

## **BMB 829**

Fall 2016

Tuesdays and Thursdays, 9:10 AM-10:00AM

Room 111 Biochemistry

Course coordinator: Honggao Yan, [yanh@msu.edu](mailto:yanh@msu.edu)

### Instructors:

Melinda Frame	B7 CIPS Bldg	432-2327	<a href="mailto:framem@msu.edu">framem@msu.edu</a>
A. Daniel Jones	215A Biochemistry	432-7126	<a href="mailto:jonesar4@msu.edu">jonesar4@msu.edu</a>
Louis King	5112 BPS Bldg	355-1536	<a href="mailto:kingl@msu.edu">kingl@msu.edu</a>
Jeff Landgraf	S18 Plant Biology	432-9814	<a href="mailto:landgra1@msu.edu">landgra1@msu.edu</a>
Erik Martinez-Hackert	509A Biochemistry	355-1604	<a href="mailto:emh@msu.edu">emh@msu.edu</a>
Honggao Yan	313A Biochemistry	353-3978	<a href="mailto:yanh@msu.edu">yanh@msu.edu</a>

Texts: No text; material provided by instructors

### Exams:

**Midterm: Tuesday, October 25th, 7-9 p.m., Rm 111 BMB (Note: exam at night) No lecture this day.**

The Midterm Exam will cover materials provided by the first three lecturers. The final exam will cover materials by the remaining three lecturers only.

**Final: Thursday December 15th, 10:00 a.m. – 12:00 p.m., Room 111 BMB**

Absence from examination: Absence from any examination will be on the basis of a written statement from a physician stating that the student was unable to attend the exam to be presented to Dr. Yan. Other matters can be taken up with Dr. Yan but must constitute serious problems.

### Problem Set:

Each instructor during or upon completion of his or her lecture series will provide a take home problem set. It is expected that each student will work INDEPENDENTLY on the problem set, unless otherwise instructed. Details of each problem set will be announced by the corresponding instructor.

### Grading:

Each lecture counts 10 points, 7 of which from exam and 3 from problem set. The total of points is 280, 196 of which from two exams and 84 from eight problem sets (1 Problem set from each instructor). Course grades will be curved.

Office Hours: Appointments can be arranged with individual faculty.

### Course Objectives:

The course seeks to introduce students to modern structural/analytical and molecular techniques, including confocal microscopy, mass spectrometry, flow cytometry, next-generation sequencing and gene expression analysis, x-ray crystallography analysis of protein structure and interactions, NMR, isothermal titration calorimetry, and surface plasmon resonance. It provides methodological information that goes beyond the textbook basics on molecular biology, optical imaging and protein chemistry.

Course materials and announcements can be accessed using the MSU D2L system. Students are expected to monitor this site for assignments and other important information.

## BMB 829 Lecture Schedule: Fall 2016

Thr. 9/1	Landgraf	DNA sequencing, genotyping, and gene expression analysis
Tue. 9/6	Landgraf	DNA sequencing, genotyping, and gene expression analysis
Thr. 9/8	Landgraf	DNA sequencing, genotyping, and gene expression analysis
Tue. 9/13	King	Introduction to Flow Cytometry and what it does
Thr. 9/15	King	The flow cytometer
Tue. 9/20	King	Simple phenotyping – protocol and data analysis
Thr. 9/22	King	The cell cycle – protocol and data analysis
Tue. 9/27	Jones	Mass Spectrometry: Ionization methods and metabolite identification
Thr. 9/29	Jones	Mass Spectrometry: Quantitative metabolite analysis using GC/MS and LC/MS
Tue. 10/4	Jones	Mass Spectrometry: Stable isotope tracers and their application for pathway elucidation and flux analysis
Thr. 10/6	Jones	Mass Spectrometry: Identification of proteins and peptides
Tue. 10/11	Jones	Mass Spectrometry: Characterization of post-translational modifications of proteins
Thr. 10/13	Jones	Mass Spectrometry: Techniques for probing tertiary and quaternary structure of proteins
Tue. 10/18	Frame	Confocal Microscopy: Optics, fusion proteins, diffusion
Thr. 10/20	Frame	Confocal Microscopy: FRET, Spectral Imaging; Laser Capture Microscopy
Tue. 10/25		<i>Evening midterm – no class. Covers through October 13 Lecture.</i>
Thr. 10/27	Yan	Principles of NMR: Basics and observables
Tue. 11/1	Yan	Principles of NMR: Biomolecular experimentation
Thr. 11/3	Yan	Applications of NMR: Structure and interactions
Tue. 11/8	Yan	Applications of NMR: Dynamics and catalysis
Thr. 11/10	Yan	Macromolecular binding. Thermodynamic and kinetic parameters
Tue. 11/15	Yan	ITC and SPR analysis of binding
Thr. 11/17	Martinez-Hackert	<i>From Gene Sequence to Protein Structure &amp; Function: Bioinformatic analysis for cloning design</i>
Tue. 11/22	Martinez-Hackert	Gene cloning approaches and cloning objectives
<i>Thursday November 24: Thanksgiving Day, no class</i>		
Tue. 11/29	Martinez-Hackert	Gene expression systems for protein production
Thr. 12/1	Martinez-Hackert	Protein purification
Tue. 12/6	Martinez-Hackert	Crystallization and x-ray structure determination
Thr. 12/8	Martinez-Hackert	Structural analysis and interpretation

**Final:** Thursday December 15<sup>th</sup>, 10:00 a.m. – 12:00 p.m., Room 111 Biochemistry.