MIBO/IDIS/POPH 4450-4450L and 6450-6450L MICROBIAL GENETICS: 4 Credit Hours (Microbial Genetics and Genomics)

Course Description: Molecular basis of gene regulation in microorganisms with emphasis on systems pertaining to pathogenesis, evolution, and ecology. Computer lab examines evolutionary relatedness, sequence comparisons, database searches and reconstruction of metabolic pathways.

Expected Learning Outcomes: Students will develop an understanding of bacterial genetic systems and how they relate to important bacterial processes. Students will also develop an understanding for genomic and proteonomic approaches for studying diverse microbial species.

Additional Requirements for Graduate Students: Students taking the course for graduate credit will be given additional assignments associated with the computer lab. Students must also give a classroom lecture pertaining to topic(s) covered in class.

Lecture: Monday, Wednesday, Friday, 1:25-2:15pm, Biological Sciences Bldg., Rm. 216

Computer Lab: Wednesday, 2:30-4:25 pm, Biological Sciences Bldg., Rm. 217. *Required*

No excused absences from 1abs. Each missed lab results in loss of points from final grade, in accordance to points assigned for that lab(s). A printed lab report is due 2 weeks following each lab or lab module and it is to be turned in at the beginning of lab period. Lab module Identifying Virulence Genes (Lab 13/14) is due Dec. 3.

Grades: A-F

Honor Code and Academic Honesty Policy
Students are expected to abide by the University Honor Code and Academic Honesty Policy as described in "A Culture of Honesty." For term papers, problem sets and exams, students are expected to work individually. In the computer lab, some modules may require working in groups but all students are expected to contribute equally to the work. The writing in all lab reports must be original responses from individuals. Any material from books or websites must be acknowledged and referenced.

Prerequisites: Undergraduates- MIBO 3500; Graduate MIBO 3500 or permission of department.

Textbook: Molecular Genetics of the Bacterial Cell 3rd Edition, ASM Press; Washington, D.C. ***(Required)***

Instructors
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Office Hours: By appointment only.

Topical Outline:

Aug. 13-16 Add/Drop Deadline for Undergraduates
Aug. 13-20 Add/Drop Deadline for Graduate Students

WEEK ONE

MODULE I: INTRODUCTION TO BACTERIAL GENETICS

Aug. 13	Lecture 1: Genes and Mutations I	MAURER
Readings	Chapters 3- p. 139-184	
Aug. 15	Lecture 2: Genes and Mutations II	MAURER
Aug. 15	Lab 1: Literature Search and Reading Papers	MAURER
Readings	Chapter 11- p. 459-494	
Aug. 17	Lecture 3: DNA Repair and Mutagenesis	MAURER
Readings	Chapter 2- p. 71-125	

WEEK TWO

Aug. 20	Lecture 4: Gene Expression	MAURER
Readings	Introduction- p. 1-5	
Aug. 22	Lecture 5: Microbial Taxonomy	MAURER
Aug. 22	Lab 2: Phylogeny	MAURER
Readings	Chapter 1- p. 13-51	
Aug. 24	Lecture 6: Cell Division I	MAURER
Readings	Box 1.3	

WEEK THREE

Aug. 27	Lecture 7: Cell Division II	MAURER
Readings	Chapter 2- p. 87-89	

MODULE II: METABOLISM AND METABOLOMES

Aug. 29	Lecture 8: Enzymes	MAURER
Aug. 29	Lab 3: Metabolic Pathways I	MAURER
Aug. 31	Lecture 9: Metabolism I	MAURER

WEEK FOUR

Sept. 3	Labor Day, No Classes	
Sept. 5	Lecture 10: Metabolism II	MAURER
Sept. 5	Lab 4: Metabolic Pathways II	MAURER
Sept. 7	Lecture 11: Metabolism III	MAURER

WEEK FIVE

Sept. 10	***Exam I (Lectures 1-11)***	***MAURER***

MODULE III: GENOMES

Sept. 12	Lecture 12: Genes I	NEIDLE
Sept. 12	Lab 5: DNA Sequence analysis	NEIDLE
Sept. 14	Lecture 13: Genes II	NEIDLE

WEEK SIX

Sept. 17	Lecture 14: Genomes I	NEIDLE
Sept. 19	Lecture 15: Genomes II	NEIDLE
Sept. 19	Lab 6: Sequence Comparisons I	NEIDLE
Sept. 21	Lecture 16: Genome Plasticity I	NEIDLE

WEEK SEVEN

Sept. 24	Lecture 17: Genome Plasticity II	NEIDLE
Sept. 26	Lecture 18: Genome Plasticity III	NEIDLE
Sept. 26	Lab 7: Sequence Comparisons II	NEIDLE
Sept. 28	Lecture 19: Sequence Analysis I	NEIDLE
WEEK EIGHT		
Oct. 1	Lecture 20: Sequence Analysis II	NEIDLE
Oct. 3	Lecture 21: Protein Structure I	NEIDLE
Oct. 3	Lab 8: Structure Lab	NEIDLE
Oct. 5	Lecture 22: Protein Structure II	NEIDLE
WEEK NINE		
Oct. 8	***Exam II (Lectures 12-22)***	***NEIDLE***
Readings	Chapter 1- p. 63; Chapter 4- p. 197-240; BOX 1.1	

MODULE IV: RECOMBINANT DNA TECHNOLOGY

Oct. 10	Lecture 23: PCR	MAURER
Oct. 10	Lab 9: PCR	MAURER
Readings	Chapter 5- p. 243-274	
Oct. 12	Lecture 24: Plasmids & Conjugation	MAURER
Readings	Chapter 9- p. 377-424	
WEEK TEN		
Oct. 15	Lecture 25: Transposons	MAURER
Readings	Chapter 1- p. 55-62; Chapter 6- p.289-290	
Oct. 17	Lecture 26: Recombinant DNA I	MAURER
Oct. 17	Lab 10: Cloning Strategies	MAURER
Readings	Box 1.5; Box 10.3; Chapter 2 p. 186-190	
Oct. 18	**WITHDRAWAL DEADLINE**	
Oct. 19	Lecture 27: Recombinant DNA II	MAURER
Readings	Chapter 12- p. 499-543	
WEEK ELEVEN		

MODULE V: REGULATION

Oct. 22	Lecture 28: Transcriptional Control I	NEIDLE
Oct. 24	Lecture 29: Transcriptional Control II	NEIDLE
Oct. 24	Lab 11: Regulation I	NEIDLE
Oct. 26	Fall Break	
WEEK TWELVE		
Oct. 29	Lecture 30: RNA Processing and Stability	NEIDLE
Oct. 31	Lecture 31: Translational/Post Transcriptional Regulation	NEIDLE
Oct. 31	Lab 12: Regulation II	NEIDLE
Nov. 2	Lecture 32: Microarrays	NEIDLE
WEEK THIRTEEN		
Nov. 5	***Exam III (Lectures 23-32)***	***MAURER/NEIDLE***

MODULE VI: RECOMBINATION

Nov. 7	Lecture 33: Recombination	MAURER
Nov. 7	Lab 13: Identifying Virulence Genes	MAURER
Readings	Chapter 8- p. 343-373	
Nov. 9	Lecture 34: Phages	MAURER

Readings Chapter 14- p. 614-632
WEEK FOURTEEN

MODULE VII: GENES AND BEHAVIOR

Nov. 12 Lecture 35: Protein Export MAURER
Readings Box 4.1; Box 5.2; Box 8.1; Box 8.3; Chapter 9- p. 414-415; Chapter 13- p.587-593
Nov. 14 Lecture 36: Genetics of Bacterial Pathogenesis MAURER
Nov. 14 Lab 14: Identifying Virulence Genes II MAURER
Readings Chapter 14- p. 635-652; Box 5.3, Box 14.1; Box 14.2
Nov. 16 Lecture 37: Microbial Development MAURER
WEEK FIFTEEN
Nov. 19-23 Thanksgiving
WEEK SIXTEEN

MODULE VIII: THE COMPEXITIES OF REGULATION

Nov. 26 Lecture 38: Protein Domains NEIDLE
Nov. 28 Student Presentations NEIDLE
Nov. 28 Student Presentation Continued (LAB PERIOD) NEIDLE
Nov. 30 Lecture 39: Complex Regulation I NEIDLE
WEEK SEVENTEEN
Dec. 3 Lecture 40: Complex Regulation II NEIDLE
Dec. 4 Lecture 41: Complex Regulation III NEIDLE
WEEK EIGHTEEN
Dec. 7 Final: 12:00- 3:00pm. Exam IV (Lectures 33-41) MAURER/NEIDLE

Grades

IDIS, MIBO or POPH 4450/4450 L. *Undergraduate Only*. There are *1,000 total possible pts.* calculated into the grading for this course. Here is the following breakdown:

- Exams: 100 pts. each; 4 exams; 400 pts., total.
- Labs: 14 total lab sessions = 580 pts. Points are assigned to labs based on continuation/building upon of previous labs and overall difficulty.

  Students are required to read material/protocols before each lab period. Your preparation will affect the time necessary in completing the lab for the allotted time period. There is also an expectation by the instructors that students will need to do additional reading and work necessary in completing several of the lab assignments.

- Attendance and class participation: 20 pts.

Exams I-IV: 40%
LAB/attendance and class participation: 60%

IDIS, MIBO or POPH 6450/6450 L. *Graduate Only.* There are *1,200 total possible pts.* calculated into the grading for this course. Here is the following breakdown:

- Exams: 100 pts. each; 4 exams; 400 pts., total.

- Labs: 14 total lab sessions = 680 pts. Points are assigned to labs based on continuation/building upon of previous labs and overall difficulty. Graduate students will have extra questions/tasks on specific lab assignments.

  Students are required to read material/protocols before each lab period. Your preparation will affect the time necessary in completing the lab for the allotted time period. There is also an expectation by the instructors that students will need to do additional reading and work necessary in completing several of the lab assignments.

- Student presentations: 100 pts.
- Attendance and class participation: 20 pts.

Exams I-IV: 33.33%
LAB/Student Presentations/attendance and class participation: 66.66%

Grade	MIBO/IDIS/POPH 4450/4450L	MIBO/IDIS/POPH 6450/6450L
A	940-1000 pts	1128-1200 pts
A-	900-939 pts	1080-1127 pts
B+	870-899 pts	1044-1079 pts
B	840-869 pts	1008-1043 pts
B-	800-839 pts	960-1007 pts
C+	770-799 pts	924-959 pts
C	740-769 pts	888-923 pts
C-	700-739 pts	840-887 pts
D	600-699 pts	720-839 pts
F	$\leq$599 pts	$\leq$719 pts