DISCIPLINE SPECIFIC ELECTIVE 28

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
DSE 28 Cognitive Neuroscience	4	3	1	0	Class XII Passed	Nil

Learning Objectives

- Develop an understanding into the discipline of Cognitive Neuroscience as an emerging field.
- Orient towards Contemporary Methods used in the study of Cognitive Neuroscience.
- Gain insight into Higher-order cognitions and the underlying basis of behaviours of Attention & Consciousness, Visual Cognition, Object Recognition and Language.
- Explicating links between Cognitive Neuroscience and its Application in the Contemporary Social Worlds.

Learning outcomes

- Knowledge about the discipline of Cognitive Neuroscience, its Emergence, Scope and Methods.
- Understanding of the basics of Cognitive Processes.
- Comprehending the Basic and Higher Mental functions of Attention, Consciousness, Visuospatial Recognition and Language.
- Awareness into the Real-World Applications and Ethical considerations of Cognitive neuroscience

Syllabus DSE: 28

UNIT – I Introduction **(12 Hours)**

Foundations of Cognitive Neuroscience: Emergence and Scope of Cognitive Neuroscience as a Discipline. Methods in Cognitive Neuroscience: Behavioural, Structural and Functional Imaging. Psychophysiological, Stimulation and Lesion Methods.

UNIT – II Brain & Neuronal Structures **(12 Hours)**

Basis of Cognitive Functions: The Cognitive Neuroscience Triangle. Five principles of Neural Network Model. Hemispheric Specialisation, Split Brain Experiments.

UNIT – III Cognitive Neuroscience of Basic and Higher mental functions (15 Hours)

Attention & Consciousness: Basis of Attention & Consciousness:
Networks of Attention, States of Consciousness & Stages of Sleep.

Visual & Spatial Cognition: Cortical basis of Vision; Object Recognition: Anatomy of Object Recognition

Language: Anatomy of Language &; Basic Networks of Language.

UNIT – IV Applications & Ethics in Cognitive Neuroscience (6 Hours)

Neuroscience in Society: Aspects of Artificial Intelligence, Social Cognition; Legal & Ethical Imperatives.

Practical component (if any) - Nil

Suggestive Tutorials: (15 hours)

Faculty teaching the Course could initiate Group Discussions, Case studies, Video Discussions, Simulation activities etc as part of the Tutorial Component.to be assessed. These could be formulated Unit wise as the following topics:

- Group discussions on the historical development of cognitive neuroscience, emphasizing key milestones and contributions.
- Facilitating debates on the advantages and limitations of different structural and functional imaging methods, encouraging critical thinking about methodological choices.
- Assigning case studies that require students to analyse how disruptions in specific neural networks relate to cognitive dysfunction.
- Organize group projects where students create visual representations (diagrams, models) illustrating the cognitive neuroscience triangle and hemispheric specialization.
- Conduct simulation activities for Consciousness States through meditations etc and discuss /report subjective experiences.
- Organize discussions on the role of brain networks in attention and consciousness, featuring expert's videos in the field.
- Engage in a class-wide discussion on the ethical considerations of using cognitive neuroscience in society, with a focus on artificial intelligence and social cognition.
- Assign case study analysis where students evaluate real-world applications of cognitive neuroscience, considering both the benefits and ethical challenges.
- Engaging students in designing and doing experiments/ simulations using open-source software.

Essential Readings

Badgaiyan, R. D. (2019). Neuroscience of the nonconscious mind. Academic Press.

Chakravarthy, V. S. (2019). Demystifying the brain: A computational approach. Springer.

Gazzaniga, Ivry and Mangun (2014). Cognitive Neuroscience: The Biology of the Mind. Fourth edition.

Kolb, B., & Whishaw, I. Q. (2009). Fundamentals of human neuropsychology. Macmillan.

Suggested/Recommended Readings:

Baars, Bernard J.; Gage, Nicole M. (2010). Cognition, Brain, and Consciousness: Introduction to Cognitive Neuroscience. Academic Press.

Kosslyn & Koenig (1995). Wet Mind: The New Cognitive Neuroscience. 2nd edition

Posner, M. I., & Petersen, S. E. (1990). The attention system of the human brain. Annual review of neuroscience, 13(1), 25-42.

Ward J. (2015). The Student's Guide to Cognitive Neuroscience (Third Edition). Psychology Press.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.