conduction of heat, gravitational potential, telegraph equation, dispersion of contaminants, Fourier series, Fourier transforms, etc. in the theory of PDEs.

SYLLABUS

Theory

Unit I: Familiarities with different type of first order linear and non-linear PDEs - Examples of PDEs arising in transport equation, conservation laws, spread of epidemic cholera - Cauchy problem for first order PDE (12 hours)

Unit II: Method of characteristics, Classical methods for simple PDE models (12 hours)

Unit III: Second order PDE arising in wave equations, conduction of heat, gravitational potential, telegraph equation, dispersion of contaminants - classification of second order PDE and their solution (12 hours)

Unit IV: Fourier Series and Fourier transforms - Boundary Value Problem: Dirichlet and Neumann Problems (12 hours)

Essential/recommended readings

1. *Partial Differential Equations*, E.DiBenedetto, Birkhauser, Boston,1995.
2. *Partial Differential Equations*,Fritz John,NarosaPubl.Co.,NewDelhi,1979.
3. *Linear Partial Differential Equation for Scientists and Engineers*, TynMyint-U and Lokenath Debnath, Springer, Indian reprint, 2006.
4. *Partial Differential Equations: An Introduction with Mathematica and MAPLE*, Ioannis P Stavroulakis and Stepan A Tersian, World Scientific, 2004

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

DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE):

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Brain and Cognition: Computational Neurosciences (DSE)	4	1	0	3	12th Pass	Understanding in Python, Networks

Learning Objectives

This module is designed to:

- o Introduce students to the field of neuroscience
- o Introduce students to the components of Learning, Memory and Neuroplasticity
- o Differentiate between Neural Network and Artificial Neural Network
- o Understand Neurological Disorders, Neural Coding and Neuroimaging

Learning outcomes

- After studying this course, the students will be able to:
  - o Comprehend Neural Network of the Brain and Artificial Neural Network
  - o Understand the different aspects of Neurosciences and its applications
  - o Develop knowledge about Neuroplasticity, Learning, Memory
  - o Understand Different Neurological Disorders,

Phobia SYLLABUS

Theory:

Unit I: Introduction to Neuroscience (15 hours)

Introduction to Neurobiology; Brain, Synapse and Neurons; Gut-Brain Connection; Recent developments in Neurosciences

Practice/Labs/Projects:

Unit II: Networks (Neural, Artificial Networks) (30 hours)

Networks and Patterns; Feedback and Feed Forward Loops; Artificial neural Network; Perceptrons, Multilayer Feed Forward Neural Networks; Neuro Dynamics

Unit III: Learning, Memory, Neuroplasticity (30 hours)

Learning and Memory; Short term and Long term memory; Associative and Dissociative Learning; Memory based Learning, Neural plasticity; Cognitive and Neural modeling

Unit IV: Sleep, Neurological Disorders, Neural Imaging (30 hours)

Different stages of sleep, Sleep Disorders, Coma; Phobia; Common NeurologicalDisorders; NeuroImaging, Functional Magnetic Resonance Imaging (fMRI), Computed Tomography (CT), Positron Emission Tomography (PET)

Essential/recommended readings

1. ***Neuroscience: Exploring The Brain, Enhanced Edition*, Bear M et al., Jones and Bartlett Publishers, 2020.**
2. ***Fundamentals of Computational Neuroscience*, Thomas Trappenberg, Oxford University Press, 2010.**

3. *Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems*, Peter Dayan and Larry Abbott, MIT Press, 2005.

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

DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE):

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Systems Biology (DSE)	4	1	0	3	12th Pass	Network Biology, Python

Learning Objectives

This module is designed to:

- Develop an understanding of the biological equations and events as a whole and combines different streams of biosciences to get a bigger picture
- Explore cutting-edge technologies of biosciences to novel findings that travel to hitherto unexplored fields

Learning outcomes

After studying this course, the students will be able to:

- Comprehend biological networks and organization of biological systems
- Develop an understanding of designing simple organisms
- Perform biological data analysis, protein-protein interaction networks etc.

SYLLABUS

Unit I: Introduction to Systems Biology (9 hours)

Biological complexity, Biological circuits, Bio-physical properties of macromolecules, Biomolecular interaction analysis, Developmental biology, Data integration and hypothesis generation, Reversible reactions and feedback loops

Unit II: Network and Modelling (9 hours)