

**Faculty:**

Dr. Daniel Ducat (Course Coordinator)  
206 Plant Biology  
Phone: 432-5118  
Email: [ducatdan@msu.edu](mailto:ducatdan@msu.edu)

Dr. Shelagh Ferguson-Miller  
Office: 310A Biochemistry Building  
Phone: 355-0199  
Email: [fergus20@msu.edu](mailto:fergus20@msu.edu)

Dr. Gregg Howe  
Office: 4275 Molecular Plant Sciences  
Phone: 355-5159  
Email: [howeg@msu.edu](mailto:howeg@msu.edu)

Dr. Erik Martinez-Hackert  
Office: 509A Biochemistry Building  
Phone: 355-1604  
Email: [emh@msu.edu](mailto:emh@msu.edu)

Dr. John Wang  
Office: 402D Biochemistry Building  
Phone: 353-9542  
Email: [wangj@msu.edu](mailto:wangj@msu.edu)

**General course information:** This course will utilize the D2L course management system. You must be officially registered in the course to access the D2L site. Instructors will post lecture notes, assigned papers, and other relevant material on this site. The lecturers will assume that students have a solid foundation in understanding basic principles of biochemistry and molecular biology. For this reason, BMB801 is strongly recommended as a background for the course.

**Overall objectives of the course:** This course is intended to provide an advanced treatment of key concepts in signal transduction and metabolic regulation. Attention will be focused on general themes that are expected to dominate future research in a particular area. The choice of lecture topics is also intended to provide students with an appreciation of the similarities and differences in signal transduction systems found in diverse organisms, including animals, yeast, plants, and bacteria.

**Examinations and Grading:** There will be four examinations: (I) Monday, Feb. 5, 2016 at 7:00-9:00 p.m., and covering material Jan. 8 through Feb. 2 (Ferguson-Miller, Wang) (**110 pts.**); (II) Open book take-home exam due Monday March 12, 2017, and covering material from Feb. 5 through March 2 (**Ducat; 120 pts.**); (III) Open book take-home exam due April 9, 2017, and covering material from March 12 through March 30 (**Howe; 90 pts.**); and (IV) Open book take-home exam due May 4 and covering material from April 2 through April 27 (total **120 pts**) (Martinez-Hackert, 30 pts; Howe, 90 pts). Final grades will be computed by summing grades (total 440 pts) from each examination.

**BIOCHEMISTRY 802 Spring 2018*****Metabolic Regulation & Signal Transduction***

Instructors: Ducat, Ferguson-Miller, Howe, Martinez-Hackert, Wang

M,W,F 10:20-11:10 a.m.

Location: Rm. 111 Biochemistry (BMB)

Date	Instructor	Topic
M 1/8	Ferguson-Miller	Lipids and Membranes
W 1/10	Ferguson-Miller	Membrane structure/asymmetry
F 1/12	Ferguson-Miller	Membrane protein organization
M 1/15	--	<i>Martin Luther King, Jr. Day - no classes</i>
W 1/17	Ferguson-Miller	Phospholipids
F 1/19	Ferguson-Miller	Sphingolipids and inositol lipids
M 1/22	Ferguson-Miller	Lipidomics
W 1/24	Wang	Phospholipases
F 1/26	Wang	Synthesis of eicosanoid hormones
M 1/29	Wang	Leukotrienes and prostaglandins
W 1/31	Wang	Prostacyclins and thromboxanes
F 2/2	Wang	Nitric oxide signaling
<b>First Exam Monday, February 5 -- 7:00 p.m. (1/8 through 2/2 material)</b>		
M 2/5	Ducat	Quorum Sensing I
W 2/7	Ducat	Quorum Sensing II
F 2/9	Ducat	Interspecies sensing and communication
M 2/12	Ducat	Classical Small G Protein Signaling
W 2/14	Ducat	Hijacking of Small G Protein Signaling in Pathogenesis
F 2/16	Ducat	PII and Carbon/Nitrogen balance I
M 2/19	Ducat	PII and Carbon/Nitrogen balance & Light Integration
W 2/21	Ducat	Circadian Rhythms
F 2/23	Ducat	Ligand-gated ion channels
M 2/26	Ducat	Receptor Evolvability & Modularity
W 2/28	Ducat	Conservation and modularity in signal transduction pathways
F 3/2	Ducat	Engineering through modularity of signal transduction pathways
<b>Second Exam Take home exam due Monday, March 12 by 5:00 pm (2/5 through 2/23 material)</b>		
3/5-9	---	<b>SPRING BREAK</b>
M 3/12	Howe	Ligand-receptor interactions
W 3/14	Howe	G protein-coupled receptors I
F 3/16	Howe	G protein-coupled receptors II
M 3/19	Howe	Structure and function of trimeric G proteins I
W 3/21	Howe	Structure and function of trimeric G proteins II
F 3/23	Howe	Regulation of G protein signaling I
M 3/26	Howe	Regulation of G protein signaling II
W 3/28	Howe	Nuclear receptors
F 3/30	Howe	NK-kB signaling
<b>Third Exam Take home exam due Monday, April 9 by 5:00 pm (2/26 through 3/30 material)</b>		

M 4/2	Martinez-Hackert	TGF- $\beta$ signaling I
W 4/4	Martinez-Hackert	TGF- $\beta$ signaling II
F 4/6	Martinez-Hackert	TGF- $\beta$ signaling III
M 4/9	Howe	Kinases in signal transduction I
W 4/11	Howe	Kinases in signal transduction II
F 4/13	Howe	Plant receptor kinases
M 4/16	Howe	Histidine kinases and two-component signaling pathways
W 4/18	Howe	Photoreceptors
F 4/20	Howe	Phosphatase-linked receptors
M 4/23	Howe	Ubiquitin ligase-linked receptors I
W 4/25	Howe	Ubiquitin ligase-linked receptors II
F 4/27	Howe	Engineering small-molecule sensors

**Fourth Exam** Take-home exam due Friday, May 4 by 12:00 noon (4/2 through 4/27 material).