [Cohenford@marshall.edu](mailto:Cohenford@marshall.edu) |
| \*Office/Hours | To be announced in class |
| University Policies | By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to [www.marshall.edu/academic-affairs](http://www.marshall.edu/academic-affairs) and clicking on “Marshall University Policies.” Or, you can access the policies directly by going to <http://www.marshall.edu/academic-affairs/?page_id=802> Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment. |

**\***Or by appointments.

**Course Description: Course Description:** Most metabolic pathways can be classified as either anabolic or catabolic. Catabolic pathways are degradative and cause the breakdown of complex compounds such as carbohydrates, lipids and amino acids to simple molecules, for example, CO2, H20 and NH3. Anabolic pathways are synthetic and form complex products from simple precursors such as glucose to form glycogen. This course provides an overview of major metabolic pathways, their interrelationships and controls involved in the anabolism and catabolism of carbohydrates, lipids (fatty acids) and amino acids. It also focuses on enzyme function and kinetics and on certain inborn errors of metabolism where specific deficiencies or defects in enzymes contribute to serious diseases.

**Prerequisites**: BSC 121 or 250 or CHM 212 or IST 340 or consent of instructor.

**Required Texts and Materials:**

Biochemistry Lippincott’s Illustrated Reviews 7th  Edition (2017) **ISBN**-10:1496344499

* Supplemental materials are contained within the Blackboard Learn environment (<http://www.marshall.edu/muonline/>).

**Recommended Texts/Reading Materials:**

* Biochemistry ‘The Molecular Basis of Life’ Fifth Edition Oxford University Press, by Trudy McKee, James R. McKee

ISBN 978-0-19-973084-1

**Grading Policy and Grading System:**

Your grade will be calculated as follows:

Exam 1: 20% Exam II: 20%

Exam III 20% Quizzes: 20%

Project 20%

Total 100%

Your final grade in the class will be measured as follows:

A: 90-100

B: 80-89

C: 70-79

D: 60-70

F: Below 60

**Exams:** The exams will focus on the materials presented in class. All lectures will be in PowerPoint format. Each exam will be based on multiple choice questions and descriptive essays. These essays may at times be thought provoking and require you to apply learned concepts in simulated situations. *There will be no final exam for the course.*

**Quizzes:** Following each main topic, there will be a quiz. The quiz dates will be announced to allow for adequate preparation. The quizzes may vary in format and may include both multiple choice and short answer questions.

**Make-up Exams/Quizzes and Penalty***:* Make-up exams/quizzes will be granted only in cases recognized by the University through an excused absence. Students without a valid excuse will receive an F (zero) for an exam and or a quiz.

**Project:** Each student will be assigned a research topic for presentation in class. The date for each presentation will be announced in advance to allow for adequate preparation. Each presentation must **not be less than 35 min** and **must not exceed 40 min.** In addition, each student must submit a written report about his/her presentation. The format for the written report will be discussed in class. Failure to submit the written report will result in a grade of an **F** (Zero total points) for the project.

**Attendance Policy:** Student attendance and participation will be required. Punctual attendance to lectures will be considered in the final grade. For example, if a student with a 68 average has a full attendance record and has actively participated, that student may receive a grade of C for the course.

**Other Policies:** The use of cell phones is prohibited in class. Any student using a cell phone will be asked to leave the lecture hall.

|  |  |  |
| --- | --- | --- |
| **Course Student Learning Outcomes** | **How Practiced in this Course** | **How Assessed in this Course** |
| Students will gain an understanding of:   * Bioenergetics * Chemistry and Structure of Amino Acids. * Chemistry and Reactions of Carbohydrates. * Metabolic Pathways such as Glycolysis, Gluconeogenesis, Glycogen Synthesis and Breakdown, Pentose Pathway &   the Metabolism of monosaccharides and disaccharides.   * Emphasized also will be the role and function of the TCA Cycle, Metabolism of Amino Acids, the Urea Cycle,   Lipids, the regulation of gene expression, and the role and function of enzymes in biological systems. | In-class lectures, discussions, video clippings (or DVDs) and reading materials provided by instructor. | Announced quizzes, and Exams  **Exam I covers:**    Amino Acids, Bioenergetics, Amino Acid Disposal of Nitrogen, Amino Acid Degradation, & Carbohydrate Chemistry and Reactions    **Exam II covers:**  Glycolysis, Gluconeogenesis, Pentose Pathway, Glycogen Synthesis and Breakdown, metabolism of monosaccharides & disaccharide, and the TCA Cycle.  **Exam III covers:**  Amino acid degradation, the Urea Cycle,  Enzymes and the Regulation of Gene Expression  instructor’s PowerPoint presentations and instructor’s recommended reading materials. |

**†Course Schedule**

|  |  |
| --- | --- |
| August 20tht  August 22nd  August 24 | Overview of Course  PPT Bioenergetics  PPT Amino Acids and Properties |
| **Week 1** | Recommended Reading Materials: Biochemistry 7th Edition Lippincott’s Reviews Chapters entitled “Amino Acids” and “Bioenergetics and Oxidative Phosphorylation”. |
| Aug 27th    Aug 29th  Aug 31st  **Week 2** | PPT: Amino Acids and Properties (Cont.)  PPT: Amino Acids Disposal of Nitrogen  PPT: Amino Acid Degradation Part 1  PPT:Amino Acid Degradation Part 1 (Cont.)  PPT: Review of Carbohydrates Part 1  Recommended Reading Materials: Biochemistry 7th Edition Lippincott’s Reviews Chapters entitled “Amino Acids”, “Bioenergetics and Oxidative Phosphorylation”, “Amino Acids: Disposal of Nitrogen” and “ Amino Acids Degradation and Synthesis”.. |
| **September 3rd** | **Labor Day Holiday** |
| Sep 5th  Sept 5th  Sept 7th  **Week 3** | **Quiz 1: Amino Acids, Bioenergetics, Amino Acid Disposal of Nitrogen** **and Amino Acid Degradation**  PPTs: Carbohydrates Part 1 (Cont.)  PPTs: Carbohydrates Part II  PPT**:** Carbohydrates Part II (Cont.)  PPT: Carbohydrates Part III  Recommended Reading: Biochemistry 7thth Edition Lippincott’s Reviews Chapter entitled “ Introduction to Carbohydrates” |
| Sept 10th  Sept 12th.  Sept 14th  **Week 4** | PPT: Carbohydrates Part III (Cont.)  PPT: Carbohydrates Part III (Cont.)  PPT: An Overview of Glycolysis  PPT: An Overview of Glycolysis  Recommended Reading: Biochemistry 7thth Edition Lippincott’s Reviews Chapter entitled “Glycolysis” |
| Sept 17  Sept 19    Sept 21  **Week 5** | **Exam 1: Amino Acids, Bioenergetics, Amino Acid Disposal of Nitrogen**, **Amino Acid Degradation, Carbohydrates (I, II and III)**  PPT: Gluconeogenesis  PPT: Gluconeogenesis  PPT: Pentose Pathway  Recommended Reading Materials: Biochemistry7th Edition Lippincott’s Reviews Chapters entitled “Gluconeogenesis” and “”Pentose Phosphate Pathway and NADPH” |
| Sept 24  Sept 26  Sept 28  **Week 6** | PPT: An Overview of Pentose Pathway (Cont.)  PPTs: An Overview of Glycogen Synthesis and Breakdown  PPTs: An Overview of Glycogen Synthesis and Breakdown (Cont.)  **Quiz #2**  **PPTs: Glycolysis, Gluconeogenesis, and Pentose Pathway**  Recommended Reading Materials: Biochemistry 7th Edition Lippincott’s Reviews Chapter entitled “The Pentose Pathway and NADPH” and ‘Glycogen Metabolism’. |
| October 1st  Oct 3rd  Oct 5th  **Week 7** | PPT: An Overview of Glycogen Synthesis and Breakdown (Cont.)  PPTs: Metabolism of Monosaccharides and Disaccharide  PPTs: Metabolism of Monosaccharides and Disaccharide  (Cont.)  PPT: The TCA Cycle (41)  PPT: The TCA Cycle  Recommended Reading Materials: Biochemistry 7th Edition Lippincott’s Reviews Chapters entitled “Glycogen Metabolism’, “Metabolism of Monosaccharides and Disaccharides” and “Tricarboxylic Acid Cycle”. |
| October 8th    Oct 10th  Oct 12th  **Week 8** | **Quiz 3: An Overview of Glycogen Synthesis and Breakdown, Metabolism of Monosaccharides and Disaccharide, and the TCA Cycle**  PPT: Amino Acid Degradation Part II  PPT: Amino Acid Degradation Part III  Recommended Reading Materials: Biochemistry 7th Edition Lippincott’s Reviews Chapters entitled “Amino Acid Disposal of Nitrogen”, “Amino Acid Degradation and Synthesis” and “Conversion of Amino Acids to Specialized Products”. |
| October 15th    Oct 17th  Oct 19th  **Week 9** | **Exam II: Glycolysis, Gluconeogenesis, Pentose Pathway, An Overview of Glycogen Synthesis and Breakdown, Metabolism of Monosaccharides & Disaccharide, and the TCA Cycle**  PPT: The Urea Cycle  PPT: The Urea Cycle (Cont)  PPT: Enzymes Part I  Recommended Reading Materials: Biochemistry 7th Edition Lippincott’s Reviews Chapter entitled “Amino Acids Disposal of Nitrogen” and “Enzymes”. |
| Oct 22nd  Oct 24th  Oct 26th  Week 10 | PPT: Enzymes Part I (Cont.)  PPT: Enzymes Part II  PPT: Enzymes Part II (Cont.)  PPT: Enzymes Part II (Cont.)  **Quiz 4: Amino Acid Degradation Part II, Part III and the Urea Cycle** |
| Oct 29    Oct 31st  Nov 2nd  Week 11 | PPT: Lipids  PPT: Lipids  **Quiz 5: Enzymes** |
| Nov 5th  Nov 7th  Nov 9th  **Week 12** | **Student Project Presentations**  **Student Project Presentations**  **Student Project Presentations** |
| Nov 12th-  Nov 14th    Nov 16th  **Week 13** | Video Film Extraordinary Measures: “ Pompeii’s Disease”  Video: Lorenzo’s Oil “Adrenoleukodystrophy”  PPT: Regulation of Gene Expression PT1  Recommended Reading Materials: Biochemistry 7th Edition Lippincott’s Reviews Chapter entitled “Regulation of Gene Expression” |
| **Nov 20th-Nov 24**  **Week 14**  Nov 26th  Nov 28th  Nov 30th  **Week 15** | **THANKS GIVING HOLIDAY**  **PPT: Regulation of Gene Expression**  **PPT: Regulation of Gene Expression**  **PPT; Regulation of Gene Expression**  Recommended Reading Materials: Biochemistry 7th Edition Lippincott’s Reviews Chapter entitled “Regulation of Gene Expression” |
| **Dec 3rd**  **Dec 5th**  **Dead Weak**  **Dec 7th** | **Exam III:**  Amino Acid Degradation Part II, Part III and the Urea Cycle  Enzymes and Regulation of Gene Expression  Review of Exam III  **Last Day of Class** |

**‡** The above course schedule is presented as a guide only and may be changed at any time by the instructor.