

# Bio electricity - Video course

## COURSE OUTLINE

The course aims at helping the students to think and appreciate the myriad of bioelectrical phenomenon in the nature. This includes the bio-electrical signals in animal, plants and in several bio-materials. These are not only important in physiological functioning of the system but offers enormous inspiration to develop novel sensors, actuators, energy-harvesting platforms for sustainable developments. The thrust of the course will be to highlight "how we can record the electrical signals from wide range of specimens, analyze them and thinking in an innovative manner to use them for energy harvesting and other bio-engineering applications. The final goal of the course is to empower students to use their conceptual understanding to develop sustainable technologies.

## COURSE DETAIL

Sl. No.	Module wise / Lecture wise	Description
1	<b>Module 1</b>	<b>Overview</b> What is bioelectricity ? Historical perspective Examples in nature
2	<b>Module 2</b>	<b>Bioelectrical phenomenon in mammals, insects, and fishes</b> 1. Bioelectric potentials 2. Ion channels 3. Action potentials 4. Voltage clamp studies 5. Current clamp studies 6. Capacitance measurement 7. Impulse propagation 8. Cardiac electrophysiology 9. Neuromuscular junction 10. Skeletal muscle 11. Brain and memory 12. Sensory circuits
3	<b>Module 3</b>	<b>Bioelectrical phenomenon in plant system</b> 1. Electrical signaling between plant cells 2. Photosynthetic bioelectricity
4	<b>Module 4</b>	<b>Measurement of bioelectrical processes</b> 1. Patch clamp electrophysiology 2. Micro-electrode array 3. Field effect transistors 4. Electrometers



NP-TEL

# NPTEL

<http://nptel.iitm.ac.in>

## Biotechnology

### Pre-requisites:

Some back ground of basic sciences and engineering

### Additional Reading:

I shall provide a list of references with each lecture.

### Hyperlinks:

I shall add the necessary links with each and every lecture

### Coordinators:

**Prof. Mainak Das**  
Department of Biological Science & Bio-Engineering IIT Kanpur

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**Module 5**

**Exploiting bioelectrical phenomenon to build bio-electronic devices**

**1. Cyborgs**

- A. Brain-computer interface
- B. Retinal Implants
- C. Bionic arm
- D. Cochlear implants
- E. Artificial heart

**2. Energy harvesting devices**

- A. Synthetic leaf and water splitting cluster: An inspiration from photosynthesis
- B. Plant and flower dye sensitized solar cells
- C. Suspended-load backpack for energy harvesting
- D. Non-conventional, nature inspired bio-electronics, semiconductor materials

**References:**

- 1. I will provide links and suggest necessary reading materials while I will be teaching the course.