I. GENERAL INFORMATION

A. COURSE DESCRIPTION - This course is designed to provide the student with the basics of the following:
   (i) biomolecules and their structures
   (ii) enzyme mechanisms and kinetics
   (iii) major metabolic processes and their regulation

This course assumes that the student has a strong background in Chemistry and understands chemical reactions and mechanisms. It is recommended that the student has completed Organic Chemistry.

B. COURSE DAY/TIME/LOCATION - Tuesday (Sec. 02)
   - 6:30 - 9:00 PM
   - T.B.D.

C. INSTRUCTOR - Wilhelm S. Cruz, Ph.D. (cruzws@biology.wustl.edu)

D. TEACHING ASSISTANTS -

   John L. Tymoczko, Jeremy M. Berg, and Lubert Stryer
   ISBN: 1-4641-2613-5 (Previous editions are acceptable)

F. REVIEW SESSIONS - Weekly, review sessions covering the material discussed in lecture will be offered. Attendance is optional. The location is T.B.D. at this moment.
   - The review sessions from January 21 - March 3 will be on TUESDAYS, 5:30 - 6:30 PM.
   - The review sessions from March 18 - April 29 will be on WEDNESDAYS, 5:00 - 6:00 PM.

II. GRADING - The course grade will be based upon of two exams and a students (group) presentation. A standard grading scale will be implemented. A=90% and above   D=60%-69%
   B=80%-89%    E=59% and below
   C=70%-79%

Scores at the upper 2% of each letter grade will be given a "plus" (+); for example, a 98%=A+. There are no "minus" (-) letter grades.

A. EXAMS
   1. There will be three, in-class exams given on the dates indicated which will comprise 90% of your course grade (collectively). Your two (2) highest exam scores will be worth 35% each of your course grade (70% total). Your lowest exam score will be worth 20% of your course grade.
   2. The exams are not cumulative and will only cover the lectures indicated.
   3. The exam format will be short-answer/definitions/mechanisms, essay, and problem-solving. Old exams have been posted on Canvas for you to familiarize yourself with the type of exam questions.
   4. EXAM PROCEDURES:
      - All electronic devices (cell phones, watches, tablets/laptops, calculators, etc...) must be turned OFF and placed securely in your backpack.
      - Pencil/pen containers must be placed in your backpack.
      - All backpacks must be place in the front of the room.
      - The only items allowed at your desk are pens, pencils, erasers, and clear plastic beverage containers are permitted.
   5. EXAM DATES:
      - The exam dates are "set in stone". Alternate exam dates will NOT be considered.
        - February 11, 2020
        - March 24, 2020
        - April 28, 2020
      - YOU MUST TAKE YOUR EXAM IN THE SECTION THAT YOU ARE REGISTERED.
      - Late exams are NOT permitted. However, in cases of a medical emergencies, only a late exam can be granted if:
        A. Notification is given prior to the start of the exam.
        B. Documentation, specific to the medical emergency, is provided within 24 hours of scheduled exam day/time.
6. Graded exams will be returned the week following the exam. If you are absent when the exams are returned, your exam can be picked-up from your instructor by appointment.

7. **REGRADES:**
   - Prior to submitting a regrade request, compare your answer to the posted answer key.
   - Exam regrade requests must be **written** and submitted within **7 days** after the exams are returned.
   - Download, print out, and complete the **Regrade Request Form**. Follow the instructions on submitting a regrade request.
   - Incomplete Regrade Request Forms will not be considered.
   - **NOTE:** A subset of exams will be photocopied prior to return. Any alteration to an exam question will result in:
     A. a "0" (zero) on that exam
     B. the "0" grade will that exam will count as one of the two higher exam scores
     C. the infraction will be promptly reported to the Academic Integrity Office

**B. GROUP PRESENTATIONS - 10%** of your course grade is attributed to the group presentation. These presentations are designed to have the student (working with a group of students) explore, research and present a topic of Biochemistry that is clinically relevant. Each groups will present a brief **15 minute PowerPoint presentation**. Suggested topics are listed below. A group may choose a topic not listed, however, make sure that the presentation can answer the questions noted at the end of this section. A group will consist of **4 students**. You are allowed to choose the members of your group. If you are unable to find a group, you will be assigned to a group. **The deadline for forming a group and selecting a topic is Wednesday, January 22, 2020 at 10:00 PM.**

Make sure that your group presentation can answer the following questions:

1. **What is the disease? What are the clinical symptoms?**
2. What is the epidemiology? How is it transmitted? Who are susceptible? How many are afflicted?
3. **What is the biochemical/molecular cause?**
4. How is the disease treated? Surgery? Medication?
5. Current basic science/pharmaceutical research investigating/treating this disease?

Suggested presentation topics *(as scheduled below)*.

**1st set** Presentation Topics:
1. Familial Hypercholesterolemia & Endocytosis (Ch. 1)
2. Tay-Sachs Disease & Lysosome Function (Ch. 1)
3. Kwashiorkor & Dietary Amino Acids/Proteins (Ch. 3)
4. Transmissible Spongiform Encephalopathies (prion disease) & Protein Folding (Ch. 4)
5. Hurler Disease & Glycosaminoglycans (Ch. 10)
6. I-cell Disease & Mannose-6-phosphate (Ch. 10)
7. Leukocyte Adhesion Deficiency (Ch. 10)
8. Lactose Intolerance & Lactose Metabolism (Ch. 16)

**2nd set** Presentation Topics:
1. Cataracts & Galactosemia/Galactose Metabolism (Ch. 16)
2. Beriberi & Pyruvate Metabolism (Ch. 18)
3. Leber Hereditary Optic Neuropathy & Electron Transport Chain (Ch. 20)
4. Diabetes (Type I & II)
5. Gout & Allosteric Enzymatic Regulation (Ch. 8)
6. Sickle-Cell Anemia & Hemoglobin (Ch. 9)
7. Hers Disease & Glycogen Storage (Ch. 23/24)
8. Von Gierke Disease & Glycogen Storage (Ch. 23/24)

**3rd set** Presentation Topics:
1. Pompe Disease & Glycogen Storage (Ch. 23/24)
2. Chanarin-Dorfman Syndrome (Ch. 28)
3. Adrenoleukodystrophy & Very Long Chain Fatty Acids (Ch. 28)
4. Amyotrophic Lateral Sclerosis (ALS)
5. Werner Syndrome (Ch. 34)
6. Machado-Joseph Disease (Ch. 34)
7. Huntington Disease (Ch. 34)
8. Hutchinson-Gilford & Lipid-Attachments to Proteins (Ch. 11)
### III. COURSE SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>Date (Tuesday)</th>
<th>Topics</th>
<th>Textbook Readings</th>
</tr>
</thead>
</table>
| 1    | Jan. 14        | • Introduction to BIO 406  
• Biochemistry (overview), Cell Structure, Biomolecules, Molecular Interactions, and Water  
• Amino Acids  
• Proteins and Protein Structure  
• Carbohydrates | 1 & 2 |
| 2    | Jan. 21        | • Digestion  
• Glycolysis  
• Gluconeogenesis  
• The Pyruvate Dehydrogenase Complex | 14 |
| 3    | Jan. 28        | • The Citric Acid Cycle  
• The Electron Transport Chain  
• ATP Synthesis | 19 |
| 4    | Feb. 4         | **Student Presentations (1st Set) - Review Session** | |
| 5    | Feb. 11        | **EXAM I (Weeks 1 - 4)** | |
| 6    | Feb. 18        | • Signal Transduction Pathways  
• Glycogen Synthesis  
• Glycogen Degradation | 13 |
| 7    | Feb. 25        | • Regulation of Glucose Metabolism  
• Fatty Acid Synthesis  
• Fatty Acid Degradation | 16 |
| 8    | Mar. 3         | • Enzyme Action  
• Kinetics and Regulation  
• Mechanism and Inhibitors  
• Hemoglobin | 6 |
|      | Mar. 10        | **SPRING BREAK - NO CLASS** | |
| 9    | Mar. 17        | **Student Presentations (2nd Set) - Review Session** | |
| 10   | Mar. 24        | **EXAM II (Weeks 6 - 9)** | |
| 11   | Mar. 31        | • Nucleic Acid Structure  
• DNA Replication  
• Transcription and transcriptional regulation of gene expression in prokaryotes  
• Translation in prokaryotes | 33 |
| 12   | Apr. 7         | • Protein Biochemistry Techniques  
• Current Molecular Biology Topics  
• Determining a Protein Sequence | 5 |
| 13   | Apr. 14        | • Lipids  
• Membrane Structure and Function | 11 |
| 14   | Apr. 21        | **Student Presentations (3rd Set) - Review Session** | |
| 15   | Apr. 28        | **EXAM III (Weeks 11 - 14)** | |