

# Online Short Term Course on "Methods in Cell and Molecular Biology"



16 - 20 November, 2020

Centre for Continuing Education (CCE)

Indian Institute of Science, Bangalore, India - 560012

## Course Content:

In this course, we will teach you the principles and applications of commonly used techniques in a cell and molecular biology research laboratory. The course is aimed at students who wish to understand the methods and advanced techniques used in the field of life sciences. In addition, this course enables the students to learn the concept of genetic engineering and transgenic technology. This course will also help students to prepare competitive exams like GATE and CSIR-NET. In the morning session, there will be theory classes and in the afternoon session, there will be online demonstration of techniques commonly used in research laboratory. Online demonstration includes familiarization of stepwise protocols with the help of video clips, demonstrations and research articles, and its troubleshooting methods, data analysis and interpretation of results. The detailed topics covered in theory and practical sessions is given below.

## Theory Sessions:

Introduction to the course- genomic and plasmid DNA isolation; RNA isolation-DNA labelling and visualization- nucleic acid digestion and ligation- construction of genomic DNA and cDNA libraries- PCR, Next generation sequencing (NGS)- Gene cloning and production of Recombinant proteins-Vectors, types of vectors: bacterial and viral vectors, cloning systems-therapeutic vaccines using recombinant proteins -Generation of Recombinant viruses: Adenovirus, lentivirus and retroviruses- Gene therapy: Uses of recombinant viruses; Protein interactions: Chromatin immunoprecipitation and its analysis, Electrophoretic mobility shift assay- Antisense technology: RNAi Genome editing: Gene knockout and knock-in in plant and animal cells by Agrobacterium-mediated and CRISPR-Cas9-mediated gene editing methods- Genetic engineering of Stem cells: Knockout and transgenic animal generation-Generation of tissue-specific conditional gene knockout mice- Generation of inducible transgenic mice.

## Online Practical Sessions:

Genomic and plasmid DNA isolation, RNA isolation, PCR, RT-PCR- Nucleic acid restriction digestion, ligation, bacterial transformation and selection of transformants, plasmid isolation, PCR-based screening- Gel electrophoresis and staining; western blotting, protein visualization and interpretation- Protein-nucleic acid and protein-protein interaction: EMSA, Chromatin Immunoprecipitation and its analysis, co-immunoprecipitation assays- Recombinant Protein Purification from bacteria- Choice of expression vector; components and choice of expression system; Choice of protein tag- Affinity Chromatography, Immobilized metal ion affinity chromatography, Ion exchange chromatography, Gel Filtration chromatography, Reverse phase chromatography- Assessing the purity of sample: SDS page, Mass spectrometry and its sample preparation, and Western Blotting. Mammalian cell culture- Techniques, preparation of growth media, cell lines, Transfection of mammalian cells: Viral transfection (adenovirus, lentivirus; verification of transfection and gene expression- Microscopy techniques, Confocal microscopy: principle, uses, advantages and limitations.

### Participants:

College students (Life sciences, Medical, Veterinary, Pharmacy, Biotechnology &), Industry (Pharmaceutical Companies & Biotech Companies) – Researchers, Postdocs and Students in the field of Biological Sciences

### Minimum Qualification Required:

Students either studying or completed any Bachelor's degree or master's degree including BSc (research), MSc, B.Tech, B.Pharm., BVSc., MBBS, B.Pharm., MSc.

### Prerequisites:

Basic knowledge in Life Sciences

### Course Coordinator:

- Dr. N. Ravi Sundaresan, Dept. of Microbiology and Cell Biology, Indian Institute of Science, Bangalore – 560012  
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**Registration:** This course can be attended only by registration. The number of participants is limited to 100. The registration will be accepted on a first-come first-served basis.

Apply online at: <http://cce.iisc.ac.in/ssp-stc.html>

**The registration fee is INR 5000 +18% GST**

**Last Date to Apply: 31/10/2020**

**Duration: 16 – 20 November, 2020**

**Note: Classes will be conducted via Microsoft Teams.**