Chem 450 CRN 73932
Information Storage and Transfer - Molecules and Pathways
Fall 2018

Instructor: Maegan Weltzin, Murie 113E, 474-6527, mmweltzin@alaska.edu

Office Hours: Monday following lectures (1-3). However, students are encouraged to contact the instructor by phone or email at any time.

Lecture: Monday, Wednesday, Friday 11:45-12:45 AM, REIC 202 (YES, you can bring your lunch) 8-26-2017 to 12/6/2017 (not including final)

Textbook: *Principals of Biochemistry* (2008) 7th Edition
David L. Nelson and Michael M. Cox
W. H. Freeman and Company, NY
ISBN-10: 1-4641-2611-9

Most general biochemistry books provide adequate reading material with minimal difference in detail and depth on most topics.

Course
This 3 credit course will focus on the biochemistry (structure and dynamics) of cellular information storage and transfer linking the three principal macromolecules DNA, RNA, and Proteins including nucleotide metabolism, DNA structure and topology, DNA Replication/Repair/ Recombination, Cell Cycle Regulation, RNA transcription and processing, Gene Expression, Translation, and Protein Metabolism. Biomedical relevance and contemporary techniques will be addressed when appropriate.

Paper Discussions
Research paper(s) pertinent to topics addressed in lectures will be discussed with respect to rationale, hypothesis, research data, and analysis. Papers will be distributed ***one week prior*** to discussion. Individual students or group of students will be randomly called on to detail and explain sections and/or figures of papers to their classmates. These discussions are important to translate science knowledge into understanding i.e. the application of science.

Course Goals:
- Develop an understanding of the biochemical processes underlying structure, function, regulation, and dynamics of DNA, RNA, and Proteins.
- Fundamentals include but are not limited to structure-function relations of protein/DNA interactions, regulation and synchronization of complex macromolecular processes, and protein quality control. All topics are discussed in the context of developmental processes and/or pathologies.
- Use of concepts to formulate hypotheses and interpret experimental data to benefit the understanding of current research through paper discussion.

Learning Outcomes
1. Understand structure-function relationship determining macromolecular interactions
2. Aspects of synergism, cooperativity, and reciprocity relevant to macromolecular dynamics

3. Gene regulation – interplay among macromolecules and expression of phenotypes
4. Biomedical/disease-related aspects of topics
5. Critical reading of primary research literature
6. Understanding of principal methods and techniques

Instructional Methods:
The teaching methods employed in this course will consist of PowerPoint lectures (70%), group work (10%), and class discussions (20%). Primary research papers allow to explore distinct topics more in depth through discussions and to translate science knowledge. Blackboard (https://classes.uaf.edu) will be utilized as a platform to distribute papers, other assignments, lecture material, exams, and other announcements regarding the course. It is imperative that reading (see schedule) of sections should be done ***in advance*** and ***notes are taken*** during lecture. It is assumed that every student is frequently visiting blackboard to check for announcements as well as email notifications

Students will assemble a course portfolio composed of summary write-ups on sets of lectures pertinent to each topic. Summaries are guided by a set of questions provided by the instructor. Outcomes of paper discussions will also be infused into the portfolio. Twice times during the semester (listed in course schedule) the portfolio will be subject to grading by the instructor.

Grading
Exams: There will be four (4) exams (100 points each) over the course period (listed in course schedule). These exams will be a combination of multiple choice/short answer (in class) and essay questions (take home).
Papers: ***Six paper*** discussions over the term of the semester account for 100 points (20 points each paper, 5 out of 6 papers will be accounted for). Students are expected to contribute to these discussions with explanations and arguments. One constructive contribution is sufficient to receive full points.
Participation: ***Class participation*** will be included in the final grade (40 points). This entails an active involvement into the regular lecture materials discussed and group activities.
Portfolio: Written assignments will be used to generate summaries of key topics discussed. Summaries will be guided by questions given by the instructor (85 points). There will be one midterm evaluation and one final evaluation (see course schedule).
Final project: There will be a group final project involving diseases (75 points).

Class Participation	40 Points
Portfolio	85 Points
Final Project	75 points
Paper Discussion	100 Points
Term Exam I	100 Points
Term Exam II	100 Points
Term Exam III	100 Points
Final Exam	100 Points
Total	700 Points

Grade:	***Percentage:***
A+	97-100
A	90-96
A-	88-89
B+	86-87
B	80-85
B-	78-79

C+	76-77
C	70-75
C-	68-69
D+	66-67
D	60-65
D-	58-59
F	0-57

Course Policies

Attendance: Regular attendance is expected to ensure consistency in discussions and presentations. Active student participation is essential and will be accounted for in the final grade. If you are unable to attend class, you should contact the instructor in advance.

Exams: Four exams will be given. Although exams are NOT cumulative, with the progression of the course a cumulative character is unavoidable. *Makeup exams* will only be allowed with pre-approval of the instructor or with an acceptable, documented reason such as unexpected illness, family emergencies or other unavoidable events. The format of a make-up exam could vary from the original.

Papers: Students will receive adequate preparation time (1 week). ***Emphasis*** is put on an understanding of sections such as rationale, hypothesis, data/experimental design, results, and critical analysis. Students or groups of students will be randomly called upon to answer questions.

Participation: Class participation is expected and entails an active interest aside form paper discussion/presentations. This includes but is not limited to answering questions during lectures, asking for clarifications, or contributing to ad hoc discussions.

Portfolio: Writing summaries of key topics is the most effective check whether concepts are fully understood and also help to integrate the material into the greater context. Content of the portfolios should include: class notes, research articles, group work, exams, topic summaries.

Final project: There will be a group final project involving diseases. Students will receive adequate preparation time (>1 week). Students will be required to co-present and put together a one-page class handout. Scoring rubric will be posted on blackboard.

Ethical Considerations:

The Chemistry Department's policy of cheating is as follows: *"Any student caught cheating will be assigned a course grade of F. The student's academic advisor will be notified of this failing grade and the student will not be allowed to drop the course"*.

Students must also adhere to UAF policies, the student code of conduct as well as the University of Alaska *Honor Code,* which states:

Students will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations. Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses, and other reports. No work submitted for one course may be submitted for credit in another course with- out the explicit approval of both instructors. Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion.

Plagiarism Policy:
Plagiarism is defined as the use of "other" intellectual property without proper reference to the original author. Intellectual property includes all electronic, spoken or print media ***thus any information taken of the web is included under this statement***. Students are expected to cite all sources used in oral and written presentations. Cases of plagiarism will be taken seriously with a grade 0 for the particular assignment. Severe cases may be referred to the Department Chair or Dean or class failing considered.

Disabilities
Students with a physical or learning disability are required to identify themselves to the Disability Services office, 474-7043, located in the Center for Health and Counseling. The student must provide documentation of the disability. Disability Services will then notify the instructor of special arrangements for taking tests, working homework assignments, and doing lab work.

Computer Access: Currently Department of Computing and Communications (DCC) maintains two open labs on campus: the Bunnell Lab, and the Node (Rasmussen library). The Node has 24-hour access.

Support Services: Support can be obtained through the University of Alaska Library system, online resources, and the instructor. Additional services are available through Student Support Services (http://www.uaf.edu/sssp/) at UAF.

Classroom Etiquette: The purpose of this information is to assist students in understanding proper classroom behavior. The classroom should be a learning centered environment in which faculty and students are unhindered by disruptive behavior. Students are expected to maintain proper decorum in the classroom and to stay for the entire length of class. If the student must plans to leave during class, they should inform the instructor prior to the start of class. The University of Alaska Fairbanks is an institution of higher education that promotes the free exchange of ideas. However, students must adhere to the rules set forth by the University and the instructor. Failure to comply with classroom rules may result in dismissal from the class and/or the University. Faculty have the authority to manage their classrooms to ensure an environment conducive to learning. The University of Alaska Student Code of Conduct (the Code), part of the Board of Regents Policy 09.02, is available at https://www.alaska.edu/bor/policy/09-02.pdf. You should be familiar with the Code as you will be held accountable to maintain the standards stated within. The Code includes the following statements:

P09.02.020.A As with all members of the university community, the university requires students to conduct themselves honestly and responsibly and to respect the rights of others. Students may not engage in behavior that disrupts the learning environment, violates the rights of others or otherwise violates the Student Code of Conduct (Code), university rules, regulations, or procedures. Students and student organizations will be responsible for ensuring that they and their guests comply with the Code while on property owned or controlled by the university or at activities authorized or sponsored by the university.

P09.02.030.B Behavior that occurs on property owned or controlled by the university, in university online environments and classes, or at activities sponsored by or authorized by the university, is subject to university student conduct review and disciplinary action by the university. The Student Code of Conduct may also apply to behavior that occurs off campus when it may present a potential danger or threat to the health and safety of others or may reasonably lead to a hostile environment on campus. The Student Code of Conduct may also apply to behavior exhibited online or electronically via email, social media, text messaging, or other electronic means.

Amending Syllabus
The instructor may initiate changes to this syllabus subject to majority approval by students. Any and all changes will be clearly communicated (oral, email, blackboard). The instructor reserves the right to make minor change to the lecture schedule or calendar and any grading policies that are favor of the student.

Special Dates pertinent to the course
See academic calendar for details at http://catalog.uaf.edu/calendar/.

Course Schedule

Date	Lecture	Topic	Text
8-26	1	Introduction to Course	
8-28	2	Nucleotide Basics (Chemistry & Biosynthesis)	279-85, 310-13 888-903
8-30	3	Nucleotide Biosynthesis	
9-2		**Labor Day**	
9-4	4	Nucleotide Degradation & Associated Diseases	888-903
9-6	5	Deoxynucleotides & DNA Structure	894-898, 284-96
9-9	6	DNA lab techniques and DNA Topology	957-72
9-11	7	Chromosome Structure	962-82
9-13	**I**	**Paper Discussion I (Topoisomerases)**	
9-16	8	DNA Replication	987 - 1005
9-18	**(1-7)**	**Exam I**	
9-20	9	DNA Replication (Telomeres)	987 - 1005
9-23	10	DNA Repair	1005 - 1031
9-25	11	DNA Repair/Recombination	
9-27	12	DNA Recombination/Transposition	
9-30	**II**	**Paper Discussion II (Repair)**	
10-2	13	Cell Cycle Regulation	476 - 487
10-4	14	Oncogene/Tumor Suppressor/Cancer	
10-7	15	RNA polymerases	1035-47
10-9	**(8-14)**	**Exam II** (portfolio check)	
10-11	16	RNA polymerases	1035-47
10-14	**III**	**Paper Discussion III (RNAP mechanism)**	

10-16	17	RNA processing (capping, poly A) splicing, editing, siRNA	1047-63
10-18	18	RNA processing (capping, poly A) splicing, editing, siRNA	
10-21	19	Gene Expression (prokaryotes)	1127-47
10-23	20	Gene Expression (eukaryotes)	1147-69
10-25	**IV**	**Paper Discussion IV (siRNA or editing)**	
10-28	21	Chromatin Dynamics	1147-69
10-30	**(15-20)**	**Exam III**	
11-1	22	Translation (Genetic Code, tRNA)	1055-58, 1077-88
Date	**Lecture**	**Topic**	**Text**
11-4	**V**	**Paper Discussion V (chromatin)**	
11-6	22	Translation (Ribosomes)	1088-96
11-8	23	Translation (Initiation, Elongation,)	1096-114
11-11	24	Translation (Termination, Degradation)	Literature
11-13	25	Protein Folding	115-151
11-15	26	Protein Folding and Sorting	115-151 & 1100-09
11-18	27	Protein Sorting and Targeting	1114-23
11-20	28	Protein Degradation	1114-23
11-22	**VI**	**Paper Discussion VI (Folding/Degradation)**	
11-25	30	Enzymes - Kinetics	183-236
11-27	31	Enzymes - Kinetics	183-236
11-28		**Thanksgiving**	
12-2	32	Unfolding Protein Response	Literature
12-4	33	Group Presentations	Literature
12-6	34	Group Presentations	Literature
12-13	**(21-34)**	**Final Exam 10:15-12:15pm** (portfolio check)	