

# GLOBAL INITIATIVE FOR ACADEMIC NETWORKS



National Coordinating Institute  
**INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR**

[www.gian.iitkgp.ac.in](http://www.gian.iitkgp.ac.in)

## MEDICAL APPLICATIONS OF ELECTRICAL, ELECTRONICS & HIGH VOLTAGE ENGINEERING

### Overview

Medicine and healthcare is an important aspect of the 21<sup>st</sup> century, as it affects people's lives as well as economics and budgets of countries. Electrical, electronics and high voltage (HV) engineering concepts and applications are part of medicine and healthcare, as our body is electric with biopotentials and other electrical characteristics. Thus, there is a critical need for engineers, scientists and clinicians who are familiar with the various ongoing developments in these fields and to work with their applications and electrical devices used in medicine and healthcare, their design, building, testing, repair and service maintenance. This necessitates the knowledge of those devices, their functionalities and their operations. A number of new initiatives were undertaken to achieve this goal, to increase the number of engineering graduates who could meet these requirements.

This course deals with the advanced study of technical and professional topics in applications of electrical, electronics, and HV engineering concepts to medical and healthcare. Attendees will learn about design, building, and testing of concepts of practical devices, such as ECG amplifiers, muscle stimulators and electrical manipulations of cancer cells for enhanced uptake of usually impermeable drug molecules and genes (DNA).

This course is organized into 14 one hour lectures and hands on experiments. The various topics include Biopotentials and electrodes, ECG, EEG and EMG amplifier design problems and Muscle stimulation, Electro manipulation of biological cells Electrochemotherapy, Electrogenetransfer, Irreversible electroporation, Membrane transport, Design and Development of pulse generators, Electric field simulation of biological systems, Enhancing the accuracy of medical images using MATLAB Mammogram, and Diabetic Retinopathy, Design and Development of non-invasive blood pressure monitor, vein finder, Building and testing of ECG/EEG amplifier, Building and testing of ECG/EEG amplifier.

Course participants will learn these topics through lectures and hands on experiments. Case studies and assignments will be included for discussion to foster research motivation of participants.

#### Modules

**Course duration: May 22-28, 17 (2 hours per day for the 1st 5 days and 4 hours on the last day)**  
**Number of participants for the course will be limited to fifty.**

#### Who Should Attend

- You are an electrical or electronics or HV engineer or research scientist interested in designing medical devices used for day to day use and applications.
- You are a medical student or medical professional interested to learn the basics and function of ECG, EEG, EMG amplifiers and muscle stimulators
- You are a student or faculty from academic institutions interested in learning how to do research on various types of cancer using electrical pulses for drug/gene (DNA) delivery.

## Fees

The participation fees for taking the course is as follows:

<b>Participants from abroad</b>	:	<b>\$ 250</b>
<b>Industry/ Research Organizations</b>	:	<b>₹ 15000</b>
<b>Academic Institutions</b>	:	<b>₹ 5000</b>

The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24h free internet facility. The participants will be provided with accommodation on payment basis.

## The Faculty



**Dr. Raji Sundararajan** is a Professor in the School of Engineering Technology, Purdue University, West Lafayette, IN, USA. Her research interests include electrochemotherapy, design and development of Medical Apps, and Biomedical devices.



**Dr. N K Kishore** is a Professor of Indian Institute of Technology, Kharagpur. His research interests are in the area of Power Systems, High Voltage Engineering, Applications of High Voltage Engineering, Renewable Energy, and EMI/EMC.

## Course Co-ordinator

Professor N.K. Kishore

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## Registration Process

Registration for GIAN courses is not automatic because of the constraints on maximum number of participants allowed to register for a course. In order to register for one or multiple non-overlapping courses, you have to apply online using the following steps:

Create login and password at <http://www.gian.iitkgp.ac.in/GREGN>

1. **Login and complete the registration form.**
2. **Select courses**
3. **Confirm your application and payment information.**
4. **Pay Rs.500 (non-refundable) through online payment gateway.**

The course coordinators of the selected courses will go through your application and confirm your selection as a participant one month before the starting date of the courses. Once you are selected you will be informed and requested to pay the full fees through online payment gateway service.

