

Course title: **Synaptic Neurochemistry**

Course number: **27-595-01**

Lecturer: **Prof. Dana Cohen**

Second Semester

Hours: 2 h/w – 1 credit points

Course goals:

The purpose of the course is to familiarize the students with the neurochemistry of the neurotransmitter systems of the Central Nervous System. The course will cover basic concepts of synaptic transmission, neurotransmitter biochemistry and receptor pharmacology.

Course content:

This course will familiarize the students with the basic neurotransmitter systems in the mammalian brain. The emphasis is on the biochemistry, anatomy, physiology, and pharmacology, and functions of the systems.

Classes format:

The course will consist of 13 frontal lectures. As the students come from a variety of backgrounds, they will be expected to supplement the course as needed by reading the appropriate chapters from the book: **The Biochemical Basis of Neuropharmacology**, 8th edition, by Cooper, Bloom, and Roth. Other readings and supplements will be given as needed.

Detailed lecture plan:

As the students' background is variable, the lecture list is approximate. In each lecture on specific neurotransmitters, examples will be given of behaviors determined by the transmitters and their agonists and antagonists.

Notes	Reading required	Topic	Class #
History of the study of synaptic transmission and neurochemistry, basic concepts of neurochemistry and pharmacology		Basic review of synaptic transmission	1
Overview of the methodologies		Research methods in neurochemistry	2

used to study neurotransmitter systems			
Different types of neurotransmitters, how neurotransmitters are categorized: Neuromodulators vs. excitatory and inhibitory neurotransmission.		Chemical neurotransmission: history of concepts, categories of neurotransmitters	3
Synthesis and removal of Ach. Receptor types: agonists and antagonists. Central cholinergic systems.		Neuromodulators I: The “first” neurotransmitter: Acetylcholine	4
Synthesis of catecholamines. DA receptor types: agonists and antagonists. Central dopaminergic systems.		Neuromodulators II: Dopamine	5
NE receptor types: agonists and antagonists. Removal of catecholamines and indolamines.		Neuromodulators III: Norepinephrine	6
Synthesis of 5-HT. 5-HT receptor types: agonists and antagonists		Neuromodulators IV: Serotonin	7
Summary of the different CNS neuromodulatory systems with emphasis on behavioral neuroanatomy.		Neuromodulatory systems	8
Discovery of AA neurotransmitter systems, Glycine, GABA, Glutamate, Aspartate		Amino Acid Neurotransmission I: General	9
Synthesis and removal of Glutamate. Types of glutamatergic receptors: agonists, antagonists		Glutamatergic neurotransmission	10
Synthesis and removal of GABA. Types of GABAergic		GABAergic neurotransmission	11

receptors: agonists, antagonists			
Examples of interactions among neurotransmitter systems in behavior		Interactions among neurotransmitters	12
		Summary	13

Course assignments

Requirements

The students will be expected to attend the lectures. This will be a factor in the grade, as there is no exam.

Final grade

The principal determinant of the grade will be a project, which is to be handed in at the end of the course. This will take the form of a research proposal of a study involving some aspect of a neurotransmitter system. The student will have wide latitude in choosing the type of study: whether behavioral, biochemical, electrophysiological, neuroanatomical, pharmacological, etc. The proposal will be in a fixed format, to be distributed to the students. The proposal will be written in English. The student will be required to generate hypotheses, general and specific aims, and describe the methods which (s)he will use to perform the study. A two-page background will also be required, with a thorough reference list.

During the course of the semester, the students will be required to submit the topic ahead of time, and strongly encouraged to discuss the project with the instructor.

Bibliography

Cooper, Bloom, and Roth: The Biochemical Basis of Neuropharmacology, (Eighth edition), Oxford University Press