

Course ID: **BCH 297**

Credits: 3

Course Name: **Introduction to Biochemistry**

Prerequisites:

BIO 131, BIO 133, CHE 251

Class Information		Instructor Information		First day of classes:	Wed., Jan. 06, 2016
<b>Days:</b>	WED / FRI	<b>Instructors:</b>	Team Taught: Graeme Gissing Liza Abraham Enitan Ibisani	<b>Last day to add/drop, or change to audit:</b>	Sun., Jan. 17, 2016
<b>Time:</b>	9:45-11:00	<b>Email:</b>	ggissing@ambrose.edu	<b>Last day to request revised exam:</b>	Mon., Feb. 29, 2016
<b>Room:</b>	A1085-1	<b>Phone:</b>	403-410-2000 x 5940	<b>Last day to withdraw from course:</b>	Fri., Mar. 18, 2016
<b>Lab:</b>	WED: 11:15-2:15	<b>Office:</b>	G2204	<b>Last day to apply for time extension for coursework:</b>	Tue., Mar. 29, 2016
<b>Room:</b>	A2151				
<b>FINAL EXAM:</b>		<b>Office Hours:</b>	Office hours for each of the three instructors will be provided in class	<b>Last day of classes:</b>	Wed., Apr. 13, 2016
<b>Date:</b> Monday, April 18, 2016 <b>Time:</b> 1:00 PM <b>Room:</b> A2141					

**Textbook:**

McKee, T. and McKee, J.R. *Biochemistry: the molecular basis of life*. 5th Edition. 2013. Oxford University Press. New York.

**Note:** Students may use an alternate undergraduate biochemistry text if approved by an instructor.

**Note:** A link to a free basic undergraduate biochemistry text will be provided in class.

**Course Description:**

Biochemistry explores the chemical makeup and reactions that are essential for life processes. This course will introduce students the structure and function of carbohydrates, amino acids, proteins, lipids, and enzymes, along with an introduction to metabolism and metabolic diseases. The course tutorial and laboratory components will introduce students to some fundamental biochemistry experiments and aid in the comprehension of the concepts covered during lectures.

## Expected Learning Outcomes:

It is the aim of the course that students acquire the following skills:

1. Understand the structure, function, and biochemistry of important biological macromolecules.
2. Understand the principles of enzymatic activities and analysis.
3. Comprehend various metabolic pathways and appreciate their complexity, network, and regulation.
4. Connect metabolic pathways and biomolecules to common metabolic diseases.

## Course Schedule:

The following schedule provides a general guideline and timetable for topics and tests. It may change depending on progress through the semester.

**Note:** The Lab and Tutorial schedule may change.

Day	Week	Date	Learning Outcomes	Instructor (may change)
W	01	January 6, 2016	<b>INTRODUCTION:</b> Course outline and course evaluation	Graeme
F	01	January 8, 2016	<b>FOUNDATIONS:</b> Introduction to biochemistry	Graeme
W	02	January 13, 2016	<b>AQUEOUS CHEMISTRY:</b> Buffers and pH Buffers and pH in biological systems  <b>Tutorial 01:</b> Buffers and pH calculations	Liza
F	02	January 15, 2016	<b>ENERGETICS:</b> Laws of thermodynamics Energy in biological systems	Liza
W	03	January 20, 2016	<b>CARBOHYDRATES:</b> Carbohydrates classes and structures  <b>Tutorial 02:</b> Dilutions and serial dilution calculations, micropipetting	Graeme
F	03	January 22, 2016	<b>CARBOHYDRATES:</b> Oligosaccharides and polysaccharides Glycosidic linkages	Graeme
W	04	January 27, 2016	<b>AMINO ACIDS AND PEPTIDES:</b> Amino acids Titration curves for diprotic and triprotic amino acids Isoelectric point of amino acids and peptides  <b>Tutorial 03:</b> Data analysis and standard curves	Graeme

F	04	January 29, 2016	<b>PEPTIDES AND PROTEINS:</b> Protein structure (1°, 2°, 3° and 4°) Peptide bonds Rotation angles phi and psi Interactions important for the stability of protein structure Quaternary structure	Graeme
W	05	February 3, 2016	<b>PROTEINS:</b> Myoglobin and hemoglobin Protein denaturation  <b>Lab 01:</b> Protein concentration assays	Liza
F	05	February 5, 2016	<b>LIPIDS:</b> Introduction to lipids	Eni
W	06	February 10, 2016	<b>LIPIDS AND MEMBRANES:</b> Important types of lipids in biological systems Membrane lipids (structure and function) Membrane proteins (structure and function)  <b>Lab 02:</b> Structure and function of lipids (wet lab or case study). Half of lab period. Second half open for assistance with questions for Test 01.	Eni
F	06	February 12, 2016	<b>Test 01: Material from Week 01 to Week 05 (inclusive)</b>	Graeme
W	07	February 17, 2016	No class	
F	07	February 19, 2016	No class	
W	08	February 24, 2016	<b>ENZYMES:</b> Transition state and activation energy barrier Enzymes and substrate binding Cofactors Enzyme classes (oxidoreductases, transferases, hydrolases, lyases, isomerases, and ligases) and functions  <b>Lab 03:</b> Bioinformatics	Liza
F	08	February 26, 2016	<b>ENZYMES:</b> Michaelis-Menten plots Vmax and Km Eadie-Hofstee plots Lineweaver-Burk plots Turnover number (kcat) Competitors	Graeme
W	09	March 2, 2016	<b>PHOTOSYNTHESIS:</b> Photosynthesis overview Light and Dark Reactions  <b>Lab 04:</b> Enzyme Kinetics	Graeme

F	09	March 4, 2016	<b>PHOTOSYNTHESIS:</b> Light and Dark Reactions (continued) Photorespiration Comparison and biological significance of C3, C4, and CAM	Graeme
W	10	March 9, 2016	<b>GLYCOLYSIS AND THE FATES OF PYRUVATE:</b> Conversion of glucose into pyruvate through glycolysis (must be able to draw all intermediates, list any required cofactors, and name/classify the enzyme for each step) Entry of glycerol and fructose into glycolysis Glycolysis regulation Pyruvate conversion to ethanol or lactate under anaerobic conditions  <b>Lab 05:</b> Chromatography of photosynthetic pigments and determining absorbance	Liza
F	10	March 11, 2016	<b>METABOLISM: CARBOHYDRATES AND DISEASE</b> Gluconeogenesis Glycogenesis and glycogenolysis Diseases associated with carbohydrate metabolism	Eni
W	11	March 16, 2016	<b>AEROBIC RESPIRATION:</b> Pyruvate conversion to acetyl-CoA Pyruvate dehydrogenase complex Form, creation, and function of NAD and FAD  <b>Tutorial 04:</b> Glycolysis case studies. Half of lab period. Second half open for assistance with questions for Test 02.	Liza
F	11	March 18, 2016	<b>Test 02: Material from Week 06 to Week 10 (inclusive)</b>	Graeme
W	12	March 23, 2016	<b>AEROBIC RESPIRATION: TCA</b> TCA cycle (must be able to draw all intermediates, list any required cofactors, and name/classify the enzyme for each step) Alpha-ketoglutarate dehydrogenase complex and succinyl-CoA synthetase TCA cycle regulation  <b>Tutorial 05:</b> TBD - Possibly aerobic respiration dry lab or case study	Graeme
F	12	March 25, 2016	Good Friday - No class	
W	13	March 30, 2016	<b>AEROBIC METABOLISM: ETC</b> How reducing power is converted to ATP in oxidative phosphorylation How NADH and FADH <sub>2</sub> are oxidized in the electron transport chain and how electrons travel through each complex of the electron transport chain How the passage of electrons through the electron transport chain creates an electrochemical gradient that	Graeme

			can be used by ATP synthase to synthesize ATP Describe how ATP synthase uses the electrochemical gradient to synthesize ATP (binding-change mechanism)  <b>Tutorial 05:</b> Open - Term project assistance	
F	13	April 1, 2016	<b>METABOLISM AND DISEASE: LIPIDS</b> Lipid metabolism and Beta-oxidation Key examples of lipids and disease	Eni
W	14	April 6, 2016	<b>METABOLISM AND DISEASE: VITAMINS</b> The role of vitamins in metabolic pathways Consequences of vitamin deficiency Key examples of vitamins and disease  <b>Tutorial 06:</b> Biochemistry Symposium	Eni
F	14	April 8, 2016	<b>METABOLISM: OVERVIEW</b> Review of metabolism (big picture to connect the previously covered topics) Integration of metabolism	TBD
W	15	April 13, 2016	LAST CLASS - WILL REMAIN OPEN  <b>No Lab or Tutorial</b>	OPEN

### Requirements:

All exams and assignments are announced and/or scheduled in advance. Assignments are due at the designated time; please see the late policy below for additional information about late submissions.

#### Theory (Lecture) Exams:

1. Term tests are objective, utilizing a variety of formats including multiple-choice, matching, true/false, short answer, calculations, drawing of diagrams and metabolic pathways. Tests may also contain a set of selected short essay questions.
2. The final exam will have a structure similar to the term tests, with a combination of question formats. Approximately 50% of the final exam will cover new material (since term test 2 of 2). Approximately 50% of the exam will consist of comprehensive material. This ratio may change based on class progress but will be made clear prior to the final exam. Further details regarding this comprehensive material will be forthcoming.

#### Labs:

1. Lab Reports and/or Assignments (where applicable) are exercises designed to review major concepts, summarize pertinent results, and demonstrate comprehension of material covered in both lab and lecture. Lab reports and/or Assignments will always be collected at the **BEGINNING** of the class in which they are due, unless otherwise noted by the instructor. **Please note:** Attendance at the laboratory and tutorial sessions is compulsory. Any lab missed without a valid excuse cannot be made up.

### Submission of Assignments:

Over the course of term, we may be engaged in a number of projects, assignments, experiments that require both faculty-student and student-student collaboration that will be turned in for a grading. Thus, it will be vital that all parties take responsibility for their part in these activities. We will provide clear objectives, adequate time, and necessary assistance for completing any projects, assignments, experiments. As students, you will be responsible for working together and managing your time such that you are prepared for due dates.

**Method of Submission:** All written assignments and lab reports are to be **printed and handed in as a hard copy** unless otherwise instructed. **Note:** Emailed assignments will not be accepted unless specifically asked for as a submission method.

### Late Submission of Assignments:

We realize that certain circumstances prevent students from turning in individual assignments on time and have developed the following late policy to address these rare situations. This policy will apply to all lecture and laboratory assignments. The late policy will **NOT cover term tests, quizzes, or the final exam**, all of which **MUST** be completed on time or a grade of zero will be assigned.

The following will only apply if the instructor is contacted **IN WRITING** prior to the deadline. Late submissions without contact prior to the deadline will not be accepted.

Condition (calendar days include both weekdays and weekends)	Deduction
Assignment is turned in 1 calendar day after it is due (e.g. Due: Monday, handed in on Tuesday)	20%
Assignment is turned in 2 calendar days after it is due (e.g. Due: Monday, handed in Wednesday)	30%
Assignment is turned in 3 calendar days after it is due (e.g. Due: Friday, handed in on Monday)	40%
Assignment is turned in 4 calendar days after it is due (e.g. Due: Monday, handed in on Friday)	50%
Assignment is turned in 5 or more calendar days after it is due	100%

### Attendance:

Regular attendance will be essential for success on all exams and assignments. No points will be subtracted from your grade for non-attendance. However, in-class assignments and any in-class graded activities cannot be made up and, **if missed, will receive a grade of zero.**

### Grade Summary:

Activity	Percent of Grade	Notes
Term Test 01	15%	*Term project can be: <b>1)</b> Individual Term Paper (10 pages text) <b>2)</b> Presentation at the Biochemistry Symposium (conference presentation style) <b>3)</b> Formal Scientific Poster for the Biochemistry Symposium
Term Test 02	15%	
Lab Reports / Activities / Assignments (4 or 5)	20%	
Lecture / Activities / Assignments / Quizzes (4)	10%	
Term Paper / Term Project*	10%	
Final Exam	30%	

<b>Grade Summary:</b>	
A+	97-100%
A	93-96%
A-	89-93%
B+	83-89%
B	77-82%
B-	70-76%
C+	67-69%
C	63-66%
C-	60-62%
D+	54-59%
D	50-53%
F (Fail)	Below 50%

## Policies:

### Communication

All students have received an Ambrose e-mail account upon registration. It is the student's responsibility to check this account regularly as the Ambrose email system will be the professor's instrument for notifying students of important matters (cancelled class sessions, extensions, requested appointments, etc.) between class sessions. If students do not wish to use their Ambrose accounts, they will need to forward all messages from the Ambrose account to another personal account.

### Registration

During the **Registration Revision Period** students may enter a course without permission, change the designation of any class from credit to audit and /or voluntary withdraw from a course without financial or academic penalty or record. Courses should be added or dropped on the student portal by the deadline date; please consult the List of Important Dates. After that date, the original status remains and the student is responsible for related fees.

Students intending to withdraw from a course after the Registration Revision Period must apply to the Office of the Registrar by submitting a "Request to Withdraw from a Course" form or by sending an email to the Registrar's Office by the **Withdrawal Deadline**; please consult the List of Important Dates on the my.ambrose.edu website. Students will not receive a tuition refund for courses from which they withdraw after the Registration Revision period. A grade of "W" will appear on their transcript.

### Exam Scheduling

Students wishing to withdraw from a course, but who fail to do so by the applicable date, will receive the grade earned in accordance with the course syllabus. A student obliged to withdraw from a course after the Withdrawal Deadline because of health or other reasons may apply to the Registrar for special consideration.

Students, who find a conflict in their exam schedule must submit a Revised Examination Request form to the Registrar's Office by the deadline date; please consult the List of Important Dates. Requests will be considered for the following reasons only: 1) the scheduled final examination slot conflicts with another exam; 2) the student has three final exams within three consecutive exam time blocks; 3) the scheduled final exam slot conflicts with an exam at another institution; 4) extenuating circumstances. Travel is not considered a valid excuse for re-scheduling or missing a final exam.

### Electronic Etiquette

Students are expected to treat their instructor, guest speakers, and fellow students with respect. It is disruptive to the learning goals of a course or seminar and disrespectful to fellow students and the instructor to use electronics for purposes unrelated to the course during a class session. Turn off all cell phones and other electronic devices during class. Laptops should be used for class-related purposes only. Do not use iPods, MP3 players, or headphones. Do not text, read, or send personal emails, go on Facebook or other social networks, search the internet, or play computer games during class. Some professors will not allow the use of any electronic devices in class. The professor has the right to disallow the student to use a laptop in future lectures and/or to ask a student to withdraw from the session if s/he does not comply with this policy. Repeat offenders will be directed to the Dean. If you are expecting communication due to an emergency, please speak with the professor before the class begins.

### Academic Policies

It is the responsibility of all students to become familiar with and adhere to academic policies as stated in the Academic Calendar. Personal information (information about an individual that may be used to identify that individual) may be required as part of taking this class. Any information collected will only be used and disclosed for the purpose for which the collection was intended. For further information contact the Privacy Compliance Officer at [privacy@ambrose.edu](mailto:privacy@ambrose.edu).

### Extensions

Although extensions to coursework in the semester are at the discretion of the instructor, students may not turn in coursework for evaluation after the last day of the scheduled final examination period unless they have received permission for a course Extension from the Registrar's Office. Requests for course extensions or alternative examination time must be submitted to the Registrar's Office by the deadline date; please consult the List of Important Dates. Course extensions are only granted for serious issues that arise "due to circumstances beyond the student's control."

### Appeal of Grade



An appeal for change of grade on any course work must be made to the course instructor within one week of receiving notification of the grade. An appeal for change of final grade must be submitted to the Registrar's Office in writing and providing the basis for appeal within 30 days of receiving notification of the final grade, providing the basis for appeal. A review fee of \$50.00 must accompany the appeal. If the appeal is sustained, the fee will be refunded.

### **Academic Integrity**

We are committed to fostering personal integrity and will not overlook breaches of integrity such as plagiarism and cheating. Academic dishonesty is taken seriously at Ambrose University as it undermines our academic standards and affects the integrity of each member of our learning community. Any attempt to obtain credit for academic work through fraudulent, deceptive, or dishonest means is academic dishonesty. Plagiarism involves presenting someone else's ideas, words, or work as one's own. Plagiarism is fraud and theft, but plagiarism can also occur by accident when a student fails or forgets to acknowledge to another person's ideas or words. Plagiarism and cheating can result in a failing grade for an assignment, for the course, or immediate dismissal from the university college. Students are expected to be familiar with the policies in the current Academic Calendar that deal with plagiarism, cheating, and the penalties and procedures for dealing with these matters. All cases of academic dishonesty are reported to the Academic Dean and become part of the student's permanent record.

**Note:** Students are strongly advised to retain this syllabus for their records.