Jordan University of Science and Technology

Faculty of Engineering

Biomedical Engineering Department

BME562 Control And Communication In The Nervous System - JNQF Level: 7

First Semester 2023-2024

Course Catalog
3 Credit Hours. 3 Credit hours (3 h lectures). An introduction to the structural and functional elements common to nervous systems with emphasis on cellular dynamics, intraneuronal communication, sensory and effector system.

Text Book	
Title	?Neuroscience of Communication.?
Author(s)	Webster
Edition	2nd Edition
Short Name	Ref#1
Other Information	...

Course References

Short name	Book name	Author(s)	Edition	Other Information
Ref#2	?Neuroscience: Exploring the Brain.?	Processing.? Oxford University Press. Bear, M.F., Connors, B., Paradiso, M. (2006)	3rd Edition	...
Text Book	Principles of Neural Science	Kandel, E.R., Schwartz, J.H., Jessell, T.M.	6th Edition	

Instructor	
Name	**Dr. Yazan Al Dweiri**
Office Location	C5 L2
Office Hours	Sun : 08:30 - 09:30 Sun : 10:30 - 12:00 Tue : 10:30 - 13:00 Wed : 08:30 - 11:30 Thu : 10:30 - 12:30

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Class Schedule & Room
Section 2: Lecture Time: Sun, Tue : 09:30 - 10:30 Room: E2010

Prerequisites		
Line Number	**Course Name**	**Prerequisite Type**
102364	MED236A Physioanatomy	Prerequisite / Study
284310	BME431 Physiological Modeling And Control Systems	Prerequisite / Study

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Weeks 1, 2	- Relationship between brain and behavior.- Distinct functional regions of the brain. - Localization of cognitive functions. - Representation of mental processes.	
Week 3	- Classes of cells within the nervous system.- Signaling ne tworks a nd t heir o rganization. - Conveying uniqueinf ormation.	
Weeks 4, 5	-Ion channels and signaling - Characteristics and structure of ion channels. - Origin and determination of membrane potential. - Balance of ion fluxes. - Contribution of different ions. ? Electrical equivalent circuit.	
Week 6	- Local signaling: Passive electrical properties of neurons. - Membrane in put resistance.- Membrane c a p a c i t a n c e . - Efficiency of signal conduction, and velocity of propagation.	
Week 7	- Propagated signaling ? Theaction potential.- Properties of voltage-gated channels and signaling capabilities.- Signaling function and molecular structure.	
Weeks 8, 9	- Synaptic T ransmission. - Chemical vs. electrical synapses. - Signaling time and signal amplification. - Transmitter release. - Quantal units. ? Synaptic vesicles and mechanisms regulating their production and release.	
Week 10	- Signaling at the neuron ? muscle synapse - Neuromuscular junction and end plate potentials. - Patch clamp and single channel currents. - ACh gated channels.- Synaptic in tegration. - Glutamate, GABA, and Glycine mediated channels.- Integration of excitatory and inhibitory signals.- Grouping of synapses according to function	
Weeks 11, 12	- Codingof s ensory i nformation. - Correlating stimulus wit sh ensation. -Stimulus energy and sensory modality. - Spatial distribution of sensory neurons. - Stimulus amplitude and intensity of sensation. ? Adaptation rate and duration of stimulation	
Weeks 13, 14	- Construction of visual images. - Visual perception. - Processing of motion, depth, form, and color. -Visual attention and conscious awareness. - Visua lP rocessing. -Eyes receptor sheet.- Phototransduction. - Receptor adaptation to changes in light intensity	

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method

Appreciate the role of control and communication in the nervous system in Biomedical Engineering [1SO4] [1L7K1]	8%	
Study the relationship between brain and behavior. [1SO1, 1SO3] [1L7K1]	10%	
Study the classes, structure, and organization of nerve cells. [1SO1, 1SO2, 1SO3, 1SO4, 1SO6, 1SO7] [1L7K1]	15%	
Analyze the origin of signals and signaling capability in the nervous system. [1SO1, 1SO3, 1SO4, 1SO6] [1L7S1]	15%	
Study local signaling in the nervous system. [1SO1, 1SO2, 1SO3, 1SO4, 1SO6] [1L7S1]	12%	
Study propagated signaling and intraneuronal / neuro- muscular synaptic transmission. [1SO1, 1SO2, 1SO3, 1SO4, 1SO6] [1L7S3]	10%	
Correlate the coding of sensory information to stimulus energy, modality spatial & temporal distribution. [1SO1, 1SO3, 1SO6] [1L7S2]	20%	
Apply neuro-communication principles to the construction and perception of visual images. [1SO1] [1L7S3]	10%	

Relationship to Program Student Outcomes (Out of 100%)						
SO1	SO2	SO3	SO4	SO5	SO6	SO7
32.32	6.9	22.32	18.65		17.32	2.5

Relationship to NQF Outcomes (Out of 100%)			
L7K1	L7S1	L7S2	L7S3
33	27	20	20

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