Biochemistry 385 – Metabolic Biochemistry
UA Online and iCourse – Winter 2018

Description of the Course
Fundamentals of metabolism at the cellular and organismal levels, with a focus on regulatory mechanisms that control metabolic flux. Topics include metabolic flux through energy converting pathways, metabolism of carbohydrates, lipids, amino acids, and nucleotides. This course is designed for undergraduate students with majors in any of the Life Sciences and other pre-professional health science students, many of whom are working towards a Biochemistry minor. Bioc 385 is the companion course to Bioc 384 "Foundations in Biochemistry." Note that since the same textbook is used for both courses, it is possible to take them out of sequence if necessary by referring to material in the book.

Bioc 384/385 Course Prerequisites: MCB 181R, CHEM 152, and CHEM 241A or equivalents.

Course Objectives:
Students will be able to:
1. Describe the meaning of metabolic flux and have foundational understanding of metabolic regulation.
2. Describe carbohydrate degradation/biosynthetic pathways and regulation of carbohydrate metabolism.
3. Describe lipid degradation and biosynthetic pathways and regulation of lipid metabolism..
4. Describe amino acid degradation and biosynthetic pathways and regulation of amino acid metabolism.
5. Describe nucleotide degradation and biosynthetic pathways and regulation of nucleotide metabolism.
6. Describe the relationship between metabolic pathways and physiological responses to hormones.
7. Describe the structure-function relationships of DNA, RNA, and protein modifying proteins.

Course web site on D2L
Information about lectures, homework, exams, grades, supplemental reading and all other aspects of this course will be available on the D2L course web site. The information contained in this course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructors. Any changes will be announced on the course web site. It is the responsibility of each student to check the course web site at least weekly.

Instructor
Dr. Miesfeld: rlm@email.arizona.edu

Course Materials
Required Textbook: **Miesfeld & McEvoy *Biochemistry*** (Norton, Pub., ISBN: 978-0-393-61402-2) is made available as an E-book with all e-media ancillaries, including the required online graded homework (SmartWork5) to all students at a discount and charged to your bursars account (~$95) after an "opt out" deadline has passed – *you must actively choose to opt out.* If you already have the 360 day E-book license you are good to go. If you have a print copy, you will still need the SmartWork online homework. Note that this textbook was chosen because it was specifically developed for non-biochemistry majors with an interest in the health professions or environmental studies in the life sciences. Any royalties in excess of $500 that are received by RLM from textbook sales to UA students in this class will be donated to the College of Science Galileo Circle for the awarding of undergraduate student scholarships: https://cos.arizona.edu/content/galileo-circle-scholars

Accessibility and Accommodations
It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact Disability Resources (520-621-3268) to establish reasonable accommodations. Contact DRC and instructions are given at the following website: http://drc.arizona.edu

University Policy against Discrimination and Harassment
The University has policies against discrimination and harassment. The policies are outlined on the website. http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Student Assessment
The exams will be monitored by Examity http://odltools.arizona.edu/examity-students using Level 3, which is live proctoring with required pre-scheduled exam times. The special instructions are:

1) handheld or online **calculator is allowed**
2) **drink on desk is allowed**
3) student **may use a small whiteboard for scratch notes** and calculations, but it *must be erased* at the end of the exam
4) students **may have a copy of the first page of the exam** with formulas and diagrams but *must not have any writing on it in front or back, nor can anything be written on it during the exam*
5) the student **MUST have a handheld mirror with them at the beginning of the exam** and use it to reflect the laptop/computer screen and keyboard during authentication to ensure there are no notes attached to the computer.

Examity live proctoring for all exams is paid for by the required $50 online fee. There will be **4 Midterm Exams** worth 150 points each and a **Cumulative Final Exam** worth 150 pts. The Final Exam is based on a large set of multiple choice review questions taken from the Norton Publishing Test Bank that will be posted on the D2L website in the Quiz menu with unlimited attempts and answers provided. These review questions will be available as a study guide *in advance* of the Final Exam. Only four exam scores will be used in the final grade, giving total exam points of 600 pts. There will be **12 Homework Assignments** (access through D2L Quizzes tab) worth 10 pts each to give a total of 120 pts. In addition, there will be **24 SmartWork (SW) Quizzes** (access through SW link on Content tab) each worth 5 points for a total of 120 pts. Lastly, there are **12 Discussion Assignments** (access through the Discussion tab) worth 10 pts each to give a total of 120 pts. The format for the Discussions consists of answering all of the instructor questions, pose a follow-up question of your own to one of the instructor questions, and then choose one of your peer's follow-up questions and describe why you think it is a good question. This is a **total of *960 pts*** in the course. **Extra credit** of up to 35 pts. is available.

Guaranteed grade cutoffs for total points *(some adjustment downward in the cutoffs may occur)*:
864 total pts. (90%) for an "A" grade
768 total pts. (80%) for a "B" grade
624 total pts. (65%) for a "C" grade
480 total pts. (50%) for a "D" grade
<480 total pts. (<50 %) for a "E" grade

A grade of Incomplete can only be obtained at the end of the semester, when all but a minor portion of the course work has been satisfactorily completed. Consult the UA General Catalog for information.

Make-Up Exam Policy
Students who know in advance that they will be unable to take an examination must contact the instructor to *request* an alternate time to take the exam. In the case of an emergency during the window time of the exam, the student must contact the instructor by email or phone *before* the exam begins. Proof of the problem, such as a note from a physician, is required in order to take a make-up exam.

University Code of Conduct and the Code of Academic Integrity
The Dean of Students' office provides you with a link to a comprehensive index of important University policies and procedures:http://deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity
All students in this class have to follow the University Code of Conduct and the Code of Academic Integrity. Any violations will be reported to the Dean of Student's Office.

Readings in the Biochemical Sciences - Extra Credit (EC1 and EC2) Opportunity
Outside reading of two biochemistry papers found under the Assignments tab in D2L are worth *15 points each* in the form of bonus points for 30 pts. extra credit. Scoring is as follows: 15 pts. for a paper that is well-written and answers all questions fully, 12 pts. for basic answers but with some misconceptions, 8 pts for incomplete answers, 4 pts for minimal effort and/or failure to demonstrate understanding, and 0 pts. for exceeding threshold match using TurnItIn.com plagiarism software. These ~2 page EC papers are to be turned in **by 11:00pm on the day of the deadline**. *No assignments will be accepted by email to the instructor or TA before or after the deadline. All files uploaded to D2L Dropbox MUST be in MS Word format (.doc or .docx), if the uploaded file is not readable by TurnItIn.com, it will be scored as zero*. In addition, 5 points of extra credit will be given to everyone if 50% of the students complete the TCEs.

Confidentiality of Student Records http://www.registrar.arizona.edu/ferpa/default.htm

The information contained in this course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by this instructor.

Module	Unit	Topic	Textbook Sections	*Smartwork Quizzes*
1	1	*Review of Bioenergetics in Metabolism*	*Sections 2.1, 9.1*	*SW1*
	2	*Review of Enzyme Function and Regulation*	*Sections 7.1, 7.5*	*SW2*
	3	*Plants Harvest Energy from the Sun*	*Section 12.1*	*SW3*
2	4	*Energy Conversion by Photosystems I / II*	*Section 12.2*	
	5	*Photophosphorylation and Calvin Cycle*	*Sections 12.3, 12.4*	*SW4*
	6	*C4/CAM Pathways Reduce Photorespiration*	*Sections 12.4*	
3	7	*Overview of Carbohydrate Structure and Function*	*Section 13.1*	*SW5*
	8	*Biological Functions of Glycoconjugates*	*Section 13.2*	
	9	*The Pentose Phosphate Pathway*	*Section 14.1*	*SW6*
	10	*Gluconeogenesis*	*Section 14.2*	
		EXAM 1 – Topics 1 - 10		
4	11	*Glycogen Metabolism*	*Section 14.3*	*SW7*
	12	*Many Lipids are made from Fatty Acids*	*Section 15.1*	*SW8*
	13	*Triacylglycerols are Energy Storage Lipids*	*Section 15.2*	
5	14	*Cell Membranes Contain Three Major Lipids*	*Section 15.3*	*SW9*
	15	*Lipids Function in Cell Signaling*	*Section 15.4*	
	16	*Fatty Acid Oxidation and Ketogenesis*	*Section 16.1*	*SW10*
6	17	*Synthesis of Fatty Acids and Triacylglycerols*	*Section 16.2*	*SW11*
	18	*Cholesterol Synthesis and Metabolism*	*Section 16.3*	
	19	*Nitrogen Fixation and Assimilation*	*Section 17.1*	*SW12*
		EXAM 2 Topics 11-19		

Module	Unit	Topic	Textbook	*Smartwork Quizzes*
7	20	*Amino Acid Degradation*	*Section 17.2*	*SW13*
	21	*Amino Acid Biosynthesis*	*Section 17.3*	*SW14*
	22	*Biosynthesis of Amino Acid Derivatives*	*Section 17.4*	
8	23	*Purine Metabolism*	*Sections 18.1, 18.2*	*SW15*
	24	*Pyrimidine Metabolism*	*Section 18.3*	*SW16*
	25	*Deoxynucleotide Metabolism*	*Section 18.4*	
9	26	*Metabolic Integration*	*Section 19.1*	*SW17*
	27	*Metabolic Energy Balance*	*Section 19.2*	*SW18*
	28	*Biochemistry of Nutrition and Exercise*	*Section 19.3*	
	29	*Biochemical Case Studies*	*RLM Handout*	
		EXAM 3 Topics 20-29		
10	30	*Biochemistry of DNA Synthesis*	*Section 20.1*	*SW19*
	31	*DNA Repair and Recombination*	*Sections 20.2, 20.3*	
	32	*Structure and Function of RNA*	*Section 21.1*	*SW20*
11	33	*Biochemistry of RNA Synthesis*	*Section 21.2*	
	34	*Eukaryotic RNA Processing and Silencing*	*Sections 21.3, 21.4*	*SW21*
	35	*Deciphering the Genetic Code*	*Section 22.1*	
	36	*Biochemistry of mRNA Translation*	*Section 22.2*	*SW22*
12	37	*Post-translational Modification of Proteins*	*Section 22.3*	
	38	*Mechanisms of Prokaryotic Gene Regulation*	*Sections 23.1, 23.2*	*SW23*
	39	*Mechanisms of Eukaryotic Gene Regulation*	*Section 23.3*	*SW24*
		EXAM 4 Topics 30-39		
		FINAL EXAM: Based on a Set of Review Questions *(questions are <u>not</u> taken directly from midterm exams)*		