BACTERIAL PHYSIOLOGY
MICR-3500 Fall 2016
Lec (01), MW 10:00 am – 10:50 am, SH C237; Lab (02), M 11 am-1:30 pm; ASCL-126

Lec Instructor
Prof. Howard Xu; Office: LKH-356; Office Hours: Mondays: 9:20 am – 10:00 am, or by appointments
Tel: (323) 343-2188; hxu3@calstatela.edu My Moodle course name: FALL 2016 MICR 3500-01
Cal State LA Moodle website: https://moodle.calstatela.edu/
Lab Instructor
Bita Bahrami; Office: LKH-126; Office Hours: M, T, W, R, 8:10-9:00 am

Prerequisites: MICR 3300; Chem 3200.

Recommended Textbook: The Physiology and Biochemistry of Prokaryotes, 4th ed., by David White, James Drummond, Clay Fuqua. Oxford University Press, Inc., New York, NY. (3rd edition is acceptable). ISBN 978-0-19-539304-0.
There is no need to purchase lab textbooks; lab procedures will be posted on Moodle.
Additional Reference Textbooks: For Lab section: Microbial Physiology and Biochemistry Laboratory: A Quantitative Approach. by David White and George D. Hegeman. Oxford University Press, Inc., New York, NY. ISBN-13: 978-0195113136; Amgen Biotech Experience student guide, Amgen Foundation, 2015;
For lecture section: Molecular Genetics of Bacteria, 3rd ed. By L. Snyder and W. Champness. ASM Press. Washington, DC.

Student Learning Outcomes:
Upon completion of this course, students will be able to:

- Understand concepts in bacterial physiology with emphasis on basic bacterial biochemical pathways, metabolism and cellular development
- Describe critical processes of bacterial cellular development
- Describe the processes and mechanisms of information flow
- Discuss the basic elements of bacterial heredity and the mechanisms of genetic information exchanges
- Describe regulation and interactions of different pathways
- Describe transport mechanisms in bacterial cells
- Discuss modern advances in genomics and pathogenesis related to bacterial physiology
- Critically evaluate the primary literature
- Perform hands-on experiments relevant to bacterial physiology
- Appreciate how various aspects of bacterial physiology manifest in laboratory experiments.
- Demonstrate improved technical analysis, written and oral communication skills.
- Analyze, synthesize, and interpret experimental results.
- Learn to work in a team environment.

Attendance

Lecture attendance is strongly recommended since examinations will be based on materials presented in class. For labs, each student has two allowances for excused or emergency absences (documentable) during the entire semester but the student is responsible for making up lost lab work or data or assignment.

Performance evaluation: **600 points total**

Lecture: 400 points

Examination 1	100
Examination 2	100
Writing exercise homework	40
Final (comprehensive)	160

Laboratory: 200 points

Midterm	80
Quizzes (4 quizzes; 5 pts each)	20
Final examination (accumulative)	100

Final grades will be based on % of achievable points obtained:
Total points earned / 600 points x 100 = % achieved

	B+: 88-89%	C+: 78-79%	D+: 68-69%	F: ≤ 59%
A: ≥92%	B: 82-87%	C: 72-77%	D: 62-67%	
A-: 90-91%	B-: 80-81%	C-: 70-71%	D-: 60-61%	

In borderline cases (passing/ non-passing or grade levels), lecture attendance and active participation may be considered for the final outcome.

Scientific literature search and writing exercise.

The writing exercise will be worth 40 points and will consist of a summary report that explains a primary (not a review) scientific paper related to Bacterial Physiology. The reference to the paper will be assigned to each student on a date to be announced. It is the responsibility of the student to find the paper via PubMed or library and print it out. The student will study the paper in detail and perform a background literature search to obtain at least two additional references (papers) published before and cited by this paper. The report shall cover the following four sections with clear subtitles: the **Background** of the research (why do it), major **Methods** used (how), **Results** obtained (what happened), **Conclusions** (significance to the field) and **References (naturally including the main reference)**. The report should follow routine rules relative to the format of species names and gene names. The explanation should be clear enough that a fellow classmate could read it and understand it. The report should be 4 to 5 typed pages in length with double spacing between lines. Fonts of Times New Roman 12 point size are to be used. The due date for the writing report will be announced. Reports handed-in late will result in deduction of final report points (10% deduction per day after due date).

General Information

No make-up examinations. Missed exams will be given as "0 points" unless satisfactorily justified (e.g. doctors' slips). The University Academic Honesty Policy and the Drop/Incomplete Policy explained in the University General Catalogue will be strictly followed. Students are responsible for the prerequisites for this course and are encouraged to discuss any questions regarding the policies and prerequisites with the instructor. Students with disabilities: please contact the instructor to arrange appropriate accommodations.

LECTURE SCHEDULE

Week/Date	Lecture Topic (textbook chapter)	LAB EXERCISE
1/Aug 22	Overview; bacterial structure and function (1)	Micropipetting (Exp 1); Bacterial transfer and isolation (Exp 1b)
1/Aug 24	Bacterial growth and cell division (2)	
2/Aug 29	Chromosome replication (3)	Continue Exp 1b; Bacterial growth curve (including microplate growth curve (Exp 2)
2/Aug 31	Chromosome partitioning (3)	
3/Sept 5	**Labor Day; University closes**	No lab
3/Sept 7	Membrane bioenergetics (4)	
4/Sept 12	Electron transport (5)	Observe results for Exp 2; Effect of environment on bacterial growth (Exp 4);
4/Sept 14	Solute transport (17)	Lab class needs to stop by to measure OD for Exp 4;
5/Sept 19	Photosynthesis (6)	Share and discuss OD data of Exp 4;

		Start Exp 5, Lactic acid production.
5/Sept 21	**Examination 1**	
6/Sept 26	Fermentation pathways (15)	Exp 8, Assay of amylase and protease secreted by *Bacillus subtilis*
6/Sept 28	Central metabolic pathways I (9)	
7/Oct 3	Central metabolic pathways II (9)	**Lab midterm**; continue Exp 5.
7/Oct 5	Lipids metabolism (10)	
8/Oct 10	Nitrogen metabolism (13)	Exp 11, Induction of alkaline phosphatase and determination of its cellular location
8/Oct 12	Methylotrophy (14)	
9/Oct 17	Macromolecular synthesis and processing: RNA (11)	ABE-Lab 2, Digest of pKAN-R and pARA plasmids
9/Oct 19	Macromolecular synthesis and processing: proteins (11)	
10/Oct 24	Macromolecular synthesis and processing: cell wall (12)	ABE-Lab 3, Building the pARA-R plasmid
10/Oct 26	**Examination 2**	
11/Oct 31	Macromolecular synthesis and processing: capsule (12)	ABE-Lab 4, Verification of Restriction and Ligation using Gel Electrophoresis
11/Nov 2	Protein transport (18)	
12/Nov 7	Protein secretion (18)	ABE-Lab 5, Transforming Bacteria with the pARA-R plasmid
12/Nov 9	Bacterial genetics	
13/Nov 14	Cellular expression (Moat book, Chapter 7)	ABE-Lab 6, Purifying fluorescent protein
13/Nov 16	Chemotaxis (20) and Responses to environmental cues (19)	
14/Nov 21	Photoresponses, aerotaxis (20)	Students stop by lab to record results of ABE-Lab 5
14/Nov 23	**Finals Study Day; No classes**	
15/Nov 28	Microbial biofilm (21)	**Lab Final Exam**
15/Nov 30	Bacterial development (23)	
Dec 5	Bacterial genomics and functional genomics	
Finals wk	**Final Exam Dec 9, 9:10 am to 11:10 am**	