

**Course Title: Cognitive Neuroscience: Advanced Cognitive Psychology**

**Programme in which it is offered: M.Sc. in Clinical Psychology**

Course Category		Core	Schedule of Offering	Semester 1	
Course Credit		4	Course Code	PSY 513	
Total Number of Hours		60	Contact Hours Per Week	4	
Lecture	3	Tutorial	1	Practical	0
Last Revision			2023		

**Course Introduction**

This course is an introduction to basic concepts of cognitive psychology. Course will cover theories and research done in the area of cognitive psychology. Topics covered will be an introduction to cognition, memory, language comprehension, language production, problem solving, reasoning and decision making. Diverse theories and certain experiments will be described and discussed.

**Course Objectives**

After completing the course, the students will be able to:

- Develop a core competency in the area of cognitive psychology, focusing on topics such as language, memory, problem solving, reasoning and decision making
- To be able to comprehend how the human brain interprets and manipulates information
- Understand human psychology from cognitive perspective
- Describe, evaluate, and communicate the impact of researches done in the area of cognition

**Course outcomes**

- Development of knowledge about cognitive processes that govern human behaviour
- Apply the knowledge to explain day to day life and experiences
- Describe, evaluate, and communicate the impact of researches done in the area of cognition
- Able to communicate the scientific understanding in simple and scientific language.

### PSO-CO Mapping

CO/PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	√	√							
CO2				√	√			√	√
CO3				√		√	√		
CO4				√		√			

**Prerequisites and other constraints:** BA/BSc Psychology and Admission to MSc Clinical Psychology Program

### Teaching Pedagogy

The pedagogy includes interactive lectures. The interactive learning component will consist of lecture sessions, classroom exercises, and discussions. The independent learning component, on the other hand, shall include such exercises as independent reading and doing individual assignments. Finally, the cooperative learning component involves doing assignments in groups.

It is envisaged that students will be guided to read, think, solve problems, and actively participate in the learning process. This shall be attained through a mix of teaching methods, such as, lectures, projects, assignments, case studies, individual and group presentations, discussion, and fieldwork.

### Modules

#### Module 1: Introduction to Cognitive Neuroscience (10 Hrs)

- Introduction to Cognitive Neuroscience. Building block of the nervous system; Neurons and Glia. Functions of Glial cells
- External and Internal structure of the neuron, Bipolar, Unipolar and Multipolar. Function of Neuron: Transmission of signal within and between the neurons. Afferent and Efferent Neurons.
- Structure of the Nervous System, Spinal Cord, Medulla, Cerebellum, Pons, Midbrain, Hypothalamus, Thalamus, Hypothalamus, Thalamus, Basal Ganglia, Limbic System, Cerebral Cortex, Corpus Callosum. Meninges and Blood Brain Barrier. Cytoarchitectonic Divisions.
- Research Methods: Invasive methods, Histological Methods, Neuroimaging Techniques, Neuropsychological assessments, Psychophysical methods, Genetic Methods, Animal Studies.

### **Module 2: Attention (12 Hrs)**

- Attention: Defining attention. Factors influencing attention. Brain structures involved in arousal, vigilance and sustained attention.
- Selective Attention. Theories of selective attention. Filter Theory, Attenuation Theory, Late-Selection Theory, Kahneman's model of Attention, Capacity, and Mental Effort, Schema Theory. Change Blindness and Inattentional Blindness.
- Role of Superior Colliculus, Thalamus, Parietal Lobe and Medial Prefrontal Cortex in selective attention.
- Automatic Processing. Divided Attention. Attention hypothesis of automatization.
- Methods used in Indian system for developing attention: Chitta Ekagratha, Types of Upasanas and method of dhyana

### **Module 3: Perception (10 Hrs)**

- Perception: Sensation and transduction, defining perception, Gestalt approaches to study perception.
- Theories of visual perception: Bottom up processes: Gibson's Theory of Direct Perception, Template Theories, Feature-Matching Theories, Recognition-by-Components Theory. Top down processes; Perceptual Learning, Change Blindness, The Word Superiority Effect, A Connectionist Model of Word Perception.
- Photoreceptors and Ganglion cells, Pathways from retina to the Brain.

### **Module 4: Memory (10 Hrs)**

- Defining Memory, Encoding, Storage and Retrieval. Types of memory; sensory memory, short term memory and working memory. Types of long term memory.
- Models of Memory: Modal model- Atkinson and Shiffrin, levels of processing model - Lockhardt and Tulving, levels of recall model - Zinchenko, Anderson's ACT model, integrative model.
- Forgetting: interference and decay theories of forgetting, motivated forgetting, memory distortions, Eyewitness Testimony, factors influencing memory, Memory Enhancing Strategies.
- Role of hippocampus, cortical regions, Basal ganglia and amygdala in memory

### **Module 5: Representation of Knowledge (12 Hrs)**

- Elements of thought: Concepts, propositions, mental imagery. Theoretical descriptions of the nature of the concepts; Classical view, Prototype view, Exemplar View, Schemata View, Knowledge-Based View.

- Characteristics of mental images (rotation, size, shape, part-whole relation) spatial cognition and cognitive maps.
- Models of knowledge organization (in semantic memory): prototype, feature comparison, hierarchical model, Connectionist Models (Parallel Distributed Processing) of McClelland, Rumelhart, & Hinton), Networks models –Quillian, Spreading Activation - Collins & Loftus, schemas, Parallel Distributed Processing Model of McClelland & Rumelhart.

### Module 6: Higher Order Cognition (6 Hrs)

- Reasoning: Deductive and Inductive reasoning
- Problem solving; Problem solving strategies, Impediments to problem solving, Critical Thinking. Decision making, Phases of decision making. Organization of frontal lobe for executive functioning.
- Psycholinguistics, Nature versus nurture, Linguistic- Relativity Hypothesis. Theories of language acquisition: Skinner-behaviorism, Chomsky (LAD), Lennerberg- genetic readiness. Role of the left hemisphere in language processing. Neural organization of language

### Additional Reading and Suggested Activities:

Introduction to Neuropsychological assessment tools, Discussion and presentation on theories of cognitive psychology, Introduction to artificial intelligence, Field visit to cognitive psychology and AI labs. Introduction to Psychophysics, and psychophysical methods.

Discussion on Nyaya- Pramana Shastra – the ways of knowing. Mimanasa: the art of interpretation of meanings of words and sentences

### References

1. Banicich, M,T., & Compton, R,J.(2010). Cognitive Neuroscience. (3rd Ed.). Wadsworth Publishing.
2. Solso, R. L., MacLin, M. K., & MacLin, O. H. (2005). (7th ed.). Pearson Education.
3. Sternberg, R., Sternberg, K. and Mio, J., 2012. Cognitive Psychology. 6th ed. Belmont, Calif.: Wadsworth/Cengage Learning.
4. Galotti, K.M. (2001). Cognitive Psychology in and out of the Laboratory. New Delhi: SAGE Publications.
5. Eysenck, M, W. & Keane, M, T. (2010) Cognitive Psychology: A Student's Handbook.
6. Carlson, N. R. (2008). Foundations of physiological psychology. Boston: Pearson/A and B

### Evaluation Pattern

The course follows a continuous evaluation system with 50% weightage on internal components and 50 % on the end term examination. The internal component consists of a series of assignments which will be spread throughout the course.

#### Evaluation Matrix

Read and prepare critical summary of cognitive psychology research Paper related to the module	10%
Individual assignments	10%
Group assignments	10%
Mid-term Examination	20%
End Term Exam	50%
Total	100%

The assignments involved in the CIA will be subject to plagiarism checks. A submission with unexplained similarities exceeding 20% for MSc courses will be reverted for resubmission. The final submission is subject to score penalization as defined by the course instructor at the start of the course, with a clear communication of the same to all the registered candidates.