

**COURSE RECORD**

Code	BENG621
Name	CELL SIGNALING
Hour per week	3 (3 + 0)
Credit	3
ECTS	10
Level/Year	Graduate
Semester	Fall and Springs
Type	Elective
Location	TBA
Prerequisites	None. However, students are expected to be familiar with cell/molecular biology and biochemistry.
Special Conditions	None
Coordinator(s)	Dr. AYSUN ADAN
Webpage	-
Content	Basic principles of cell signaling. Characterization of signaling components including receptors (membrane and intracellular/nuclear receptors), ligands, second messengers and effectors. Integration and amplification of signals. How to transfer information: posttranslation modification of proteins and cross talk between signaling pathways. Major signaling pathways, Cell signaling and apoptosis. Cell cycle control. Signaling defects.
Objectives	<ul style="list-style-type: none"> <li>- The basic concepts and molecular mechanisms of signal transduction will be discussed</li>   <li>- Major signaling pathways involved in important cellular processes will be revised</li>   <li>- The role(s) of dysregulation of cellular signaling pathways in diseases and abnormal cellular conditions will be discussed</li>   <li>- Therapeutic strategies designed to specifically target altered signaling pathways will be touched</li> </ul>
Learning Outcomes	<p><b>L01:</b> for students to be able to understand what signal transduction means and its molecular mechanisms</p> <p><b>L02:</b> to be familiar with the diversity of signaling mechanisms</p> <p><b>L03:</b> to understand the importance of signal transduction in development, health and disease</p> <p><b>L04:</b> to be able to understand/read signal transduction literature and to apply this knowledge to their own research</p>
Requirements	This class will require reading and active participation.
Reading List	<p>Molecular Biology of the Cell. 2014. Garland Science. Bruce Alberts and Alexander Johnson (Might be helpful for basic understanding)</p> <p>Current review and research articles will be mainly followed on every subject</p>
Ethical Rules and Course Policy	

### LEARNING ACTIVITIES

Activities	Number	Weight (%)
Lecture	14	30%
Scientific paper discussions by students	14	35%
Term paper drafts	7	35%
Total		100

### ASSESSMENT

Evaluation Criteria	Weight (%)	
Term paper drafts (every two weeks)	10%	
Term paper presentation and final draft (at the end of semester)	30%	
Scientific paper discussions during the term	15%	
Attendance/Participation	5%	
Final Exam	40%	
Total		100%

For a detailed description of grading policy and scale, please refer to the website <https://goo.gl/HbPM2y> section 28.

### COURSE LOAD

Activity	Duration (hour)	Quantity	Work Load (hour)
In class activities (lecture)	2	14	28
Required paper readings before the class	5	14	70
Paper presentations (in class)	1	7	7
Research (web, library)	5	14	70
Pre-work for Presentation	4	7	28
Term paper drafts	5	7	35
Term paper submission and presentation	2	1	2
Final	15	1	15
<b>General Sum</b>			<b>255</b>

ECTS: 10 (255/25)

### CONTRIBUTION TO PROGRAMME OUTCOMES\*

	P01	P02	P03	P04	P05	P06	P07	P08
L01	3		3					
L02	3		3					
L03							4	4
L04		3	4	4				

\* Contribution Level: 0: None, 1: Very Low, 2: Low, 3: Medium, 4: High, 5: Very High

### WEEKLY SCHEDULE

W	Topic	Outcomes
1	Introduction to signal transduction: general principles Activity: No activity	L01, L02
2	Signal transduction mechanisms I: signals and receptors Activity: No activity	L01, L02
3	Signal transduction mechanisms II: second messengers and protein modifications Activity: No activity	L01, L02
4	G Protein Coupled Receptor Signaling , Receptor and Non-Receptor Tyrosine Kinases Activity: Current scientific papers will be discussed	L01, L02
5	Serine / Threonine Kinase Coupled Receptors and Nuclear Receptors Activity: Current scientific papers will be discussed	L01, L02
6	Lipids as signaling molecules Activity: Current scientific papers will be discussed	L01, L02
7	Ions and ion channels Activity: Current scientific papers will be discussed	L01, L02

8	Signaling pathways I: MAP Kinase Pathways, The PI3K-PKB/Akt Pathway, Signaling by TGFB superfamily, JAK/STAT signaling Activity: Current scientific papers will be discussed	L01, L02, L03 L04
9	Signaling pathways II: mTOR signaling, calcium signaling, The Cyclic AMP Pathway Activity: Current scientific papers will be discussed	L01, L02, L03 L04
10	Signaling pathways III: Wnt signaling, hedgehog signaling, notch signaling Activity: Current scientific papers will be discussed	L01, L02, L03 L04
11	Signaling Pathways that Control Cell Proliferation, Growth, Division and Metabolism Activity: Current scientific papers will be discussed	L01, L02, L03 L04
12	Cell Death Signaling Activity: Current scientific papers will be discussed	L01, L02, L03 L04
13	Signal Transduction in Cancer Activity: Current scientific papers will be discussed	
14	Signaling in diabetes and obesity Activity: Current scientific papers will be discussed	L01, L02, L03 L04

DR. AYSUN ADAN  
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