

Course contents for Techniques in Cell and Animal Physiology

1. **Faculty:** FLSB
2. **Course Code:**
3. **Course Title:** Techniques in Cell and Animal Physiology
4. **Number of Credits:** Two
5. **Course objectives:**

Current research in health sciences involves use of cell and animal models for various diseases ranging from infectious (bacterial and viral) to non-infectious (cancer, metabolic disorders and neurodegenerative disorders) ones. Cellular responses to these stress are studied in this course at the organelle, cellular, tissue and animal levels. A range of techniques measuring mitochondrial function will be covered integrating with overall cellular metabolic changes and overall viability and cell proliferation. At the tissue level, specimen collection and imaging would be studied in detail. Further, this course would expose students to various animal models commonly used in research with specific emphasis on rodent handling, behavior and use in research. Current research papers applying these techniques would be discussed. In addition, designing an experiment with hands-on training of a few techniques would also be included as part of the course.

6. **Minimum prerequisites for taking this course, if any:** Master-level Chemistry, Biochemistry or Physiology.

7. **Course structure with units, if applicable:**

The following topics will be covered as part of the course on Neurobiology of Lifestyle Disorders:

- a. Cell Biology Techniques: assays for cell cycle, cell proliferation and cell death measurements; ion channel measurements and patch clamp technique; electron microscopy; confocal microscopy
- b. Mitochondrial Techniques: assays measuring apoptosis, necrosis and autophagy; organelle separation from tissue samples; techniques to measure oxidative stress and mitochondrial permeability transition; assays measuring glycolysis, mitochondrial respiration and ETC activities.
- c. Histological Techniques: anatomical terminology; tissue fixation and perfusion; tissue sectioning methods; dye-based and antibody-based tissue staining methods
- d. Imaging Techniques: neuroanatomical tracing techniques; principles of CT scan, MRI, fMRI, DTI and PET scanning; use of imaging techniques in small animals; optogenetics.
- e. Behavior Techniques: generation of knockout and transgenic strains; rodent behavior analysis for sensory and motor abilities; tests for emotion and cognition in animals; simple psychological tests for human behaviour analysis.
- f. Integrated Metabolism Techniques: Methods to study BMI, calorimetry, glucose uptake assays, glucose tolerance tests.
- g. In vivo Techniques: humane handling of animals and methods for euthanasia, blood injection and collection techniques, stereotaxic surgery

8. **Reading suggestions: Text Books/Web-resources/other:**

- a. Original papers and reviews as provided during the class
- b. Current Protocols Series in Cell Biology, Immunology and Neuroscience

9. **Evaluation:**

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| Theory: | Written Examination | : 50% Marks |
| | Paper Presentation | : 25% Marks |
| | Research Design / Assignment/Other | : 25% Marks |