**ACADEMIC AFFAIRS OFFICE**
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

No. Acd./ 4827/IAPC-127 Dated: August 08, 2023

**Head, Department of Biosciences and Bioengineering**

The IAPC in its 127th meeting held on 01.02.2023 vide Item No. 127.2.4(2) approved a new pre-Ph.D. course 'BTN-901: Molecular Neuroscience' of Department of Biosciences and Bioengineering with modification.

The modified syllabus is attached as **Appendix-A.**

**Deputy Registrar**

**Copy to** (through e mail):-

1. All faculty
2. Head of all Departments/ Centres/ School
3. Chairperson, DAPC of Department of Biosciences and Bioengineering
4. Dean, Academic Affairs
5. Associate Dean of Academic Affairs (Curriculum)
6. Channel i/ AIS (acad.iitr.ac.in)/ Academic webpage of iitr.ac.in

# INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

**NAME OF DEPARTMENT/CENTRE:** Department of Biosciences and Bioengineering

1. **Subject Code:** BTN-901 **Course Title:** Molecular Neuroscience
2. **Contact Hours:** **L:** 3 **T:** 1 **P:** 0
3. **Examination Duration (Hrs.):** **Theory:** 3 **Practical:** 0
4. **Relative Weightage:** **CWS:** 20-35 **PRS:** 0 **MTE:** 20-30 **ETE:** 40-50 **PRE:** 0
5. **Credits:** 4 **6. Semester:** Both **7. Subject Area:** PEC
8. **Pre-requisite:** Basic knowledge of life science
9. **Objective:** To provide a fundamental understanding of brain function and its disorders at molecular scale.

10. **Details of the Course:**

| S.No. | Contents | Contact Hours |
|---|---|---|
| 1. | **Introduction to Neuroscience** – Historical perspectives in understanding of human brain; Basic cell biology and biochemistry; Basic molecular genetics. The processing units of brain- Neuronal structure and Types; Astrocytes; Microglia; Oligodendrocytes; Blood brain barrier and glymphatic system. Neuronal Communication – Synaptic Structure; Synaptic Function; Impulse transmission – neural membranes at rest and action | 8 |
| 2. | **Neuronal Circuits –** Fundamental Neuroanatomy; Central Nervous System; Peripheral Nervous System; Evolution of Neural system and fundamental developmental neuroscience - Model systems; Neural tube formation; Differentiation of CNS structures; Neurogenesis | 6 |
| 3. | **Learning, memory and cognition –** Types of memory; Synaptic and Axonal rearrangements; Molecular mechanism of memory – LTP, LTD, Synaptic plasticity, consolidation; ANS and Hypothalamus; Sleep, Language and Emotions | 12 |
| 4. | **Sensory system and Motor system –** Visual system (Eye); Olfactory system (Nose); Auditory System (Ear); Gustatory System (Taste); Somatosensory system (Touch); Spinal and Cortical control of movement; Cerebellum | 8 |
| 5. | **Neurological disorders** -Neurodegenerative disorders - Alzheimer's Disease, Parkinson's Disease, Motor Neurone Disease; Neurodevelopmental and Neuropsychological disorders - Autism, Schizophrenia, Anxiety, Pain disorders, Obsessive Compulsive disorders, Anxiety Disorders | 8 |
| **Total** | | **42** |

**11. Suggested Books:**

| S.No. | Name of Authors/Book/Publisher | Year of Publication/ Reprint |
|---|---|---|
| 1. | Joseph Loscalzo, Anthony S. Fauci, Dennis L. Kasper, Stephen Hauser, Dan Longo, J. Larry Jameson. Harrison's Principles of Internal Medicine (Vol 1 and 2) 21st Ed. McGraw Hill. | 2022 |
| 2. | Eric R. Kandel, John D. Koester, Sarah H. Mack, Steven A. Siegelbaum. Principles of Neural Science, 6th Ed. McGraw Hill | 2021 |
| 3. | Harald Sontheimer. Diseases of the Nervous System. 2nd Ed. Academic Press Inc. | 2021 |
| 4. | A. Robert Martin, David A. Brown, Mathew E. Diamond, Antonino Cattaneo, Francisco F. De-Miguel. From Neuron to Brain. 6th Ed. Oxford University Press. | 2021 |
| 5. | Dale Purves, George Augustine, David Fitzpatrick, William Hall, Anthony LaMantia, Leonard White, Richard Mooney, Michael Platt. Neuroscience, 6th Ed. Oxford University Press | 2018 |
| 6. | Bear, Mark F., Barry W. Connors, and Michael A. Paradiso. Neuroscience: Exploring the Brain, 4th Ed. Lippincott Williams & Wilkins. | 2016 |