NPTEL : Biomathematics (Biotechnology)

Co-ordinators : Dr. Ranjith Padinhateeri

Lecture 1 - Introduction

Lecture 2 - Graphs and functions - I

Lecture 3 - Graphs and functions - II

Lecture 4 - Functions and derivatives

Lecture 5 - Calculation of derivatives

Lecture 6 - Differentiation and its application in Biology - I

Lecture 7 - Differentiation and its application in Biology - II

Lecture 8 - Differentiation and its application in Biology - III

Lecture 9 - Differentiation and its application in Biology - IV

Lecture 10 - Integration - I

Lecture 11 - Integration - II

Lecture 12 - Differential equations - I

Lecture 13 - Differential equations - II

Lecture 14 - Vectors - I

Lecture 15 - Vectors - II

Lecture 16 - Vectors - III

Lecture 17 - Nernst equation

Lecture 18 - Diffusion - I : Diffusion equation

Lecture 19 - Diffusion - II : Mean-square displacement

Lecture 20 - Diffusion - III : Einsteinâ€™s relation

Lecture 21 - Statistics : Mean and variance

Lecture 22 - Statistics : Distribution function

Lecture 23 - Understanding Normal distribution

Lecture 24 - Fitting a function to experimental data

Lecture 25 - Size of a flexible protein: Simplest model

Lecture 26 - Uniform and Poisson distributions; Knudsonâ€™s analysis

Lecture 27 - Fourier Series - I

Lecture 28 - Fourier Series - II

Lecture 29 - Fourier transform

Lecture 30 - Master equation: Polymerization dynamics, Molecular motor motion

Lecture 31 - Evolution: Simplest model

Lecture 32 - Tutorial - I

Lecture 33 - Tutorial - II

Lecture 34 - Temperature, Energy and Entropy

Lecture 35 - Partition function, Free energy

Lecture 36 - Bending fluctuations of DNA and spring-like proteins

Lecture 37 - Force-extension and looping of DNA

Lecture 38 - Thermodynamics of protein organization along DNA

Lecture 39 - Learning mathematics with the help of a computer

NPTEL : Proteomics: Principles and Techniques (Biotechnology)

Co-ordinators : Prof. Sanjeeva Srivastava

Lecture 1

Lecture 2

Lecture 3

Lecture 4

Lecture 5

Lecture 6

Lecture 7

Lecture 8

Lecture 9

Lecture 10

Lecture 11

Lecture 12

Lecture 13

Lecture 14

Lecture 15

Lecture 16

Lecture 17

Lecture 18

Lecture 19

Lecture 20

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

Lecture 26

Lecture 27

Lecture 28

Lecture 29

Lecture 30

Lecture 31

Lecture 32

Lecture 33

Lecture 34

Lecture 35

Lecture 36

Lecture 37

Lecture 38

Lecture 39

Lecture 40

NPTEL : NOC:Proteins and Gel-Based Proteomics (Biotechnology)

Co-ordinators : Prof. Sanjeeva Srivastava

Lecture 0 - Proteins and Gel-Based Proteomics; Course Introduction

Lecture 1 - Introduction to amino acids

Lecture 2 - Introduction to proteins

Lecture 3 - Protein folding & misfolding

Lecture 4 - Protein purification techniques

Lecture 5 - Introduction to proteomics

Lecture 6 - Systems biology and proteomics

Lecture 7 - Sample preparation and pre-analytical factors

Lecture 8 - Sample preparation: Pre-analytical factors (Continued...)

Lecture 9 - Sample preparation: Protein extraction and quantification

Lecture 10 - One-dimensional electrophoresis

Lecture 11 - 2-DE: Rehydration, IEF & Equilibration

Lecture 12 - 2-DE: Second dimension, staining & destaining

Lecture 13 - 2-DE: Gel analysis

Lecture 14 - 2-DE: Applications

Lecture 15 - 2-DE: Applications (Continued...) & Challenges

Lecture 16 - 2D-DIGE: Basics

Lecture 17 - 2D-DIGE: Data analysis

Lecture 18 - 2D-DIGE: Applications

Lecture 19 - Protein identification using MALDI-TOF/TOF

Lecture 20 - Proteomics experiment data analysis & challenges

NPTEL : NOC:Mass spectrometry based proteomics (Biotechnology)

Co-ordinators : Prof. Sanjeeva Srivastava

Lecture 0 - Introductory lecture

Lecture 1 - Introduction to proteomics

Lecture 2 - Proteomics and sample preparation

Lecture 3 - Bacterial protein extraction

Lecture 4 - In-gel digestion

Lecture 5 - Fundamentals of mass spectrometry

Lecture 6 - Chromatography technologies

Lecture 7 - Liquid chromatography

Lecture 8 - Mass spectrometry: Ionization sources

Lecture 9 - Mass spectrometry: Mass analyzers

Lecture 10 - MALDI sample preparation and analysis

Lecture 11 - Introduction to quantitative proteomics

Lecture 12 - Hybrid mass spectrometry configurations

Lecture 13 - SILAC: In Vivo labeling

Lecture 14 - iTRAQ: In Vitro labeling

Lecture 15 - TMT: In vitro labeling

Lecture 16 - Quantitative proteomics data analysis

Lecture 17 - Proteomics and Systems biology I

Lecture 18 - Proteomics & Systems biology II

Lecture 19 - Proteomics applications

Lecture 20 - Advances and challenges in proteomics

NPTEL : NOC:Interactomics: Protein Arrays and Label-free Biosensors (Biotechnology)

Co-ordinators : Prof. Sanjeeva Srivastava

Lecture 1 - Introduction to Interactomics

Lecture 2 - An overview of label-free technologies

Lecture 3 - An overview of surface plasmon resonance (SPR)

Lecture 4 - An overview of surface plasmon resonance imaging (SPRi)

Lecture 5 - Basics of SPR: Surface chemistry

Lecture 6 - Basics of SPR: Experimental design

Lecture 7 - Protein immobilization for protein-protein interaction studies

Lecture 8 - Protein-protein interaction study: Binding analysis

Lecture 9 - Protein-protein interaction study: Kinetic analysis

Lecture 10 - Protein-small molecule interaction study: Immobilization and binding analysis

Lecture 11 - Protein-small molecule interaction study: Kinetic analysis

Lecture 12 - SPR: Interactive Session - I

Lecture 13 - SPR: Interactive Session - II

Lecture 14 - An overview of ellipsometry and interferometry techniques

Lecture 15 - An introduction to BioLayer Interferometry (BLI) and its applications in protein research

Lecture 16 - Kinetic analysis of protein-protein interaction using BLI

Lecture 17 - Label-free quantification of proteins using BLI

Lecture 18 - Diffraction-based biosensors - I

Lecture 19 - Diffraction-based biosensors - II

Lecture 20 - Nanotechniques in proteomics - I

Lecture 21 - Nanotechniques in proteomics - II

Lecture 22 - High throughputplatforms of interactomics: Protein arrays

Lecture 23 - Conventional label based detection techniques for Protein microarrays

Lecture 24 - Novel detection techniques for Protein microarrays

Lecture 25 - Recombinational cloning and its application for Protein microarrays

Lecture 26 - An introduction to Cell-free protein synthesis

Lecture 27 - Cell-free synthesis based protein microarrays: PISA and NAPPA

Lecture 28 - Cell-free synthesis based protein microarrays: MIST, DAPA and Halotag Arrays

Lecture 29 - Digging deeper into NAPPA: Basic Workflow

Lecture 30 - Digging deeper into NAPPA: Surface Chemistry, Printing and Assessment

Lecture 31 - Application of cell free expression protein microarrays in biomarker discovery

Lecture 32 - Application of cell free expression protein microarrays in immunological studies

Lecture 33 - Basics of microarray image scanning

Lecture 34 - Software for Image scanning and data processing

Lecture 35 - Microarray Data Analysis - Part I

Lecture 36 - Microarray Data Analysis - Part II

Lecture 37 - Application of protein microarray in biomarker discovery - I

Lecture 38 - Application of protein microarray in biomarker discovery - II

Lecture 39 - Systems biology and networks

Lecture 40 - Challenges in proteomics

NPTEL : NOC:Introduction to Proteomics (Biotechnology)

Co-ordinators : Prof. Sanjeeva Srivastava

Lecture 1 - Introduction to amino acids

Lecture 2 - Introduction to proteins

Lecture 3 - Protein folding and misfolding

Lecture 4 - Introduction to proteomics

Lecture 5 - Lab session â€“ Protein-protein interaction using label-free biosensors

Lecture 6 - Sample preparation and pre-analytical factors

Lecture 7 - Sample preparation: Pre-analytical factors (Continued...)

Lecture 8 - Sample preparation: Protein extraction and quantification

Lecture 9 - One-dimensional electrophoresis

Lecture 10 - Introduction to 2-DE

Lecture 11 - 2-DE: Second dimension, staining and destaining

Lecture 12 - 2-DE: Gel analysis

Lecture 13 - 2-DE Applications

Lecture 14 - 2-DE Applications (Continued...) and Challenges

Lecture 15 - Lab session - Protein/peptide pre-fractionation using OFFGEL FRACTIONATOR and data analysis

Lecture 16 - 2D-DIGE: Basics

Lecture 17 - 2D-DIGE: Data analysis

Lecture 18 - 2D-DIGE: Applications

Lecture 19 - Systems biology and proteomics - I

Lecture 20 - Systems biology and proteomics - II

Lecture 21 - Fundamentals of mass spectrometry

Lecture 22 - Chromatography technologies

Lecture 23 - Liquid chromatography

Lecture 24 - Mass spectrometry: Ionization sources

Lecture 25 - Mass spectrometry: Mass analyzers

Lecture 26 - MALDI sample preparation and analysis

Lecture 27 - Hybrid mass spectrometry configurations

Lecture 28 - Lab session - Demonstration of Q-TOF MS technology

Lecture 29 - In-gel and in-solution digestion

Lecture 30 - Lab session - Sample preparation: tissue sample preservation technology

Lecture 31 - Introduction to quantitative proteomics

Lecture 32 - SILAC: In vivo labeling

Lecture 33 - iTRAQ: In vitro labeling

Lecture 34 - TMT: In vitro labeling

Lecture 35 - Quantitative proteomics data analysis

Lecture 36 - Proteomics applications

Lecture 37 - Challenges in proteomics

Lecture 38 - OMICS and translational research

Lecture 39 - Lab session â€“ Targeted proteomics using triple quadrupole mass spectrometry

Lecture 40 - Lab session â€“ Targeted proteomics: multiple reaction monitoring

NPTEL : NOC:Introduction to Biostatistics (Biotechnology)

Co-ordinators : Prof. Shamik Sen

Lecture 1 - Introduction to the course

Lecture 2 - Data representation and plotting

Lecture 3 - Arithmetic mean

Lecture 4 - Geometric mean

Lecture 5 - Measure of Variability, Standard deviation

Lecture 6 - SME, Z-Score, Box plot

Lecture 7 - Moments, Skewness

Lecture 8 - Kurtosis, R programming

Lecture 9 - R programming

Lecture 10 - Correlation

Lecture 11 - Correlation and Regression - Part-I

Lecture 12 - Correlation and Regression - Part-II

Lecture 13 - Interpolation and extrapolation

Lecture 14 - Nonlinear data fitting

Lecture 15 - Concept of Probability: introduction and basics

Lecture 16 - Counting principle, Permutations, and Combinations

Lecture 17 - Conditional probability

Lecture 18 - Conditional probability and Random variables

Lecture 19 - Random variables, Probability mass function, and Probability density function

Lecture 20 - Expectation, Variance and Covariance - Part-I

Lecture 21 - Expectation, Variance and Covariance - Part-II

Lecture 22 - Binomial random variables and Moment generating function

Lecture 23 - Probability distribution: Poisson distribution and Uniform distribution Part-I

Lecture 24 - Uniform distribution Part-II and Normal distribution Part-I

Lecture 25 - Normal distribution Part-II and Exponential distribution

Lecture 26 - Sampling distributions and Central limit theorem - Part-I

Lecture 27 - Sampling distributions and Central limit theorem - Part-II

Lecture 28 - Central limit theorem - Part-III and Sampling distributions of sample mean

Lecture 29 - Central limit theorem - Part-IV and Confidence intervals

Lecture 30 - Confidence intervals Part- II

Lecture 31 - Test of Hypothesis - 1

Lecture 32 - Test of Hypothesis - 2 (1 tailed and 2 tailed Test of Hypothesis, p-value)

Lecture 33 - Test of Hypothesis - 3 (1 tailed and 2 tailed Test of Hypothesis, p-value)

Lecture 34 - Test of Hypothesis - 4 (Type -1 and Type -2 error)

Lecture 35 - T-test

Lecture 36 - 1 tailed and 2 tailed T-distribution, Chi-square test

Lecture 37 - ANOVA - 1

Lecture 38 - ANOVA - 2

Lecture 39 - ANOVA - 3

Lecture 40 - ANOVA for linear regression, Block Design

NPTEL : NOC:Introduction to Mechanobiology (Biotechnology)

Co-ordinators : Prof. Shamik Sen

Lecture 1 - Need to Study Mechanobiology

Lecture 2 - Cell as a Tent, Individual Components

Lecture 3 - Cell-ECM Crosstalk

Lecture 4 - ECM Proteins: Collagen

Lecture 5 - Measuring Properties of Collagen Networks

Lecture 6 - Properties of Collagen Networks

Lecture 7 - Rheology

Lecture 8 - Rheology of Biopolymer Networks

Lecture 9 - Atomic Force Microscopy (AFM)

Lecture 10 - Design of Protein Constructs for AFM

Lecture 11 - Protein Unfolding using AFM

Lecture 12 - Protein Unfolding using AFM

Lecture 13 - Focal Adhesions: Focal Adhesion Proteins

Lecture 14 - Focal Adhesion Organization

Lecture 15 - Focal Adhesions: Role of Forces

Lecture 16 - Cytoskeleton: Actin

Lecture 17 - Force-velocity Relationships of Actin Networks

Lecture 18 - Mesenchymal Cell Migration

Lecture 19 - Actin Dynamics during Mesenchymal Migration

Lecture 20 - Actin Dynamics during Mesenchymal Migration

Lecture 21 - Adhesion Independent Migration

Lecture 22 - Adhesion Independent and Collective Cell Migration

Lecture 23 - Collective Cell Migration

Lecture 24 - Mechanobiology of Stem Cell Fate - I

Lecture 25 - Mechanobiology of Stem Cell Fate - II

Lecture 26 - Mechanobiology of Stem Cell Fate - III

Lecture 27 - Mechanobiology of Diseases: Cancer - I

Lecture 28 - Mechanobiology of Diseases: Cancer - II

Lecture 29 - Mechanobiology of Diseases: Cancer - III

Lecture 30 - Mechanobiology of Diseases: Atherosclerosis and Hypertension

Lecture 31 - Mechanobiology of Diseases: Muscular Dystrophy

Lecture 32 - Nuclear Mechanotransduction: LINC complex

Lecture 33 - Nuclear Mechanotransduction: LINC Complex in Cell Migration

Lecture 34 - Nuclear Mechanotransduction: Gene Regulation

Lecture 35 - Mechanical Forces and DNA damage

Lecture 36 - Techniques in Mechanobiology: Hydrogels

Lecture 37 - Techniques in Mechanobiology: AFM

Lecture 38 - Techniques in Mechanobiology: Traction Force Microscopy, Trypson Deadhesion and Laser Ablation

Lecture 39 - Techniques in Mechanobiology: Microfabrication

Lecture 40 - Techniques in Mechanobiology: FRET

NPTEL : NOC:Introductory Mathematical Methods for Biologists (Biotechnology)

Co-ordinators : Dr. Ranjith Padinhateeri

Lecture 1 - Introduction

Lecture 2 - Graphs and Functions

Lecture 3 - Equations as Graphs

Lecture 4 - Graphs : Exponential and Periodic Functions

Lecture 5 - Graphs : Logarithmic and Other Functions

Lecture 6 - Images as 2D/3D Functions

Lecture 7 - Functions and its Derivatives

Lecture 8 - Computing Derivatives of Curves

Lecture 9 - Rules for Calculating Derivatives

Lecture 10 - Understanding Derivatives

Lecture 11 - Curvature and Second Derivative

Lecture 12 - Plotting Curves

Lecture 13 - Numerical Calculation of Derivatives

Lecture 14 - Function, Derivatives and Series Expansion

Lecture 15 - L'Hopital's Rule and Partial Derivatives

Lecture 16 - Integration

Lecture 17 - Integration : Rules

Lecture 18 - Integration : Graphical Understanding

Lecture 19 - Integration : More Examples

Lecture 20 - Integration : Product of Two Functions

Lecture 21 - Exponential Growth and Decay

Lecture 22 - Scalars and Vectors

Lecture 23 - Vectors : Position and Movement in 2D

Lecture 24 - Cell Symmetry : Use of Polar Coordinates

Lecture 25 - Gradient, Forces and Flows : Part I

Lecture 26 - Gradient, Forces and Flows : Part II

Lecture 27 - Understanding Diffusion

Lecture 28 - Diffusion Constant and Einstein Relation 1905

Lecture 29 - Diffusion Equation

Lecture 30 - Diffusion vs. Active Transport

Lecture 31 - Nernst Equation

Lecture 32 - Fourier Series : Part I

Lecture 33 - Fourier Series : Part II

Lecture 34 - Fourier Transform

Lecture 35 - Introduction to Statistics

Lecture 36 - Mean, Standard deviation and Distribution

Lecture 37 - Frequency Distribution and Probability Distribution

Lecture 38 - Binomial Distribution

Lecture 39 - Normal Distribution

Lecture 40 - Hypothesis Testing and Mathematical Modeling

NPTEL : NOC:Bioengineering: An Interface with Biology and Medicine (Biotechnology)

Co-ordinators : Prof. Sanjeeva Srivastava

Lecture 1 - Why biology for engineers - Part I

Lecture 2 - Why biology for engineers - Part II

Lecture 3 - Life processes and Cell

Lecture 4 - Cell and its properties

Lecture 5 - Cliniciana€™s Perspective - I

Lecture 6 - Nucleic Acid and Central Dogma

Lecture 7 - DNA Tools: Gene Cloning - I

Lecture 8 - DNA Tools: Gene Cloning - II

Lecture 9 - DNA Tools and Biotechnology - I

Lecture 10 - DNA Tools and Biotechnology - II

Lecture 11 - DNA Tools and Biotechnology - III

Lecture 12 - DNA Tools and Biotechnology - IV

Lecture 13 - DNA Tools and Biotechnology - V

Lecture 14 - DNA Tools and Biotechnology - VI

Lecture 15 - Cliniciana€™s Perspective - II

Lecture 16 - Genetics - I

Lecture 17 - Genetics - II

Lecture 18 - Genetics - III

Lecture 19 - Genetics - IV

Lecture 20 - Cliniciana€™s Perspective - III

Lecture 21 - Chromosomal basis of inheritance

Lecture 22 - Linkage, chromosomal disorders

Lecture 23 - Classical Genetics Experiments

Lecture 24 - Bacteria and Viruses

Lecture 25 - Cliniciana€™s Perspective - IV

Lecture 26 - Cell cycle disregulation and Cancer

Lecture 27 - Developmental Biology

Lecture 28 - Principles and application of Animal Cloning

Lecture 29 - Evolution

Lecture 30 - Cliniciana€™s Perspective - V

Lecture 31 - Amino acids and proteins

Lecture 32 - Proteins and Proteomics

Lecture 33 - Techniques to Study Protein and Proteome - I

Lecture 34 - Techniques to Study Protein and Proteome - II

Lecture 35 - Bioinformatics - I

Lecture 36 - Techniques to Study Protein and Proteome - III

Lecture 37 - Protein Interactions and Microarrays

Lecture 38 - Protein interactions and Systems biology

Lecture 39 - Bioinformatics - II

Lecture 40 - Ethics in Research and Publications

NPTEL : NOC:Applications of Interactomics using Genomics and Proteomics Technologies (Biotechnology)

Co-ordinators : Prof. Sanjeeva Srivastava

Lecture 1 - Introduction to Interactomics and Protein Arrays

Lecture 2 - NAPPA Technology and Protein Arrays - I

Lecture 3 - NAPPA Technology and Protein Arrays - II

Lecture 4 - Biomarkers: Harnessing the immune system for early detection of disease - I

Lecture 5 - Biomarkers: Harnessing the immune system for early detection of disease - II

Lecture 6 - Biomarkers: Harnessing the immune system for early detection of disease - III

Lecture 7 - NAPPA and its applications in study of antibody immune response in disease and in drug Screening - I

Lecture 8 - NAPPA and its applications in study of antibody immune response in disease and in drug screening - II

Lecture 9 - NAPPA and its applications in study of antibody immune response in disease and in drug screening - III

Lecture 10 - Using functional proteomics to identify biomarkers and therapeutic targets - I

Lecture 11 - Using functional proteomics to identify biomarkers and therapeutic targets - II

Lecture 12 - Applications of protein microarrays in Malaria Research - I

Lecture 13 - Applications of protein microarrays in Malaria Research - II

Lecture 14 - Applications of protein microarrays in Cancer Research - I

Lecture 15 - Applications of protein microarrays in Cancer Research - II

Lecture 16 - Introduction to Bioprinting and IrisÃ¢ Optical QC Benefits - I

Lecture 17 - Introduction to Bioprinting and IrisÃ¢ Optical QC Benefits - II

Lecture 18 - Basics and Applications of Reverse Phase Protein Arrays - I

Lecture 19 - Basics and Applications of Reverse Phase Protein Arrays - II

Lecture 20 - Basics and Applications of Reverse Phase Protein Arrays - III

Lecture 21 - Antibody signatures defined by high-content peptide microarray analysis

Lecture 22 - An overview of label-free technologies - I

Lecture 23 - An overview of label-free technologies - II

Lecture 24 - Mass Spectrometry coupled Interactomics - I

Lecture 25 - Mass Spectrometry coupled Interactomics - II

Lecture 26 - Biomolecular interactions using Bio-Layer Interferometry (BLI) - I

Lecture 27 - Biomolecular interactions using Bio-Layer Interferometry (BLI) - II

Lecture 28 - Biomolecular interaction analytics using MicroScale Thermophoresis

Lecture 29 - Surface Plasmon Resonance- Principles and Assays - I

Lecture 30 - Surface Plasmon Resonance- Principles and Assays - II

Lecture 31 - Use of SPR in unravelling domain motif interactions of proteasomal assembly chaperones

Lecture 32 - Next-Generation Sequencing Technology- Ion TorrentÃ¢

Lecture 33 - NGS Technology- Bioinformatics and data analysis - I

Lecture 34 - NGS Technology- Bioinformatics and data analysis - II

Lecture 35 - Next-Generation Sequencing Technology-MiSeq System

Lecture 36 - NGS target enrichment workflow for exomes, targeted panels and beyond

Lecture 37 - The Human Pathology Atlas: A Pathology Atlas of the Human Transcriptome - I

Lecture 38 - The Human Pathology Atlas: A Pathology Atlas of the Human Transcriptome - II

Lecture 39 - Conclusions and Overview - I (Statistical analysis - I)

Lecture 40 - Conclusions and overview - II (Statistical analysis - II)

NPTEL : NOC:Introduction to Proteogenomics (Biotechnology)

Co-ordinators : Prof. Sanjeeva Srivastava

Lecture 1 - Proteogenomics overview - I

Lecture 2 - Proteogenomics overview - II

Lecture 3 - Introduction to Genomics - Part I : Gene sequencing and mutations

Lecture 4 - Introduction to Genomics - Part II : Sequence Alignment

Lecture 5 - Introduction to Genomics - Part III : Transcriptome

Lecture 6 - Perspectives in Proteogenomics - I

Lecture 7 - Advancement in Cancer Genomics

Lecture 8 - Introduction to Genomics - Part IV : Epigenome

Lecture 9 - Introduction to Genomics - cBioPortal

Lecture 10 - Genotype, Gene expression and Phenotype - I

Lecture 11 - Genotype, Gene expression and Phenotype - II

Lecture 12 - An overview of NGS technology

Lecture 13 - NGS - Sequencing by synthesis - I

Lecture 14 - NGS - Sequencing by synthesis - II

Lecture 15 - Introduction to Proteomics

Lecture 16 - Proteomics: Sample Prep and Protein Quantification

Lecture 17 - Applications of Proteomics

Lecture 18 - Introduction to MS-based Proteomics - I

Lecture 19 - Introduction to MS-based Proteomics - II

Lecture 20 - Applications of NGS - IonTorrent

Lecture 21 - Genomic Analysis using Droplet PCR - I

Lecture 22 - Introduction to MS-based Proteomics - I (Hands-on session)

Lecture 23 - Introduction to MS-based Proteomics - II (Hands-on session)

Lecture 24 - Data analysis : Normalization

Lecture 25 - Data analysis : Batch Correction and Missing values

Lecture 26 - Data analysis : Statistical Test

Lecture 27 - Genomic Analysis using Droplet PCR - II

Lecture 28 - Topics in Proteogenomics : Malaria case study

Lecture 29 - Machine learning and Clustering

Lecture 30 - Hypothesis testing

Lecture 31 - ProTIGY - I

Lecture 32 - ProTIGY - II

Lecture 33 - Proteomics Data Analysis

Lecture 34 - Proteomics Lab Demonstration - I

Lecture 35 - Proteomics Lab Demonstration - II

Lecture 36 - Workflow to Automated Data Processing

Lecture 37 - Introduction to Fire Cloud

Lecture 38 - FireCloud and Data Model

Lecture 39 - Bioinformatics solutions for Big Data Analysis - I

Lecture 40 - Bioinformatics solutions for Big Data Analysis - II

Lecture 41 - Introduction to Targeted Proteomics

Lecture 42 - Data analysis using Skyline

Lecture 43 - Large-scale data Science - I

Lecture 44 - Large-scale data Science - II

Lecture 45 - Large-scale data Science - III

Lecture 46 - DIA-SWATH Atlas - I

Lecture 47 - DIA-SWATH Atlas - II

Lecture 48 - Prediction Analysis

Lecture 49 - Pathway Enrichment and Network Analysis

Lecture 50 - Human Protein Atlas - I

Lecture 51 - Human Protein Atlas - II

Lecture 52 - Affinity based proteomics & HPA

Lecture 53 - Clinical Considerations for OMICS - I

Lecture 54 - Clinical Considerations for OMICS - II

Lecture 55 - Topics in Proteogenomics: Cancer case study

Lecture 56 - Integrative Genomics Viewer (IGV)

Lecture 57 - Introduction to Proteogenomics - I

Lecture 58 - Introduction to Proteogenomics - II

Lecture 59 - Sequence centric proteogenomics

Lecture 60 - Variant Analysis

Lecture 61 - Proteomics - Clinical Applications

Lecture 62 - Perspectives in Proteogenomics - II

Lecture 63 - Predictive Analysis - I

Lecture 64 - Predictive Analysis - II

Lecture 65 - Association/ Marker Selection

Lecture 66 - WebGestalt - I

Lecture 67 - WebGestalt - II

Lecture 68 - Perspectives in Proteogenomics - III

Lecture 69 - Network Analysis - I

Lecture 70 - Network Analysis - II

Lecture 71 - Mutations and Signaling - I

Lecture 72 - Mutations and Signaling - II

Lecture 73 - Pathway Enrichment - I

Lecture 74 - Perspectives in Proteogenomics - IV

Lecture 75 - Pathway Enrichment - II

Lecture 76 - Sequence - GSEA

Lecture 77 - Linked Omics - I

Lecture 78 - Linked Omics - II

Lecture 79 - Proteogenomics - Opportunities and Challenges

Lecture 80 - Perspectives in Proteogenomics - V

NPTEL : NOC:Interactomics: Basics and Applications (Biotechnology)

Co-ordinators : Prof. Sanjeeva Srivastava

Lecture 1 - Introduction to Proteomics

Lecture 2 - Introduction to Interactomics

Lecture 3 - High throughput platforms of interactomics: Protein arrays

Lecture 4 - Cell-free expression based protein microarrays

Lecture 5 - NAPPA: Recombinational Cloning, Basic workflow, Surface Chemistry, Printing and Assessment

Lecture 6 - NAPPA Technology and Protein Arrays - I

Lecture 7 - NAPPA Technology and Protein Arrays - II

Lecture 8 - Biomarkers: Harnessing the immune system for early detection of disease - I

Lecture 9 - Biomarkers: Harnessing the immune system for early detection of disease - II

Lecture 10 - Biomarkers: Harnessing the immune system for early detection of disease - III

Lecture 11 - NAPPA and its applications in study of antibody immune response in disease and in drug screening - I

Lecture 12 - NAPPA and its applications in study of antibody immune response in disease and in drug screening - II

Lecture 13 - NAPPA and its applications in study of antibody immune response in disease and in drug screening - III

Lecture 14 - Using functional proteomics to identify biomarkers and therapeutic targets - I

Lecture 15 - Using functional proteomics to identify biomarkers and therapeutic targets - II

Lecture 16 - Applications of protein microarrays in Malaria Research - I

Lecture 17 - Applications of protein microarrays in Malaria Research - II

Lecture 18 - Introduction to Bioprinting and IrisOptical QC Benefits - I

Lecture 19 - Introduction to Bioprinting and IrisOptical QC Benefits - II

Lecture 20 - Screening of autoantibody signatures in cancer patients: Lab demonstration

Lecture 21 - Basics of Image Scanning and data acquisition

Lecture 22 - Applications of protein arrays in identification of autoantibody signatures - I

Lecture 23 - Applications of protein arrays in identification of autoantibody signatures - II

Lecture 24 - Applications of protein microarrays in deciphering PTMs and biological networks

Lecture 25 - Basics and Applications of Reverse Phase Protein Arrays - I

Lecture 26 - Basics and Applications of Reverse Phase Protein Arrays - II

Lecture 27 - Basics and Applications of Reverse Phase Protein Arrays - III

Lecture 28 - An overview of label-free technologies

Lecture 29 - Surface Plasmon Resonance - Principles and Assays - I

Lecture 30 - Surface Plasmon Resonance - Principles and Assays - II

Lecture 31 - Basics of SPR: Surface chemistry

Lecture 32 - Basics of SPR: Experimental design

Lecture 33 - Protein immobilization for protein-protein interaction studies

Lecture 34 - Protein-protein interaction study: Binding analysis

Lecture 35 - Protein-protein interaction study: Kinetic analysis

Lecture 36 - Use of SPR in unravelling domain motif interactions of proteasomal assembly chaperones

Lecture 37 - Protein-small molecule interaction study: Immobilization and binding analysis

Lecture 38 - Protein-small molecule interaction study: Kinetic analysis

Lecture 39 - An introduction to biolayer interferometry (BLI)and its applications in protein research

Lecture 40 - Biomolecular interactions using Bio-Layer Interferometry (BLI) - I

Lecture 41 - Biomolecular interactions using Bio-Layer Interferometry (BLI) - II

Lecture 42 - Lab session- An introduction to BioLayer Interferometry (BLI) and its applications in protein research

Lecture 43 - Applications of label-free technologies - II

Lecture 44 - Biomolecular interaction analytics using MicroScale Thermophoresis

Lecture 45 - Mass Spectrometry coupled Interactomics - I

Lecture 46 - Mass Spectrometry coupled Interactomics - II

Lecture 47 - Next-Generation Sequencing Technology - Ion Torrent

Lecture 48 - NGS Technology - Bioinformatics and data analysis - I

Lecture 49 - NGS Technology - Bioinformatics and data analysis - II

Lecture 50 - Next-Generation Sequencing Technology- Illumina

Lecture 51 - Agilent complete NGS target enrichment workflow for exomes, targeted panels and beyond

Lecture 52 - The Human Pathology Atlas: A Pathology Atlas of the Human Transcriptome - I

Lecture 53 - The Human Pathology Atlas: A Pathology Atlas of the Human Transcriptome - II

Lecture 54 - Statistical Analysis - I

Lecture 55 - Statistical Analysis - II

Lecture 56 - Secondary Data Analysis

Lecture 57 - Pathway Enrichment and Network Analysis

Lecture 58 - Data Repositories and Databases

Lecture 59 - Application of multi-omics approach for better understanding of cancers

Lecture 60 - Integrated Omics and Systems Biology- Conclusion

NPTEL : NOC:Maternal Infant Young Child Nutrition (Biotechnology)

Co-ordinators : Prof. Rupal Dalal

Lecture 1

Lecture 2

Lecture 3

Lecture 4

Lecture 5

Lecture 6

Lecture 7

Lecture 8

Lecture 9

Lecture 10

Lecture 11

Lecture 12

Lecture 13

Lecture 14

Lecture 15

Lecture 16

Lecture 17

Lecture 18

Lecture 19

Lecture 20

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

Lecture 26

Lecture 27

Lecture 28

Lecture 29

Lecture 30

Lecture 31

Lecture 32

Lecture 33

Lecture 34

Lecture 35

Lecture 36

Lecture 37

Lecture 38

Lecture 39

Lecture 40

Lecture 41

Lecture 42

Lecture 43

Lecture 44

Lecture 45

Lecture 46

Lecture 47

Lecture 48

Lecture 49

Lecture 50

Lecture 51

Lecture 52

Lecture 53

Lecture 54

Lecture 55

Lecture 56

Lecture 57

Lecture 58

Lecture 59

Lecture 60

Lecture 61

NPTEL : NOC:Maternal Infant Young Child Nutrition (Hindi) (Biotechnology)

Co-ordinators : Prof. Rupal Dalal

Lecture 1 - à¤ªà¤¹à¤²à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤à¤¨à¤šà¤«à¤, 5 à¤¡à¥‡à¤Ÿà¤¾

Lecture 2 - à¤¡à¥,à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤•à¤¾à¤°à¥à¤¯à¤•à¥à¤·à¥‡à¤¤à¥à¤° à¤¸à¥‡ à¤¸à¤¾à¤•à¥à¤·à¥à¤¯

Lecture 3 - à¤¤à¥€à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤®à¤¾à¤¤à¥ƒ à¤¶à¤¿à¤¶à¥ à¤¯à¥à¤µà¤¾ à¤¬à¤¾à¤² à¤ªà¥‹à¤·à¤£ à¤•à¥€ à¤°à¥,à¤ªà¤°à¥‡à¤–à¤¾ à¤”à¤° à¤•à¥à¤·à¤®à¤¤à¤¾ à¤¨à¤¿à¤°à¥à¤®à¤¾à¤£

Lecture 4 - à¤ªà¤¹à¤²à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤²à¤¾à¤‡à¤µ à¤¸à¥‡à¤¶à¤¨

Lecture 5 - à¤¡à¥,à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤ªà¤¹à¤²à¥‡ à¤ªà¥à¤°à¤•à¤¾à¤° à¤”à¤° à¤¡à¥,à¤¸à¤°à¥‡ à¤ªà¥à¤°à¤•à¤¾à¤° à¤•à¥‡ à¤ªà¥‹à¤·à¤• à¤¤à¤¤à¥à¤µ - à¤¹à¥‡à¤²à¥à¤¥ à¤¸à¥à¤ªà¥‹à¤•à¤¨ à¤Ÿà¥à¤¯à¥,à¤Ÿà¥‹à¤°à¤¿à¤¯à¤²

Lecture 6 - à¤¤à¥€à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤ªà¥à¤°à¥‹à¤Ÿà¥€à¤¨ à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 7 - à¤šà¥Œà¤¥à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤•à¥‹à¤²à¥€à¤¨ à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 8 - à¤ªà¤¾à¤,à¤šà¤µà¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤«à¥‹à¤²à¥‡à¤Ÿ à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 9 - à¤›à¤ à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤¬à¥€ 12 à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 10 - à¤¸à¤¾à¤¤à¤µà¤¾à¤, à¤²à¥‡à¤•à¥à¤šà¤° : à¤¸à¥‡à¤²à¥‹à¤¨à¤¿à¤¯à¤® à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ à¤µà¤¿à¤Ÿà¤¾à¤®à¤¿à¤¨ à¤ à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 11 - à¤ªà¤¹à¤²à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤•à¥^à¤²à¥à¤¶à¤¿à¤¯à¤® à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 12 - à¤¡à¥,à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤®à¥^à¤—à¥à¤¨à¥€à¤¶à¤¿à¤¯à¤® à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 13 - à¤¤à¥€à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤ªà¥‹à¤Ÿà¥‡à¤¶à¤¿à¤¯à¤® à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 14 - à¤šà¥Œà¤¥à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤œà¤,à¤• à¤«à¥,à¤¡

Lecture 15 - à¤ªà¤¾à¤,à¤šà¤µà¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤‡à¤,à¤¸à¥à¤²à¤¿à¤¨ à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 16 - à¤›à¤ à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤®à¥^à¤•à¥à¤°à¥‹à¤¨à¥à¤¯à¥,à¤Ÿà¥à¤°à¤¿à¤à¤,à¤Ÿà¥à¤¤, à¤•à¤¾ à¤ªà¤°à¤¿à¤šà¤¯

Lecture 17 - à¤ªà¤¹à¤²à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤ªà¤¹à¤²à¥‡ 1,000 à¤¦à¤¿à¤¨

Lecture 18 - à¤¡à¥,à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤—à¤°à¥à¤à¤µà¤¤à¥€ à¤®à¤¹à¤¿à¤²à¤¾à¤“ à¤•à¥‡ à¤²à¤¿à¤ à¥›à¤°à¥,à¤°à¥€ à¤ªà¥‹à¤·à¤£ à¤•à¥à¤°à¤¿à¤¯à¤¾à¤

Lecture 19 - à¤¤à¥€à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤†à¤¯à¤¨ à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 20 - à¤šà¥Œà¤¥à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤µà¤¿à¤Ÿà¤¾à¤®à¤¿à¤¨ à¤,à¥€ à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 21 - à¤ªà¤¾à¤,à¤šà¤µà¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤,à¤²à¥à¤«à¤° à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 22 - à¤ªà¤¹à¤²à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤,à¥à¤¤à¤¨à¤ªà¤¾à¤¨ à¤•à¤¾ à¤µà¤¿à¤œà¥à¤žà¤¾à¤¨

Lecture 23 - à¤¡à¥,à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤,à¥à¤¨à¤¹à¤°à¤¾ à¤˜à¤,à¤Ÿà¤¾ à¤”à¤° à¤–à¥€à¤, à¤ªà¤¿à¤²à¤¾à¤¨à¥‡ à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 24 - à¤¤à¥€à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤,à¥à¤¤à¤¨à¤ªà¤¾à¤¨ à¤•à¤¾ à¤®à¤¹à¤¤à¥à¤µ

Lecture 25 - à¤šà¥Œà¤¥à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤¬à¥à¤°à¥‡à¤,à¥à¤Ÿ à¤•à¥à¤°à¥‰à¤²

Lecture 26 - à¤ªà¤¾à¤,à¤šà¤µà¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤,à¥à¤¤à¤¨à¤ªà¤¾à¤¨ à¤•à¥€ à¤°à¤•à¥à¤·à¤¾ à¤•à¥‡ à¤²à¤¿à¤ à¤¬à¤¨à¤¾à¥‡ à¤-à¤¾à¤°à¤¤à¥€à¤¯ à¤•à¤¾à¤¨à¥,à¤¨

Lecture 27 - à¤›à¤ à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤¨à¤µà¤œà¤¾à¤¤ à¤¶à¤¿à¤¶à¥ à¤•à¥‡ à¤²à¥‡à¤– à¤²à¤¿à¤–à¤¨à¤¾ à¤²à¥€ à¥›à¤°à¥,à¤°à¥€ à¤¬à¤¾à¤¤à¥‡à¤, - à¤¨à¤µà¤œà¤¾à¤¤ à¤¶à¤¿à¤¶à¥ à¤•à¥‹ à¤¨à¤²à¤¾à¤¨à¥‡ à¤•à¤¾ à¤¤à¤°à¥€à¤•à¤¾

Lecture 28 - à¤¸à¤¾à¤¤à¤µà¤¾à¤‚ à¤²à¥‡à¤•à¥à¤šà¤° : à¤•à¤‚à¤—à¤¾à¤°à¥‚, à¤®à¤¦à¤° à¤•à¥‡à¤¯à¤° - à¤Ÿà¥‹à¤ªà¥€ à¤•à¥‡ à¤¸à¤¾à¤¥ à¤•à¤‚à¤—à¤¾à¤°à¥‚, à¤¬à¥ˆà¤— à¤¬à¤¨à¤¾à¤¨à¥‡ à¤•à¤¾ à¤¤à¤°à¥€à¤•à¤¾

Lecture 29 - à¤ªà¤¹à¤²à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤®à¤¾à¤ à¤•à¥€ à¤¤à¥ˆà¤¯à¤¾à¤°à¥€ à¤”à¤° à¤¬à¤šà¥à¤šà¥‡ à¤•à¥€ à¤¸à¥à¤¥à¤¿à¤¤à¤¿

Lecture 30 - à¤¦à¥‚à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤¸à¥à¤¤à¤¨ à¤•à¥‹ à¤ªà¤•à¤¡à¤¼à¤¨à¤¾ à¤”à¤° à¤¬à¤šà¥à¤šà¥‡ à¤•à¥‹ à¤¸à¥à¤¤à¤¨ à¤¸à¥‡ à¤²à¤—à¤¾à¤¨à¤¾

Lecture 31 - à¤¤à¥€à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤…à¤¨à¥à¤¯ à¤ªà¤°à¤¾à¤®à¤°à¥à¤¶ à¤¬à¤¿à¤‚à¤¦à¥

Lecture 32 - à¤šà¥Œà¤¥à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤•à¥à¤°à¥‰à¤¸ à¤•à¥à¤°à¥‡à¤¡à¤² à¤¸à¥à¤¥à¤¿à¤¤à¤¿ à¤”à¤° à¤²à¥ˆà¤šà¤¿à¤‚à¤— à¤ªà¤° à¤¹à¥‡à¤²à¥à¤¥ à¤¸à¥à¤ªà¥‹à¤•à¤¨ à¤Ÿà¥à¤¯à¥‚à¤Ÿà¥‹à¤°à¤¿à¤¯à¤²

Lecture 33 - à¤ªà¤¾à¤‚à¤šà¤µà¤¾ à¤²à¥‡à¤•à¥à¤šà¤°: à¤•à¥à¤°à¥‰à¤¸ à¤•à¥à¤°à¥‡à¤¡à¤² à¤¸à¥à¤¥à¤¿à¤¤à¤¿ à¤®à¥‡à¤‚, à¤¬à¤šà¥à¤šà¥‡ à¤•à¥‹ à¤¦à¥‚à¤§ à¤ªà¤¿à¤²à¤¾à¤¨à¥‡ à¤®à¥‡à¤‚ à¤†à¤¨à¥‡ à¤µà¤¾à¤²à¥€ à¤¸à¤®à¤¸à¥à¤¯à¤¾à¤“à¤‚ à¤•à¤¾ à¤¸à¤®à¤¾à¤§à¤¾à¤¨

Lecture 34 - à¤›à¤ à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤¸à¥à¤¥à¤¿à¤¤à¤¿ à¤”à¤° à¤—à¤¹à¤°à¥‡ à¤œà¥à¤¡à¤¼à¤¾à¤µ à¤•à¥‡ à¤²à¤¾à¤‡à¤µ à¤µà¥€à¤¡à¤¿à¤¯à¥‹

Lecture 35 - à¤ªà¤¹à¤²à¤¾ à¤²à¥‡à¤•à¥à¤šà¤°-à¤… : à¤¸à¥à¤¤à¤¨à¤ªà¤¾à¤¨ à¤•à¥‡ à¤²à¤¿à¤ à¤«à¥à¤Ÿà¤¬à¥‰à¤² à¤ªà¤•à¤¡à¤¼

Lecture 36 - à¤¦à¥‚à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤°-à¤… : à¤à¤• à¤¤à¤°à¤« à¤²à¥‡à¤Ÿ à¤•à¤° à¤¸à¥à¤¤à¤¨à¤ªà¤¾à¤¨ à¤•à¤°à¤¾à¤¨à¥‡ à¤•à¥€ à¤ªà¤•à¤¡à¤¼

Lecture 37 - à¤¤à¥€à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤°-à¤… : à¤¸à¥à¤¤à¤¨à¤ªà¤¾à¤¨ à¤•à¤¾à¤°à¤•à¥‹à¤‚, à¤”à¤° à¤…à¤¨à¥à¤¯ à¤•à¤¾à¤°à¤•à¥‹à¤‚, à¤•à¥‡ à¤•à¤¾à¤°à¤£ à¤•à¤® à¤µà¥›à¤¨ à¤¬à¥à¤¨à¤¾|

Lecture 38 - à¤šà¥Œà¤¥à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤•à¥‹à¤µà¤¿à¤¡ - 19 à¤•à¥‡ à¤¦à¥Œà¤°à¤¾à¤¨ à¤¸à¥à¤¤à¤¨à¤ªà¤¾à¤¨

Lecture 39 - à¤ªà¤¾à¤‚à¤šà¤µà¤¾ à¤²à¥‡à¤•à¥à¤šà¤°-à¤… : à¤¹à¤¾à¤¥ à¤¸à¥‡ à¤¸à¥à¤¤à¤¨ à¤•à¤¾ à¤¦à¥‚à¤§ à¤¨à¤¿à¤•à¤¾à¤²à¤¨à¤¾

Lecture 40 - à¤›à¤ à¤¾ à¤²à¥‡à¤•à¥à¤šà¤°-à¤… : à¤¸à¥à¤¤à¤¨à¤ªà¤¾à¤¨ à¤•à¤°à¤¾à¤¤à¥€ à¤®à¤¾à¤“à¤‚ à¤•à¥‡ à¤¨à¤¿à¤ªà¥à¤ªà¤² à¤•à¥€ à¤¸à¥à¤¥à¤¿à¤¤à¤¿

Lecture 41 - à¤ªà¤¹à¤²à¤¾ à¤²à¥‡à¤•à¥à¤šà¤°-à¤… : 6 à¤¸à¥‡ 24 à¤®à¤¹à¥€à¤¨à¥‡ à¤•à¥‡ à¤¶à¤¿à¤¶à¥à¤“à¤‚ à¤•à¥‡ à¤²à¤¿à¤ à¤ªà¥‚à¤°à¤• à¤†à¤¹à¤¾à¤° à¤•à¥‡ à¤¸à¤‚à¤¬à¤‚à¤§ à¤®à¥‡à¤‚, à¤¦à¤¿à¤¶à¤¾-à¤¨à¤¿à¤°à¥à¤¦à¥‡à¤¶

Lecture 42 - à¤¦à¥‚à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤°-à¤… : à¤¶à¤¿à¤¶à¥ à¤•à¥‹ à¤–à¤¾à¤¨à¤¾ à¤¬à¤¨à¤¾à¤¨à¥‡ à¤”à¤° à¤–à¤¿à¤²à¤¾à¤¤à¥‡ à¤¹à¥à¤ à¤–à¥à¤¦ à¤•à¥€ à¤¸à¤«à¤¾à¤ˆ à¤•à¥€ à¥›à¤°à¥‚à¤°à¤¤

Lecture 43 - à¤¤à¥€à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤°-à¤… : 6 à¤®à¤¹à¥€à¤¨à¥‡ à¤•à¥‡ à¤¬à¤šà¥à¤šà¥‹à¤‚ à¤•à¥‡ à¤²à¤¿à¤ à¤¶à¤¾à¤•à¤¾à¤¹à¤¾à¤°à¥€ à¤”à¤° à¤®à¤¾à¤‚à¤¸à¤¾à¤¹à¤¾à¤°à¥€ à¤–à¤¾à¤¨à¤¾ à¤¬à¤¨à¤¾à¤¨à¥‡ à¤•à¥‡ à¤¤à¤°à¥€à¤•à¥‡

Lecture 44 - à¤šà¥Œà¤¥à¤¾ à¤²à¥‡à¤•à¥à¤šà¤°-à¤… : 7 à¤®à¤¹à¥€à¤¨à¥‡ à¤•à¥‡ à¤¬à¤šà¥à¤šà¥‹à¤‚ à¤•à¥‡ à¤²à¤¿à¤ à¤¶à¤¾à¤•à¤¾à¤¹à¤¾à¤°à¥€ à¤–à¤¾à¤¨à¤¾ à¤¬à¤¨à¤¾à¤¨à¥‡ à¤•à¥‡ à¤¤à¤°à¥€à¤•à¥‡

Lecture 45 - à¤ªà¤¾à¤‚à¤šà¤µà¤¾ à¤²à¥‡à¤•à¥à¤šà¤°-à¤… : 8 à¤¸à¥‡ 11 à¤®à¤¹à¥€à¤¨à¥‡ à¤•à¥‡ à¤¬à¤šà¥à¤šà¥‹à¤‚ à¤•à¥‡ à¤²à¤¿à¤ à¤¶à¤¾à¤•à¤¾à¤¹à¤¾à¤°à¥€ à¤–à¤¾à¤¨à¤¾ à¤¬à¤¨à¤¾à¤¨à¥‡ à¤•à¥‡ à¤¤à¤°à¥€à¤•à¥‡

Lecture 46 - à¤ªà¤¹à¤²à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤ªà¥‚à¤°à¤• à¤†à¤¹à¤¾à¤° à¤•à¥‡ à¤¦à¥Œà¤°à¤¾à¤¨ à¤¹à¥‹à¤¨à¥‡ à¤µà¤¾à¤²à¥€ à¤¸à¤®à¤¸à¥à¤¯à¤¾à¤à¤‚

Lecture 47 - à¤¦à¥‚à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : 12 à¤¸à¥‡ 18 à¤®à¤¹à¥€à¤¨à¥‡ à¤•à¥‡ à¤¬à¤šà¥à¤šà¥‹à¤‚ à¤•à¥‡ à¤²à¤¿à¤ à¤¶à¤¾à¤•à¤¾à¤¹à¤¾à¤°à¥€ à¤–à¤¾à¤¨à¤¾ à¤¬à¤¨à¤¾à¤¨à¥‡ à¤•à¥‡ à¤¤à¤°à¥€à¤•à¥‡|

Lecture 48 - à¤¤à¥€à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : 19 à¤¸à¥‡ 24 à¤®à¤¹à¥€à¤¨à¥‡ à¤•à¥‡ à¤¬à¤šà¥à¤šà¥‹à¤‚ à¤•à¥‡ à¤²à¤¿à¤ à¤¶à¤¾à¤•à¤¾à¤¹à¤¾à¤°à¥€ à¤–à¤¾à¤¨à¤¾ à¤¬à¤¨à¤¾à¤¨à¥‡ à¤•à¥‡ à¤¤à¤°à¥€à¤•à¥‡ |

Lecture 49 - à¤šà¥Œà¤¥à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤¬à¤šà¥à¤šà¥‹à¤‚ à¤•à¥€ à¤ªà¤¾à¤°à¥à¤Ÿà¤¿à¤¯à¥‹à¤‚ à¤•à¥‡ à¤²à¤¿à¤ à¤¸à¥à¤µà¤¾à¤¦à¤¿à¤·à¥à¤Ÿ à¤–à¤¾à¤¨à¤¾ à¤¬à¤¨à¤¾à¤¨à¥‡ à¤•à¥‡ à¤¤à¤°à¥€à¤•à¥‡ |

Lecture 50 - à¤ªà¤¹à¤²à¤¾ à¤²à¥‡à¤•à¥à¤šà¤° : à¤•à¤¿à¤¶à¥‹à¤°à¥‹à¤‚ à¤•à¥‡ à¤²à¤¿à¤ à¤¶à¤¾à¤•à¤¾à¤¹à¤¾à¤°à¥€ à¤”à¤° à¤®à¤¾à¤‚à¤¸à¤¾à¤¹à¤¾à¤°à¥€ à¤–à¤¾à¤¨à¤¾ à¤¬à¤¨à¤¾à¤¨à¥‡ à¤•à¥‡ à¤¤à¤°à¥€à¤•à¥‡| à¤ªà¥‚à¤°à¥à¤µ à¤—à¤°à¥à¤-à¤¾à¤µà¤¸à¥à¤¥à¤¾ à¤ªà¥‹à¤·à¤£

Lecture 51 - à¤¦à¥‚à¤°à¤¾à¤²à¥‡à¤•à¤¾à¤°à¤¾ à¤²à¥‡à¤•à¤° : à¤—à¤°à¥à¤à¤µà¤¤à¤¿à¤¯à¤¾ à¤•à¤¿ à¤²à¤¿à¤¯à¤¾ à¤ªà¥Œà¤·à¥à¤Ÿà¤¿à¤• à¤¶à¤¾à¤•à¤¾à¤¹à¤¾à¤°à¥€ à¤”à¤° à¤®à¤¾à¤‚à¤¸à¤¾à¤¹à¤¾à¤°à¥€ à¤–à¤¾à¤¨à¤¾ à¤¬à¤¨à¤¾à¤¨à¥‡ à¤•à¥‡ à¤¤à¤°à¥€à¤•à¥‡

Lecture 52 - à¤¤à¥€à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¤¾à¤°à¤¾ à¤²à¥à¤¤à¤¨à¤¾à¤¨ à¤•à¤°à¤¾à¤¨à¥‡ à¤µà¤¾à¤²à¥€ à¤®à¤¾à¤“à¤, à¤•à¥‡ à¤²à¤¿à¤¯à¤¾ à¤ªà¥Œà¤·à¥à¤Ÿà¤¿à¤• à¤¶à¤¾à¤•à¤¾à¤¹à¤¾à¤°à¥€ à¤”à¤° à¤®à¤¾à¤‚à¤¸à¤¾à¤¹à¤¾à¤°à¥€ à¤–à¤¾à¤¨à¤¾ à¤¬à¤¨à¤¾à¤¨à¥‡ à¤•à¥‡ à¤¤à¤°à¥€à¤•à¥‡

Lecture 53 - à¤ªà¤¹à¤²à¤²à¤¾ à¤²à¥‡à¤•à¤°à¥à¤¯à¤¾à¤¨ : à¤¡à¤¾à¤¯à¤²à¥à¤¯à¤¾à¤¨à¤“ à¤¬à¤¹à¥à¤•à¥‡à¤¤à¤¾,à¤¡à¤¾à¤¯à¤°à¥€à¤¯à¤¾ à¤µà¤¿à¤•à¤¾à¤¸à¤¾,à¤¡à¤¾à¤¯à¤°à¥à¤¯à¤¾ à¤…à¤§à¥à¤¯à¤¯à¤¨ (1997-2003)| à¤ªà¥à¤°à¤¤à¤¿à¤¶à¤¤à¤• à¤µà¥ƒà¤¤à¤¾à¤§à¤¿ à¤šà¤¾à¤°à¥à¤Ÿ

Lecture 54 - à¤¦à¥‚à¤°à¤¾à¤²à¥‡à¤•à¤¾à¤°à¤¾ à¤²à¤¾à¤®à¤¾à¤¨à¥à¤¯ à¤µà¤¿à¤šà¤²à¤¨| à¤¡à¤¾à¤¯à¥à¤²à¥à¤¯à¤¾à¤šà¤“ à¤œà¥‡à¤¡ à¤¸à¥à¤•à¥‡à¤¤à¤° à¤šà¤¾à¤°à¥à¤Ÿ

Lecture 55 - à¤¤à¥€à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¤¾à¤°à¤¾:à¤¡à¤¾à¤¯à¥à¤²à¥à¤¯à¤¾à¤šà¤“-à¤‰à¤®à¥à¤°à¤¾ à¤•à¥‡ à¤¹à¤¿à¤¸à¤¾à¤¬ à¤¸à¥‡ à¤µà¥›à¤¨ à¤”à¤° à¤²à¤¿à¤¯à¤¾à¤ˆ à¤µà¥ƒà¤¤à¤¾à¤§à¤¿ à¤šà¤¾à¤°à¥à¤Ÿ à¤ªà¤° à¤¬à¤¨à¥‡ à¤¸à¥à¤ªà¥‹à¤•à¤•à¤¨ à¤Ÿà¥à¤¯à¥‹à¤‚à¤Ÿà¥‹à¤°à¤¿à¤¯à¤²

Lecture 56 - à¤šà¥Œà¤¥à¤¾ à¤²à¥‡à¤•à¤¾à¤°à¤¾ : à¤à¤¸à¥à¤¥à¤¾à¥‹à¤ªà¥‹à¤®à¥‡à¤à¤Ÿà¥à¤°à¤¿à¤• à¤®à¤¾à¤ª

Lecture 57 - à¤ªà¤¹à¤²à¤¾ à¤²à¥‡à¤•à¤¾à¤°à¤¾ : à¤¸à¥à¤¤à¤¨à¤¾à¤¨ à¤•à¥‡ à¤²à¤¿à¤ à¥ªà¥« à¤ªà¤°à¤¾à¤®à¤°à¥à¤¶ à¤¬à¤¿à¤¸à¤¾à¤¬à¥ - à¤à¤¾à¤— 1

Lecture 58 - à¤¦à¥‚à¤°à¤¾à¤²à¥‡à¤•à¤¾à¤°à¤¾ : à¤¸à¥à¤¤à¤¨à¤¾à¤¨ à¤•à¥‡ à¤²à¤¿à¤ à¥ªà¥« à¤ªà¤°à¤¾à¤®à¤°à¥à¤¶ à¤¬à¤¿à¤¸à¤¾à¤¬à¥ - à¤à¤¾à¤— 2| à¤¸à¥à¤¤à¤¨à¤¾à¤¨ à¤®à¥‚à¤²à¥à¤¯à¤¾à¤¨ à¤«à¥‰à¤°à¥à¤®

Lecture 59 - à¤¤à¥€à¤¸à¤°à¤¾ à¤²à¥‡à¤•à¤¾à¤°à¤¾ : à¤ªà¥‹à¤·à¤£ à¤šà¤¾à¤°à¥à¤Ÿ

Lecture 60 - à¤šà¥Œà¤¥à¤¾ à¤²à¥‡à¤•à¤¾à¤°à¤¾ : à¤²à¤°à¥à¤¨à¤¿à¤— à¤à¤¾à¥à¤°à¥‹à¤Ÿà¥‹à¤•à¥‰à¤² - à¤à¤¾à¤— 1

Lecture 61 - à¤ªà¤¾à¤à¤µà¤¾ à¤²à¥‡à¤•à¤¾à¤°à¤¾ : à¤²à¤°à¥à¤¨à¤¿à¤— à¤à¤¾à¥à¤°à¥‹à¤Ÿà¥‹à¤•à¥‰à¤² - à¤à¤¾à¤— 2

Lecture 62 - à¤›à¤¾ à¤²à¥‡à¤•à¤¾à¤°à¤¾ : à¤®à¤¾à¤¤à¥ƒ, à¤¶à¤¿à¤¶à¥ à¤”à¤° à¤¬à¤¾à¤² à¤ªà¥‹à¤·à¤£ à¤•à¥‡ à¤²à¥à¤¯à¤°à¤®à¥à¤¯à¤¤à¤¾à¤¨à¤¿à¤¯à¥

NPTEL : Enzyme Science and Engineering (Biotechnology)

Co-ordinators : Prof. Subhash Chand

Lecture 1 - Introduction and Scope to Enzyme Science and Engineering

Lecture 2 - Characteristic Features of Enzymes

Lecture 3 - Enzymes as Biocatalysts

Lecture 4 - Enzymatic Catalysis

Lecture 5 - Specificity of Enzyme Action

Lecture 6 - Kinetics of Enzyme Catalyzed Reactions

Lecture 7 - Kinetics of Enzyme Catalyzed Reactions

Lecture 8 - Deviation from Hyperbolic Enzyme Kinetics

Lecture 9 - Role of Effector Molecules in Enzyme Kinetics

Lecture 10 - Reversible Inhibition

Lecture 11 - Effect of PH and Temperature on Enzyme

Lecture 12 - Kinetics of Bi substrate Enzyme

Lecture 13 - Kinetics of Bi substrate Enzyme

Lecture 14 - Immobilized Enzymes - I

Lecture 15 - Immobilized Enzymes - II

Lecture 16 - Immobilized Enzymes - III

Lecture 17 - Immobilization of Enzymes by Entrapment

Lecture 18 - Effect of Immobilization

Lecture 19 - Reactors for Enzyme Catalyzed Reactions

Lecture 20 - Idealized Enzyme Reactor Performance

Lecture 21 - Idealized Enzyme Reactor Performance

Lecture 22 - Kinetic Parameters for IME Systems

Lecture 23 - Steady State Analysis of Mass Transfer

Lecture 24 - Steady State Analysis of Mass Transfer

Lecture 25 - Non Ideal Flow in Continuous Immobilized Enzyme

Lecture 26 - Applications of Immobilized Enzymes in Process

Lecture 27 - Analytical Applications

Lecture 28 - Enzyme Technology Challenges

NPTEL : NOC:Introduction to Dynamical Models in Biology (Biotechnology)

Co-ordinators : Prof. Biplab Bose

Lecture 1 - Mathematical modeling in Biology

Lecture 2 - How to Start Modeling

Lecture 3 - Modeling the spread of infectious disease

Lecture 4 - Modeling population growth

Lecture 5 - Numerical solution of ODE-1

Lecture 6 - Numerical solution of ODE-2

Lecture 7 - Simulating ODE-based models: Introduction to JSim

Lecture 8 - Simulating ODE-based models: Examples of simulation in JSim

Lecture 9 - Steady state and stability analysis: Understanding Steady State

Lecture 10 - Steady state and stability analysis: Stability of Steady States

Lecture 11 - Phase Plane Analysis - I

Lecture 12 - Phase Plane Analysis - II

Lecture 13 - Concepts of Bifurcation:Introduction

Lecture 14 - Concepts of Bifurcation:Bifurcation in Biological Systems

Lecture 15 - Modeling Molecular Processes in Cell: Introduction

Lecture 16 - Modeling Molecular Processes in Cell: Receptor-Ligand Interaction

Lecture 17 - Modeling Molecular Processes in Cell: Enzymatic Processes

Lecture 18 - Modeling Molecular Processes in Cell: Transcription and Translation

Lecture 19 - Modeling Cell Signaling: Negative Feedback Motif

Lecture 20 - Modeling Cell Signaling: Positive Feedback Motif

Lecture 21 - Modeling Cell Signaling: Incoherent Feedforward Motif

Lecture 22 - Modeling Transcriptional Circuits-1

Lecture 23 - Modeling Transcriptional Circuits-2

Lecture 24 - Online Resources for Mathematical Modeling in Biology

NPTEL : NOC:Genetic Engineering: Theory and Application (Biotechnology)

Co-ordinators : Dr. Vishal Trivedi

Lecture 1 - Cellular Structure - Part I

Lecture 2 - Cellular Structure - Part II

Lecture 3 - Cellular Structure - Part III

Lecture 4 - Metabolic Reactions in Biological System

Lecture 5 - Growth Media For Different Expression System

Lecture 6 - Microbial Growth Kinetics

Lecture 7 - Isolation of a Gene Fragment - Part I

Lecture 8 - Isolation of a Gene Fragment - Part II

Lecture 9 - Isolation of a Gene Fragment - Part III

Lecture 10 - Polymerase Chain Reaction

Lecture 11 - Molecular Tools for Cloning

Lecture 12 - Cloning Vectors - I

Lecture 13 - Cloning Vectors - II

Lecture 14 - DNA Delivery In Host - Part I

Lecture 15 - DNA Delivery In Host - Part II

Lecture 16 - Screening of Recombinant Clones

Lecture 17 - Protein Production in Host - Part 1

Lecture 18 - Protein Production in Host - Part 2

Lecture 19 - Protein Production in Host - Part 3

Lecture 20 - Product Recovery from Host Cells

Lecture 21 - Basics of Chromatography - Part 1

Lecture 22 - Basics of Chromatography - Part 2

Lecture 23 - Ion-exchange Chromatography

Lecture 24 - Hydrophobic Interaction Chromatography

Lecture 25 - Gel Filtration chromatography - Part 1

Lecture 26 - Gel Filtration chromatography - Part 2

Lecture 27 - Affinity Chromatography - Part 1

Lecture 28 - Affinity Chromatography - Part 2

Lecture 29 - Affinity Chromatography - Part 3

Lecture 30 - Affinity Chromatography - Part 4

Lecture 31 - Electrophoresis - Part 1

Lecture 32 - Electrophoresis - Part 2

Lecture 33 - Electrophoresis - Part 3

Lecture 34 - Protein Sequencing

Lecture 35 - Spectroscopy - Part I

Lecture 36 - Spectroscopy - Part II

Lecture 37 - Biotechnology Applications - Part 1

Lecture 38 - Biotechnology Applications - Part 2

Lecture 39 - Biotechnology Applications - Part 3

Lecture 40 - Summary and Conclusions - Part 1

Lecture 41 - Summary and Conclusions - Part 2

NPTEL : NOC:Experimental Biotechnology (Biotechnology)

Co-ordinators : Dr. Vishal Trivedi

Lecture 1 - Good Lab Practices - Part 1

Lecture 2 - Good Lab Practices - Part 2

Lecture 3 - Operation of Laboratory Instruments - Part 1

Lecture 4 - Operation of Laboratory Instruments - Part 2

Lecture 5 - Operation of Laboratory Instruments - Part 3

Lecture 6 - Solution and Buffer Preparation

Lecture 7 - Basics of Electrophoresis - Part 1

Lecture 8 - Basics of Electrophoresis - Part 2

Lecture 9 - Horizontal Gel Electrophoresis

Lecture 10 - Different Varients of Gel Electrophoresis

Lecture 11 - Scientific Questions - Part 1

Lecture 12 - Scientific Questions - Part 2

Lecture 13 - Scientific Questions - Part 3

Lecture 14 - Scientific Questions - Part 4

Lecture 15 - Basics of Chromatography - Part 1

Lecture 16 - Basics of Chromatography - Part 2

Lecture 17 - Ion-Exchange Chromatography - Part 1

Lecture 18 - Ion-Exchange Chromatography - Part 2

Lecture 19 - Hydrophobic Interaction Chromatography

Lecture 20 - Gel Filtration Chromatography - Part 1

Lecture 21 - Gel Filtration Chromatography - Part 2

Lecture 22 - Gel Filtration Chromatography - Part 3

Lecture 23 - Affinity Chromatography - Part 1

Lecture 24 - Affinity Chromatography - Part 2

Lecture 25 - Affinity Chromatography - Part 3

Lecture 26 - Affinity Chromatography - Part 4

Lecture 27 - Antibody Generation

Lecture 28 - Antibody-Antigen Interaction - Part 1

Lecture 29 - Immunoassay

Lecture 30 - Antibody-Antigen Interaction - Part 2

Lecture 31 - Antibody-Antigen Interaction - Part 3

Lecture 32 - Cell Culture Medium

Lecture 33 - Cell Fractionation

Lecture 34 - Microscopy - Part 1

Lecture 35 - Microscopy - Part 2

Lecture 36 - Cell Biology Experiments

Lecture 37 - Flow Cytometry

Lecture 38 - Polymerase Chain Reaction - Part 1

Lecture 39 - Polymerase Chain Reaction - Part 2

Lecture 40 - Polymerase Chain Reaction - Part 3

Lecture 41 - Polymerase Chain Reaction - Part 4

Lecture 42 - Sequencing Techniques

Lecture 43 - Blotting Techniques - Part 1

Lecture 44 - Blotting Techniques - Part 2

Lecture 45 - Designing Experiments

NPTEL : NOC:Biointerface Engineering (Biotechnology)

Co-ordinators : Prof. Lalit M. Pandey

Lecture 1 - Intermolecular Forces

Lecture 2 - Classification of Intermolecular Forces

Lecture 3 - Thermodynamics Aspects of Intermolecular Forces

Lecture 4 - Surface Tension and Energy

Lecture 5 - Wettability

Lecture 6 - Adhesion and Cohesion

Lecture 7 - Methods for Surface Tension Measurement

Lecture 8 - Methods for Contact Angle Measurement

Lecture 9 - Determination of Surface Tension of Solids

Lecture 10 - Protein Adsorption

Lecture 11 - Characterization of Protein Adsorption

Lecture 12 - Kinetics of Protein Adsorption

Lecture 13 - Aggregation of Proteins

Lecture 14 - Kinetics of Protein Aggregation

Lecture 15 - Effect of Surfaces on the Aggregation of Protein

Lecture 16 - Host Responses to Biomaterials

Lecture 17 - Cell Adhesion

Lecture 18 - Biocompatibility of Biomaterials

Lecture 19 - Surface Modification

Lecture 20 - Surface Modification Techniques

Lecture 21 - Coating of Calcium Phosphates on Ti-6Al-4V

Lecture 22 - Surface Characterization

Lecture 23 - Self-Assembled Monolayers

Lecture 24 - Effect of SAMs on Biointerfacial Interactions

NPTEL : NOC:Basics of Biology (Biotechnology)

Co-ordinators : Prof. Vishal Trivedi

Lecture 1 - Introduction to Living Organisms

Lecture 2 - Classification of Living Organisms - Part 1

Lecture 3 - Classification of Living Organisms - Part 2

Lecture 4 - Classification of Living Organisms - Part 3

Lecture 5 - Classification of Living Organisms - Part 4

Lecture 6 - Origin of Life - Part 1

Lecture 7 - Origin of Life - Part 2

Lecture 8 - Evolution - Part 1

Lecture 9 - Evolution - Part 2

Lecture 10 - Evolution - Part 3

Lecture 11 - Basics of Cells - Part 1

Lecture 12 - Basics of Cells - Part 2

Lecture 13 - Basics of Cells - Part 3

Lecture 14 - Cell Division and regulation

Lecture 15 - Nucleic acids

Lecture 16 - Carbohydrates - Part 1

Lecture 17 - Carbohydrates - Part 2

Lecture 18 - Carbohydrates - Part 3

Lecture 19 - Lipids

Lecture 20 - Proteins - Part 1

Lecture 21 - Proteins - Part 2

Lecture 22 - Proteins - Part 3

Lecture 23 - Proteins - Part 4

Lecture 24 - Central Dogma of Life

Lecture 25 - Replication

Lecture 26 - Polymerase chain reaction

Lecture 27 - Transcription - Part 1

Lecture 28 - Transcription - Part 2

Lecture 29 - Translation - Part 1

Lecture 30 - Translation - Part 2

Lecture 31 - Immune system - Part 1

Lecture 32 - Immune system - Part 2

Lecture 33 - Phagocytosis

Lecture 34 - Cell Death and Apoptosis

Lecture 35 - Vesicular Transport

Lecture 36 - Digestion - Part 1

Lecture 37 - Digestion - Part 2

Lecture 38 - Digestion - Part 3

Lecture 39 - Circulatory System - Part 1

Lecture 40 - Circulatory System - Part 2

Lecture 41 - Muscular System - Part 1

Lecture 42 - Muscular System - Part 2

Lecture 43 - Nervous System - Part 1

Lecture 44 - Nervous System - Part 2

Lecture 45 - Nervous System - Part 3

Lecture 46 - Homeostasis - Part 1

Lecture 47 - Homeostasis - Part 2

Lecture 48 - Homeostasis - Part 3

Lecture 49 - Summary and Conclusions - Part 1

Lecture 50 - Summary and Conclusions - Part 2

NPTEL : NOC:Data Analysis for Biologists (Biotechnology)

Co-ordinators : Prof. Biplab Bose

Lecture 1 - Rules of probability

Lecture 2 - Discrete probability distribution

Lecture 3 - Continuous probability distribution

Lecture 4 - Moments: mean and variance

Lecture 5 - Moments: variance and covariance

Lecture 6 - Bayes theorem and likelihood

Lecture 7 - Concept of statistical tests

Lecture 8 - Vector and vector operations

Lecture 9 - Matrix and matrix operations

Lecture 10 - Determinant and Inverse of a matrix

Lecture 11 - Eigenvalue and eigenvector

Lecture 12 - Linear system of equations

Lecture 13 - Singular value decomposition

Lecture 14 - Getting ready with R

Lecture 15 - Algebraic and logical operations in R

Lecture 16 - Reading and writing data

Lecture 17 - Statistics using R - descriptive statistics

Lecture 18 - Statistics using R - t-test and ANOVA

Lecture 19 - Linear algebra using R

Lecture 20 - Scatter plot, Line plot and Bar plot

Lecture 21 - Histogram and Box plot

Lecture 22 - Heatmap and Volcano plot

Lecture 23 - Network visualization

Lecture 24 - Data visualization using ggplot2 - I

Lecture 25 - Data visualization using ggplot2 - II

Lecture 26 - Correlations

Lecture 27 - Linear regression - I

Lecture 28 - Linear regression - II

Lecture 29 - Linear regression using R

Lecture 30 - Multiple linear regression

Lecture 31 - Multiple linear regression using R

Lecture 32 - Nonlinear regression

Lecture 33 - Nonlinear regression using R

Lecture 34 - Clustering and classification

Lecture 35 - Logistic regression

Lecture 36 - Logistic regression using R

Lecture 37 - Distance mesaures for clustering

Lecture 38 - k-means clustering

Lecture 39 - k-means clustering using R

Lecture 40 - Hierarchical clustering

Lecture 41 - Hierarchical clustering using R

Lecture 42 - Decision tree classifier

Lecture 43 - Support vector machines

Lecture 44 - Higher-dimensional data in biology

Lecture 45 - Principle component analysis

Lecture 46 - Principle component analysis using R

Lecture 47 - t-SNE

Lecture 48 - t-SNE using R

Lecture 49 - Diffusion maps

NPTEL : NOC:Genome Editing and Engineering (Biotechnology)

Co-ordinators : Prof. Utpal Bora

Lecture 1 - Introduction: Genes and Genome Organization

Lecture 2 - History and Basics of Genetic Engineering

Lecture 3 - Advantages and Limitations of Genetic Engineering

Lecture 4 - Breakage of Genomic DNA

Lecture 5 - Repair of Genomic DNA

Lecture 6 - Homologous and non homologous recombination

Lecture 7 - Site specific recombination

Lecture 8 - Targeted genetic modification - I

Lecture 9 - Targeted genetic modification - II

Lecture 10 - Basics of Zinc Finger Nucleases

Lecture 11 - Design of Zinc Finger Nucleases for genome editing

Lecture 12 - Applications of Zinc Finger Nucleases - Part A

Lecture 13 - Applications of Zinc Finger Nucleases - Part B

Lecture 14 - Basics of TALEN - Part A

Lecture 15 - Basics of TALEN - Part B

Lecture 16 - Design of TALEN for genome editing - Part A

Lecture 17 - Design of TALEN for genome editing - Part B

Lecture 18 - Application of TALEN - Part A

Lecture 19 - Application of TALEN - Part B

Lecture 20 - CRISPR system in bacteria - Part A

Lecture 21 - CRISPR system in bacteria - Part B

Lecture 22 - CRISPR/Cas9 in Genome Editing - Part A

Lecture 23 - CRISPR/Cas9 in Genome Editing - Part B

Lecture 24 - Applications of CRISPR/Cas9 - Part A

Lecture 25 - Applications of CRISPR/Cas9 - Part B

Lecture 26 - Computational Resources for CRISPR / Cas - Part A

Lecture 27 - Computational Resources for CRISPR / Cas - Part B

Lecture 28 - Human cell engineering in diseases : Thalassemia - Part A

Lecture 29 - Human cell engineering in diseases : Thalassemia - Part B

Lecture 30 - Human cell engineering in diseases : Severe combined immunodeficiency (SCID) - Part A

Lecture 31 - Human cell engineering in diseases : Severe combined immunodeficiency (SCID) - Part B

Lecture 32 - Human cell engineering in diseases : Hemophilia - Part A

Lecture 33 - Human cell engineering in diseases : Hemophilia - Part B

Lecture 34 - Animal models - Part A

Lecture 35 - Animal models - Part B

Lecture 36 - iPSc models - Part A

Lecture 37 - iPSc models - Part B

Lecture 38 - Cancer disease models - Part A

Lecture 39 - Cancer disease models - Part B

Lecture 40 - Engineered immune cells for Cancer therapy (I) - Part A

Lecture 41 - Engineered immune cells for Cancer therapy (I) - Part B

Lecture 42 - Engineered immune cells for Cancer therapy (II) - Part A

Lecture 43 - Engineered immune cells for Cancer therapy (II) - Part B

Lecture 44 - History and Basics - Part A

Lecture 45 - History and Basics - Part B

Lecture 46 - Genome editing and personalized therapy

Lecture 47 - Bioethics and Biosafety - Part A

Lecture 48 - Bioethics and Biosafety - Part B

Lecture 49 - Regulatory issues in Genome Editing

NPTEL : NOC:Enzyme Sciences and Technology (Biotechnology)

Co-ordinators : Prof. Vishal Trivedi

Lecture 1 - Introduction to Enzymes

Lecture 2 - Basics of Enzyme

Lecture 3 - Enzyme Classification - Part I

Lecture 4 - Enzyme Classification - Part II

Lecture 5 - Enzyme Nomenclature

Lecture 6 - Primary Structure of Enzyme

Lecture 7 - Determination of Primary Structure

Lecture 8 - Secondary Structure of Protein

Lecture 9 - Tertiary Structure of Enzyme - Part I

Lecture 10 - Tertiary Structure of Enzyme - Part II

Lecture 11 - Molecular Modelling of Enzyme Structure - Part II

Lecture 12 - Identification of Enzyme Gene - Part II

Lecture 13 - Identification of Enzyme Gene - Part II

Lecture 14 - Polymerase Chain Reaction

Lecture 15 - Enzymes in Molecular Cloning

Lecture 16 - Cloning of Enzyme Coding Gene

Lecture 17 - DNA Delivery in host - Part I

Lecture 18 - DNA Delivery in host - Part II

Lecture 19 - Screening of Recombinant Clones

Lecture 20 - Over-expression of Enzyme in host - Part I

Lecture 21 - Over-expression of Enzyme in host - Part II

Lecture 22 - Over-expression of Enzyme in host - Part III

Lecture 23 - Host Cell Disruption Methods

Lecture 24 - Basics of Chromatography

Lecture 25 - Chromatography - Part I

Lecture 26 - Chromatography - Part II

Lecture 27 - Chromatography - Part III

Lecture 28 - Carbohydrate Metabolism

Lecture 29 - Lipid Metabolism

Lecture 30 - Amino acid Metabolism and Detoxification

Lecture 31 - Enzyme-Substrate Interactions - Part I - Chromatographic Methods

Lecture 32 - Enzyme-Substrate Interactions - Part II - Spectroscopic Methods

Lecture 33 - Enzyme-Substrate Interactions - Part III - ITC

Lecture 34 - Enzyme-Substrate Interactions - Part IV - SPR

Lecture 35 - Enzyme Assay System - Part I

Lecture 36 - Enzyme Assay System - Part II

Lecture 37 - Enzyme Assay System - Part III

Lecture 38 - Enzyme Kinetics

Lecture 39 - Inhibitor Designing - Part I - Traditional Approach

Lecture 40 - Inhibitor Designing - Part II - Modern Approach

Lecture 41 - Inhibitor Designing - Part III - Computational Approach

Lecture 42 - Enzyme Inhibition - Part I

Lecture 43 - Enzyme Inhibition - Part II

Lecture 44 - Application of Enzyme - Part I - Food Industry

Lecture 45 - Application of Enzyme - Part II - Medical Field

Lecture 46 - Enzyme in Drug Discovery

Lecture 47 - Enzymes in Environmental Field

NPTEL : NOC:Molecular Biology (Biotechnology)

Co-ordinators : Prof. Vishal Trivedi

Lecture 1 - Cellular Structure (Prokaryotic cells)

Lecture 2 - Cellular Structure (Eukarytotic cells)

Lecture 3 - Cellular Structure (Eukarytotic cells)

Lecture 4 - Cell Fractionation - Part 1

Lecture 5 - Cell Fractionation - Part 2

Lecture 6 - Cellular Metabolism - Part 1

Lecture 7 - Cellular Metabolism - Part 2

Lecture 8 - Cell Cycle and Control - Part 1

Lecture 9 - Cell Cycle and Control - Part 2

Lecture 10 - Program Cell Death

Lecture 11 - Biomolecules - Part 1 : DNA

Lecture 12 - Biomolecules - Part 2 : DNA Sequencing

Lecture 13 - Biomolecules - Part 2 : RNA

Lecture 14 - Amino acids

Lecture 15 - Protein

Lecture 16 - Enzymes

Lecture 17 - Genetic Material - Part 1

Lecture 18 - Genetic Material - Part 2

Lecture 19 - Genetic Material - Part 3

Lecture 20 - Central Dogma of Molecular Biology

Lecture 21 - Replication - Part 1 : Prokaryotic System

Lecture 22 - Replication - Part 2 : Prokaryotic System

Lecture 23 - Replication - Part 2 : Eukaryotic System

Lecture 24 - Mutagenesis and repair Mechanism

Lecture 25 - Transcription in Prokaryotic system

Lecture 26 - Transcription in Eukaryotic System

Lecture 27 - Post Transcriptional modifications

Lecture 28 - Gene Control Mechanism - Part 1

Lecture 29 - Gene Control Mechanism - Part 2

Lecture 30 - Translation in Prokaryotic system

Lecture 31 - Translation in Eukaryotic System

Lecture 32 - Post Translational modifications

Lecture 33 - Southern Blotting

Lecture 34 - Northern Blotting

Lecture 35 - Western Blotting - Part 1

Lecture 36 - Western Blotting - Part 2

Lecture 37 - Polymerase Chain Reaction - Part 1

Lecture 38 - Polymerase Chain Reaction - Part 2

Lecture 39 - Real-Time PCR

Lecture 40 - Cloning - Part 1

Lecture 41 - Cloning - Part 2

Lecture 42 - Cloning Vectors

Lecture 43 - DNA Delivery - Part 1

Lecture 44 - DNA Delivery - Part 2

Lecture 45 - Screening of Recombinant Clones

Lecture 46 - Protein Over-expression

Lecture 47 - Genome Editing - Part 1

Lecture 48 - Genome Editing - Part 2

Lecture 49 - Applications of Molecular Biology - Part 1

Lecture 50 - Applications of Molecular Biology - Part 2

Lecture 51 - Applications of Molecular Biology - Part 3

Lecture 52 - Applications of Molecular Biology - Part 4

NPTEL : NOC:Microbial Biotechnology (Biotechnology)

Co-ordinators : Prof. Utpal Bora

Lecture 1 - Introduction and principles of microbial biotechnology

Lecture 2 - Classification and taxonomy of microbes A

Lecture 3 - Classification and taxonomy of microbes B

Lecture 4 - Techniques for microbial Classification and Identification

Lecture 5 - Structure, life cycle and classification of viruses

Lecture 6 - Structure and life cycle of representative groups of prokaryotic microbes

Lecture 7 - Structure of cyanobacteria and archaea

Lecture 8 - Diversity and Structure of selected eukaryotic microorganisms

Lecture 9 - Life cycle of representative groups of microbes

Lecture 10 - Basic Physiology of Microorganisms

Lecture 11 - Physiology of Extremophiles and adaptation-energy storage, temperature, pH and pressure

Lecture 12 - Physiology of Extremophiles and adaptation-halophiles, xerophiles, radiophiles and mettalophiles

Lecture 13 - Genome structure, transcription, genetic code, translation

Lecture 14 - Regulation of gene expression

Lecture 15 - Microbial growth kinetics

Lecture 16 - Control methods: Physical methods

Lecture 17 - Control methods: Chemical methods

Lecture 18 - Control methods: Biological methods

Lecture 19 - Microorganisms in industry

Lecture 20 - Microorganisms in pharmaceutical industry

Lecture 21 - Microbial Enzymes of Industrial Importance

Lecture 22 - Engineered Microbial Consortia for Industry

Lecture 23 - Microbes in Agriculture

Lecture 24 - Microbial Biocontrol

Lecture 25 - Biopesticides and Integrated Pest Management

Lecture 26 - Microbial ecology, biogeochemical cycles

Lecture 27 - Microbial waste treatment methods

Lecture 28 - Microbial Bioremediation

Lecture 29 - Fermented Food - Foundations and Principles

Lecture 30 - Health Benefits, Risks and Advances in Food Fermentation

Lecture 31 - Fermented Beverages: Microbial Processes and Biotechnological Innovations

Lecture 32 - Industrial Fermentation and Health Aspects of Fermented Beverages

Lecture 33 - Single Cell Protein production

Lecture 34 - Production of biopharmaceuticals (Enzymes,antibodies and therapeutic proteins) using rDNA technology

Lecture 35 - Production of vaccines

Lecture 36 - Production of Biofuel using microbes

Lecture 37 - Microbial fuel Cells (MFCs) and microbial electrolysis cells (MECs)

Lecture 38 - Introduction to IPR, biotechnology patents, app. process, legal and ethical considerations

Lecture 39 - Patenting in microbial biotechnology, commercialization and future of microbial patenting

NPTEL : Animal Physiology (Biotechnology)

Co-ordinators : Prof. Mainak Das

Lecture 1 - Animal Physiology

Lecture 2 - Animal Physiology

Lecture 3 - Animal Physiology

Lecture 4 - Animal Physiology

Lecture 5 - Animal Physiology

Lecture 6 - Animal Physiology

Lecture 7 - Animal Physiology

Lecture 8 - Animal Physiology

Lecture 9 - Animal Physiology

Lecture 10 - Animal Physiology

Lecture 11 - Animal Physiology

Lecture 12 - Animal Physiology

Lecture 13 - Animal Physiology

Lecture 14 - Animal Physiology

Lecture 15 - Animal Physiology

Lecture 16 - Animal Physiology

Lecture 17 - Animal Physiology

Lecture 18 - Animal Physiology

Lecture 19 - Animal Physiology

Lecture 20 - Animal Physiology

Lecture 21 - Animal Physiology

Lecture 22 - Animal Physiology

Lecture 23 - Animal Physiology

Lecture 24 - Animal Physiology

Lecture 25 - Animal Physiology

Lecture 26 - Animal Physiology

Lecture 27 - Animal Physiology

Lecture 28 - Animal Physiology

Lecture 29 - Animal Physiology

Lecture 30 - Animal Physiology

Lecture 31 - Animal Physiology

Lecture 32 - Animal Physiology

Lecture 33 - Animal Physiology

Lecture 34 - Animal Physiology

Lecture 35 - Animal Physiology

Lecture 36 - Animal Physiology

Lecture 37 - Animal Physiology

Lecture 38 - Animal Physiology

Lecture 39 - Animal Physiology

Lecture 40 - Animal Physiology

NPTEL : Bio electricity (Biotechnology)

Co-ordinators : Prof. Mainak Das

Lecture 1 - Bio electricity

Lecture 2 - Bio electricity

Lecture 3 - Bio electricity

Lecture 4 - Bio electricity

Lecture 5 - Bio electricity

Lecture 6 - Bio electricity

Lecture 7 - Bio electricity

Lecture 8 - Bio electricity

Lecture 9 - Bio electricity

Lecture 10 - Bio electricity

Lecture 11 - Bio electricity

Lecture 12 - Bio electricity

Lecture 13 - Bio electricity

Lecture 14 - Bio electricity

Lecture 15 - Bio electricity

Lecture 16 - Bio electricity

Lecture 17 - Bio electricity

Lecture 18 - Bio electricity

Lecture 19 - Bio electricity

Lecture 20 - Bio electricity

Lecture 21 - Bio electricity

Lecture 22 - Bio electricity

Lecture 23 - Bio electricity

Lecture 24 - Bio electricity

Lecture 25 - Bio electricity

Lecture 26 - Bio electricity

Lecture 27 - Bio electricity

Lecture 28 - Bio electricity

Lecture 29 - Bio electricity

Lecture 30 - Bio electricity

Lecture 31 - Bio electricity

Lecture 32 - Bio electricity

Lecture 33 - Bio electricity

Lecture 34 - Bio electricity

Lecture 35 - Bio electricity

Lecture 36 - Bio electricity

Lecture 37 - Bio electricity

Lecture 38 - Bio electricity

Lecture 39 - Bio electricity

Lecture 40 - Bio electricity

NPTEL : NOC:Human Molecular Genetics (Biotechnology)

Co-ordinators : Mr.S. Ganesh

Lecture 1 - Fundamentals of central dogma, Part 1

Lecture 2 - Fundamentals of central dogma, Part 2

Lecture 3 - Fundamentals of central dogma, Part 3

Lecture 4 - Chromosome Structure and Function

Lecture 5 - Pedigree Analysis

Lecture 6 - Complications in Mendelian Pedigree Patterns

Lecture 7 - DNA Cloning and Hybridization Techniques - Part 1

Lecture 8 - DNA Cloning and Hybridization Techniques - Part 2

Lecture 9 - Practice Session 1: Problems Related to Pedigree Analysis

Lecture 10 - Practice Session 2: Restriction Fragment Length Polymorphism and its Applications in Pedigree Analysis

Lecture 11 - Mutations and instability of human DNA (Part 1)

Lecture 12 - Mutations and instability of human DNA (Part 2)

Lecture 13 - Animal Models for Human Diseases

Lecture 14 - Positional cloning of genes for monogenic disorders

Lecture 15 - Human Genome Project and HapMap project

NPTEL : NOC:Functional Genomics (Biotechnology)

Co-ordinators : S. Ganesh

Lecture 1 - Introduction to Functional Genomics

Lecture 2 - The Genomics Era

Lecture 3 - Epigenetics

Lecture 4 - Forward Genetics vs Reverse Genetics

Lecture 5 - Genome Editing Approaches - Part 1

Lecture 6 - Genome Editing Approaches - Part 2

Lecture 7 - Transcriptomics - Part 1

Lecture 8 - Transcriptomics - Part 2

Lecture 9 - Genome Sequence Databases

Lecture 10 - DNA Sequencing Methods - Part 1

Lecture 11 - DNA Sequencing Methods - Part 2

Lecture 12 - Applications of Next-Generation Sequencing (NGS)

Lecture 13 - Tutorial - Session 1

Lecture 14 - Tutorial - Session 2

Lecture 15 - Genomic Insight into Evolution

Lecture 16 - Genome sequence: Different Questions, Different Comparisons

Lecture 17 - Outcome of Comparative Genomics

Lecture 18 - Laboratory - Session 1

Lecture 19 - Laboratory - Session 2

NPTEL : NOC:Bioenergy (Biotechnology)

Co-ordinators : Prof. Mainak Das

Lecture 1 - Introduction

Lecture 2 - Oil Economy of the World

Lecture 3 - Unit of Energy and Introduction of Bioenergy

Lecture 4 - How Biomass Formed on the Earth

Lecture 5 - Road Map of Bioenergy

Lecture 6 - Basic Biomass Technology (Resources and Production)

Lecture 7 - Basics of Mechanism of Light Reaction

Lecture 8 - Exploration of Photosynthesis Process

Lecture 9 - In Photosynthesis Oxygen Comes from Water Molecule

Lecture 10 - Hill Reaction

Lecture 11 - Electron Transport Process in Light Reaction

Lecture 12 - How Carbon dioxide converted in Carbohydrate

Lecture 13 - From Carbon dioxide to two Molecules of 3 - Phospho Glycerate by RUBISCO

Lecture 14 - RUBISCO enzyme

Lecture 15 - Photo respiration and Calvin Cycle

Lecture 16 - Efficiency Calculation of Photosynthesis Process

Lecture 17 - C3 and C4 Plant Structure and Photosynthesis Process

Lecture 18 - Biomass production System and their Categorization

Lecture 19 - Important Parameters for Selecting Biomass Crops

Lecture 20 - Factors Determining the Conversion Process - I

Lecture 21 - Factors Determining the Conversion Process - II

Lecture 22 - Factors Determining the Conversion Process - III

Lecture 23 - Conversion Technology

Lecture 24 - Conversion Process- (Combustion Process)

Lecture 25 - Pyrolysis Process

Lecture 26 - Classification of Pyrolysis

Lecture 27 - Bio Oil - (Solution for Thermal Instability and Corrosivity)

Lecture 28 - Spark Ignition Engine

Lecture 29 - Compression Ignition Engine

Lecture 30 - Carbonization - Graphene like material

Lecture 31 - Introduction of Gasification

Lecture 32 - Thermo Chemical Process of Gasification

Lecture 33 - Feed Stock Treatment of Gasification

Lecture 34 - Feed Stock Property

Lecture 35 - Gasification Types - Up Drift Gasifier

Lecture 36 - Down drift and Cross Flow Gasifier

Lecture 37 - Operation and Performance of Fixed Bed Gasifier

Lecture 38 - Fludized Bed Gasification

Lecture 39 - Operation and Performance of Fluidized Bed Gasifier

Lecture 40 - Biological Root of Gasification and Summary of Course

NPTEL : NOC:Animal Physiology (Biotechnology)

Co-ordinators : Prof. Mainak Das

Lecture 1 - An Introduction to Anatomy and Physiology

Lecture 2 - Organization of living system

Lecture 3 - Homeostasis and system integration

Lecture 4 - Positive feedback loop in homeostasis

Lecture 5 - Chemical basis of organization of the body

Lecture 6 - Integumentary System - I

Lecture 7 - Integumentary system - II

Lecture 8 - Integumentary System - III

Lecture 9 - Bone and Cartilage - I

Lecture 10 - Bone and Cartilage - II

Lecture 11 - Introduction of muscle

Lecture 12 - Skeletal muscle formation

Lecture 13 - Anatomy of skeletal muscle

Lecture 14 - Contraction in muscle

Lecture 15 - Function of actin and myosin

Lecture 16 - Length tension relationship of skeletal muscle

Lecture 17 - Excitation contraction coupling with nervous system

Lecture 18 - Stretch reflex phenomena

Lecture 19 - Nervous system anatomy and signaling

Lecture 20 - Structure and circuit of neurons

Lecture 21 - Origin of biological cell

Lecture 22 - Excitability in cell

Lecture 23 - Ion transportation in the cell

Lecture 24 - Signal propagation in neurons

Lecture 25 - Neurotransmitter and action potential

Lecture 26 - Spatial temporal summation of signal in mesh neurons

Lecture 27 - Anatomy of Hippo-campus

Lecture 28 - Epilepsy and memory

Lecture 29 - Long term potentiation

Lecture 30 - Long term depression

Lecture 31 - Alzheimers disease

Lecture 32 - Parkinsons disease

Lecture 33 - Amyotrophic lateral sclerosis

Lecture 34 - Spinal cord injury

Lecture 35 - Glial cells

Lecture 36 - Stretch reflex arc circuit - I

Lecture 37 - Stretch reflex arc circuit - II

Lecture 38 - Neuro muscular junction

Lecture 39 - Hearing system

Lecture 40 - Olfaction system

Lecture 41 - Anatomy of eye

Lecture 42 - Eye lens and cataract

Lecture 43 - Structure of Retina

Lecture 44 - Image formation and processing in eyes

Lecture 45 - Mechanism of photo processing by rods

Lecture 46 - Structure and Function of Heart - I

Lecture 47 - Structure and Function of Heart - II

Lecture 48 - Conduction circuit of heart

Lecture 49 - Contractile system and Conducting system

Lecture 50 - EKG and Comparison of action potential between pace make cell and work cell

Lecture 51 - Respiratory Physiology

Lecture 52 - Anatomy and physiology of Blood vessels - I

Lecture 53 - Anatomy and Physiology of Blood vessels - II

Lecture 54 - Anatomy and physiology of blood vessels - III

Lecture 55 - Anatomy and physiology of blood vessels - IV

Lecture 56 - Endocrine system - I

Lecture 57 - Digestive system and Endocrine system - II

Lecture 58 - Blood

Lecture 59 - Kidney and immune system

Lecture 60 - Reproductive system

NPTEL : NOC:Cell Culture Technologies (Biotechnology)

Co-ordinators : Prof. Mainak Das

Lecture 1 - Introduction of Cell Culture Technology

Lecture 2 - Philosophy and complexity in cell culture

Lecture 3 - To grow the cell outside the body

Lecture 4 - Cell cycle concept

Lecture 5 - Dividing cells

Lecture 6 - Biology of cell culture

Lecture 7 - Layout(s) and design(s) of cell culture facility

Lecture 8 - Precautions during designing the lab layout - I

Lecture 9 - Precautions during designing the lab layout - II

Lecture 10 - Precautions during designing the lab layout - III

Lecture 11 - State of the art facility in cell culture lab - I

Lecture 12 - State of the art facility in cell culture lab - II

Lecture 13 - Specialized facility in cell culture lab

Lecture 14 - Interaction of cell and glass/polycorbonate surface - I

Lecture 15 - Interaction of cell and glass/polycorbonate surface - II

Lecture 16 - Poly D lysine deposition

Lecture 17 - Surface chemical analysis

Lecture 18 - Cell growth process

Lecture 19 - Cell surface interface

Lecture 20 - Cell culture substrate patterning

Lecture 21 - Introduction of define system

Lecture 22 - Mechanical dissociation of hippocampal tissue

Lecture 23 - Rules for mechanical dissociation of tissue

Lecture 24 - Drum molecule testing

Lecture 25 - Adult hippocampal neuron dissociation

Lecture 26 - Cell separation and In vitro myelination cell culture mode - I

Lecture 27 - Cell separation and In vitro myelination cell culture mode - II

Lecture 28 - Cell separation and In vitro myelination cell culture mode - III

Lecture 29 - Cell Separation and In vitro myelination cell culture mode - IV

Lecture 30 - Cell separation and in vitro myelination cell culture mode - V

Lecture 31 - Fluorescent assisted cell sorting

Lecture 32 - Condition for regenerated cells

Lecture 33 - Introduction of skeletal muscle cell culture

Lecture 34 - Skeletal muscle cell culture

Lecture 35 - Cardiac muscle cell culture

Lecture 36 - Advance cell culture modules - I

Lecture 37 - Advance cell culture modules - II

Lecture 38 - Advance cell culture modules - III

Lecture 39 - Advance cell culture modules - IV

Lecture 40 - Advance cell culture modules - V

NPTEL : NOC:Forest Biometry (Biotechnology)

Co-ordinators : Prof. Mainak Das, Dr. Ankur Awadhiya

Lecture 1 - Introduction

Lecture 2 - Recap of formulae: area and volume

Lecture 3 - Recap of trigonometry

Lecture 4 - Measurment of central tendency and dispersion

Lecture 5 - Graphical presentation of data

Lecture 6 - Shape of a tree: Form and Taper

Lecture 7 - Metzgers theory

Lecture 8 - Form factor and form quotients

Lecture 9 - Taper equations

Lecture 10 - Making the cuts

Lecture 11 - Cross-section of a tree

Lecture 12 - Where to measure the diameter

Lecture 13 - Callipers - Usages and Issues

Lecture 14 - Tape: Usage and issue

Lecture 15 - Measurement of bark and growth rings

Lecture 16 - Tree height: Direct and indirect measurements

Lecture 17 - Method of similar triangles: Shadow and sticks

Lecture 18 - Distance measurements: foot, tape and rangefinder

Lecture 19 - Angular measurement

Lecture 20 - LIDAR

Lecture 21 - Canopy attributes - Part I

Lecture 22 - Canopy attributes - Part II

Lecture 23 - Canopy attributes - Part III

Lecture 24 - Canopy cover and closure

Lecture 25 - Photogrammetry

Lecture 26 - Basal area of a tree and stand

Lecture 27 - Stand basal area, crop diameter and crop age

Lecture 28 - Point sampling - I

Lecture 29 - Point sampling - II

Lecture 30 - Number density and sample calculations

Lecture 31 - Volume: Direct calculations through sections

Lecture 32 - The Quarter - girth formula

Lecture 33 - Volume computations in the field

Lecture 34 - Volume Table

Lecture 35 - Forest Sampling

Lecture 36 - Density and mass measurement

Lecture 37 - Normalized difference vegetation Index (NDVI)

Lecture 38 - Site quality

Lecture 39 - Recap - I

Lecture 40 - Recap - II

NPTEL : NOC:Introduction to Professional and Scientific Communication (Biotechnology)

Co-ordinators : Mr. S. Ganesh

Lecture 1 - Introduction to the topic

Lecture 2 - Where do research ideas come from?

Lecture 3 - Inductive vs Deductive Reasoning

Lecture 4 - Scientific Hypothesis

Lecture 5 - Scientific Hypothesis (Continued...)

Lecture 6 - Testing the Hypothesis

Lecture 7 - Introduction to Scientific Writing

Lecture 8 - Writing an Abstract

Lecture 9 - Title for a Research Paper

Lecture 10 - Title and Keywords

Lecture 11 - Mileposts for the Article Writing

Lecture 12 - Writing the Methods Section

Lecture 13 - Writing the Results Section

Lecture 14 - Writing Results Section (Continued...)

Lecture 15 - How to Prepare Figures

Lecture 16 - How to Prepare Schematics

Lecture 17 - How to write Introduction and Discussion Sections

Lecture 18 - Finalizing the Manuscript and Ethics in Research

Lecture 19 - Writing a Research Proposal and Preparing for a Presentation

Lecture 20 - Tutorial Session : Oral communication

NPTEL : NOC:Bioelectrochemistry (Biotechnology)

Co-ordinators : Prof. Mainak Das

Lecture 1 - Basic Concepts - I

Lecture 2 - Basic Concepts - II

Lecture 3 - Key Terms

Lecture 4 - Galvanic Cells - I

Lecture 5 - Galvanic Cells - II

Lecture 6 - Salt Bridge

Lecture 7 - Standard Potentials - I

Lecture 8 - Standard Potentials - II

Lecture 9 - Standard Potentials - III

Lecture 10 - Nernst Equation

Lecture 11 - Relationship between Standard electrode potential (EÂ°) and Equilibrium constant (K)

Lecture 12 - Cell as chemical probe and Biochemist's formal potential

Lecture 13 - Concept of Concentration Cell - I

Lecture 14 - Concept of Concentration Cell - II

Lecture 15 - Bio-electrochemistry of excitable cells (nerve cells)

Lecture 16 - Types of electrodes

Lecture 17 - Critical care profile and metal electrode

Lecture 18 - pH measurement: Ion selective electrode

Lecture 19 - Redox indicators amperometry: glucose, oxygen sensors

Lecture 20 - Redox proteins, Metalloproteins and Cyclic Voltammetry

NPTEL : NOC:Bioenergetics of Life Processes (Biotechnology)

Co-ordinators : Prof. Mainak Das

Lecture 1 - Bioenergetics of Life Processes: An Overview

Lecture 2 - Bioenergetics: Origin of life

Lecture 3 - Iron-Sulfur world

Lecture 4 - Evolution of complex cellular membranes

Lecture 5 - Charge transfer across membrane: Key terms

Lecture 6 - Biological order and energy - I

Lecture 7 - Biological order and energy - II

Lecture 8 - Biological order and energy - III

Lecture 9 - Summary of thermodynamical parameters - I

Lecture 10 - Summary of thermodynamical parameters - II

Lecture 11 - Photosynthesis - I

Lecture 12 - Photosynthesis - II

Lecture 13 - Photosynthesis - III

Lecture 14 - Photosynthesis - IV

Lecture 15 - Photosynthesis - V

Lecture 16 - Photosynthesis - VI

Lecture 17 - Photosynthesis - VII

Lecture 18 - Photosynthesis - VIII

Lecture 19 - ATP Synthesis

Lecture 20 - Mitochondria and Chemiosmotic hypothesis

NPTEL : NOC:WildLife Conservation (Biotechnology)

Co-ordinators : Dr. Ankur Awadhiya

Lecture 1 - Preliminaries

Lecture 2 - A closer look at Biodiversity

Lecture 3 - Economics Valuation of Biodiversity

Lecture 4 - Threats to Biodiversity

Lecture 5 - Preliminaries

Lecture 6 - Basics of Sampling

Lecture 7 - Distance Sampling - I

Lecture 8 - Distance Sampling - II

Lecture 9 - Radio-telemetry

Lecture 10 - Behavioural monitoring

Lecture 11 - What is a habitat

Lecture 12 - Habitat degradation, loss, fragmentation and displacement

Lecture 13 - Reserve selection and design

Lecture 14 - Habitat management and improvement

Lecture 15 - Some terminologies

Lecture 16 - Some common wildlife diseases

Lecture 17 - Principles of disease management

Lecture 18 - Preliminaries

Lecture 19 - Mechanical capture

Lecture 20 - Chemical capture

Lecture 21 - Capture myopathy

Lecture 22 - Care of immobilised animal

Lecture 23 - Legal aspects of capture and restraint

Lecture 24 - Other topics in capture and restraint

Lecture 25 - Preliminaries and introduction to genetics

Lecture 26 - Population genetics

Lecture 27 - Chromosomal and genetic disorders, inbreeding

Lecture 28 - Population viability analysis

Lecture 29 - Reintroductions and outbreeding

Lecture 30 - Fundamentals

Lecture 31 - Zoos and their management

Lecture 32 - Botanical gardens

Lecture 33 - Other aspects: cryopreservation, seed banks, etc.

Lecture 34 - Impacts of climate change

Lecture 35 - Plastics and biodiversity

Lecture 36 - Oil spills

Lecture 37 - Crisis and learnings: The Sariska case-study

Lecture 38 - Revision - I

Lecture 39 - Revision - II

Lecture 40 - Revision - III

NPTEL : NOC:Nanotechnology in Agriculture (Biotechnology)

Co-ordinators : Prof. Mainak Das

Lecture 1 - Introduction

Lecture 2 - What is Nanotechnology

Lecture 3 - An outline

Lecture 4 - Agriculture: Natural versus Modern

Lecture 5 - Modern Agriculture: controlled or out of control

Lecture 6 - A Restart:Utilising Our Discoveries

Lecture 7 - Classifying nanomaterials Based on Shape and Geometry

Lecture 8 - Classifying Nanomaterials Based on Chemical Nature

Lecture 9 - Physical Approaches to Nanomaterial Synthesis

Lecture 10 - Biological and Chemical Approaches to Nanomaterial Synthesis

Lecture 11 - Detailed Physical Techniques - I

Lecture 12 - Detailed Physical Techniques - II

Lecture 13 - Detailed Chemical Techniques

Lecture 14 - Detailed Biological Techniques

Lecture 15 - Basic Characterisation Techniques of Nanomaterials

Lecture 16 - Characterisation techniques for physical and chemical surface properties of a material

Lecture 17 - Nanomaterials in Agriculture

Lecture 18 - Iron pyrite and seed pre-treatment

Lecture 19 - nano-Pyrite and its lab trial with chickpea

Lecture 20 - nano-Pyrite field trial with spinach and its mechanistic details

Lecture 21 - Mechanistic details of the action of Pyrite nano-particle

Lecture 22 - Application of Pyrite nano-particle in different crops

Lecture 23 - Application of different nano-particles in Agriculture - I

Lecture 24 - Benefits of nanoparticles in Agriculture

Lecture 25 - Nanotechnology in animal production

Lecture 26 - Antioxidant nanomaterial in animal production - I

Lecture 27 - Antioxidant nanomaterial in animal production - II

Lecture 28 - Antioxidant nanomaterial in animal production - III

Lecture 29 - Antioxidant nanomaterial in skeletal muscle development - I

Lecture 30 - Antioxidant nanomaterial in skeletal muscle development - II

Lecture 31 - Skeletal muscle development and nanomaterial intervention

Lecture 32 - Fabrication of nano-micro devices to study force generation in muscles

Lecture 33 - Summarising role of nanomaterials in animal production

Lecture 34 - Nanomaterials in food processing and preservation - I

Lecture 35 - Nanomaterials in food processing and preservation - II

Lecture 36 - Multifunctionality of nanomaterial: water purification, waste disposal, and energy

Lecture 37 - Futuristic multifunctional, sustainable and green nanomaterial

Lecture 38 - Case study of Titanium dioxide - I

Lecture 39 - Case study of Titanium dioxide - II

Lecture 40 - The future: evolving nano world

NPTEL : NOC:Wild Life Ecology (Biotechnology)

Co-ordinators : Dr. Ankur Awadhiya, Prof. Mainak Das

Lecture 1 - Introduction to the course

Lecture 2 - A historical overview of Ecology

Lecture 3 - Ecology and Evolution

Lecture 4 - The levels of organisation

Lecture 5 - Species abundance and composition: Biodiversity

Lecture 6 - Biodiversity - II

Lecture 7 - Positive Interactions

Lecture 8 - Negative Interactions

Lecture 9 - Study of Behaviour and Behavioral Ecology

Lecture 10 - Food chains, Food webs and trophic levels

Lecture 11 - Primary Production

Lecture 12 - Nutrient Cycles

Lecture 13 - Population parameters and demographic techniques

Lecture 14 - Population growth and regulation

Lecture 15 - Population studies and applications

Lecture 16 - Community nature and parameters

Lecture 17 - Community changes and ecological succession

Lecture 18 - Community organisation

Lecture 19 - Biography: Analysis of geographic distributions

Lecture 20 - Why are things where they are?

Lecture 21 - Some push and pull factors in greater detail

Lecture 22 - Threats to species

Lecture 23 - In-situ conservation

Lecture 24 - Ex-situ conservation

Lecture 25 - Introduction and impacts

Lecture 26 - Human population growth and food requirements

Lecture 27 - Sustainable development

Lecture 28 - Oil spills

Lecture 29 - Plastic and biodiversity

Lecture 30 - Impacts of climate change

Lecture 31 - Optimum yield problem

Lecture 32 - Biological control

Lecture 33 - Ecotoxicology and pollution management, Restoration ecology

Lecture 34 - Revision

Lecture 35 - Revision

Lecture 36 - Revision

NPTEL : NOC:Forests and their Management (Biotechnology)

Co-ordinators : Dr. Ankur Awadhiya

Lecture 1 - What is a forest ?

Lecture 2 - Classification of forests

Lecture 3 - Value of forests

Lecture 4 - What is Silviculture ?

Lecture 5 - Plant Growth Factors

Lecture 6 - Ecological Succession

Lecture 7 - Soil and Soil Profile

Lecture 8 - Major Soil Types

Lecture 9 - Nutrient Cycles

Lecture 10 - Tree Form

Lecture 11 - Measurement of Tree attributes - I

Lecture 12 - Measurement of Tree attributes - II

Lecture 13 - Classical Tools

Lecture 14 - Photogrammetry

Lecture 15 - LiDAR

Lecture 16 - Kinds of Threats

Lecture 17 - Forest Fire

Lecture 18 - Forest Law

Lecture 19 - Regeneration

Lecture 20 - Silvicultureal Systems

Lecture 21 - Clear Felling System

Lecture 22 - Shelterwood System - I

Lecture 23 - Shelterwood System - II

Lecture 24 - Selection System and Irregular Shelterwood System

Lecture 25 - Logging and Processing

Lecture 26 - Growing Stock and Increment

Lecture 27 - Yield and Sustained Yield

Lecture 28 - Seed Collection and Treatment

Lecture 29 - Nursery Techniques

Lecture 30 - Planting and Tending

Lecture 31 - NTFP

Lecture 32 - Social Forestry and Tribal Welfare

Lecture 33 - Conservation of Wild Animals

Lecture 34 - Revision - Part 1

Lecture 35 - Revision - Part 2

Lecture 36 - Revision - Part 3

NPTEL : NOC:Conservation Economics (Biotechnology)

Co-ordinators : Dr. Ankur Awadhiya

Lecture 1 - Introduction to the Course, Making Decisions - I

Lecture 2 - Making Decisions - II and Interactions - I

Lecture 3 - Intecractions-II and Working of the Economy

Lecture 4 - Conservation in the Anthropocene

Lecture 5 - Human population growth and food requirements

Lecture 6 - Unsustainable development

Lecture 7 - Climate change

Lecture 8 - Plastics

Lecture 9 - Oil spills and mining

Lecture 10 - Push and pull factors: Localisation of species

Lecture 11 - Threats to species

Lecture 12 - Developmental Hazards and Ecotoxicology

Lecture 13 - Need to understand controls

Lecture 14 - Thinking as an Economist

Lecture 15 - Interdependence and gains from trade

Lecture 16 - Demand and supply

Lecture 17 - Elasticity

Lecture 18 - Government policy

Lecture 19 - Surplus and market efficiency

Lecture 20 - Market Efficiency and Cost of Taxation

Lecture 21 - International Trade

Lecture 22 - Externalities

Lecture 23 - Public goods and common resources

Lecture 24 - The design of the tax system

Lecture 25 - The Costs of Production

Lecture 26 - Competition

Lecture 27 - Monopoly

Lecture 28 - Markets for factors of production

Lecture 29 - Earnings and discrimination

Lecture 30 - Income inequality and poverty

Lecture 31 - Consumer choice

Lecture 32 - Asymmetric information, Politics and Behavioural Economics

Lecture 33 - Valuation of natural resources

Lecture 34 - Economics of Protected Areas

Lecture 35 - Economics of Environmental Disasters - 1

Lecture 36 - Economics of Environmental Disasters - 2

NPTEL : NOC:Conservation Geography (Biotechnology)

Co-ordinators : Dr. Ankur Awadhiya

Lecture 1 - The need for conservation

Lecture 2 - Geography and conservation

Lecture 3 - Biogeography

Lecture 4 - Origin and evolution of the earth

Lecture 5 - Structure of the earth

Lecture 6 - Features of the earth

Lecture 7 - Rocks and minerals

Lecture 8 - Geomorphology and processes

Lecture 9 - Evolution of landforms

Lecture 10 - Structure and composition

Lecture 11 - Atmospheric circulation and weather

Lecture 12 - Climate and climate change

Lecture 13 - Structure and composition

Lecture 14 - Oceans and water movement

Lecture 15 - Hydrological cycle

Lecture 16 - Structure and physiography of India

Lecture 17 - Climate and habitats of India

Lecture 18 - Drainage systems

Lecture 19 - Soil

Lecture 20 - Life on Earth

Lecture 21 - Biodiversity

Lecture 22 - Threats to species

Lecture 23 - Ex-situ and in-situ conservation

Lecture 24 - Benefits from conservation

Lecture 25 - Population and population growth - I

Lecture 26 - Population and population growth - II

Lecture 27 - Human development and sustainable development

Lecture 28 - Resources and Conservation

Lecture 29 - Water Resources

Lecture 30 - Mineral and Energy Resources

Lecture 31 - Economic Geography and Conservation

Lecture 32 - Trade

Lecture 33 - Settlements

Lecture 34 - Special Topics in Geography and Conservation

Lecture 35 - Disasters

Lecture 36 - Valuation of Natural Resources

NPTEL : NOC:Neurobiology (Biotechnology)

Co-ordinators : Prof. Nitin Gupta

Lecture 1 - L1 Module 1

Lecture 2 - L1 Module 2

Lecture 3 - L1 Module 3

Lecture 4 - L1 Module 4

Lecture 5 - L1 Module 5

Lecture 6 - L1 Module 6

Lecture 7 - L1 Module 7

Lecture 8 - L1 Module 8

Lecture 9 - L1 Module 9

Lecture 10 - L2 Module 1

Lecture 11 - L2 Module 2

Lecture 12 - L2 Module 3

Lecture 13 - L2 Module 4

Lecture 14 - L2 Module 5

Lecture 15 - L2 Module 6

Lecture 16 - L2 Module 7

Lecture 17 - L2 Module 8

Lecture 18 - L2 Module 9

Lecture 19 - L3 Module 1

Lecture 20 - L3 Module 2

Lecture 21 - L3 Module 3

Lecture 22 - L3 Module 4

Lecture 23 - L3 Module 5

Lecture 24 - L4 Module 1

Lecture 25 - L4 Module 2

Lecture 26 - L4 Module 3

Lecture 27 - L4 Module 4

Lecture 28 - L4 Module 5

Lecture 29 - L5 Module 1

Lecture 30 - L5 Module 2

Lecture 31 - L5 Module 3

Lecture 32 - L5 Module 4

Lecture 33 - L5 Module 5

Lecture 34 - L5 Module 6

NPTEL : NOC:Design for Biosecurity (Biotechnology)

Co-ordinators : Prof. Mainak Das

Lecture 1 - Introduction to Biosecurity and Course Overview

Lecture 2 - Allelopathic Interferences and Case Study

Lecture 3 - U.N.W.H.I.M.A.A.I

Lecture 4 - Livestock Biosecurity and its Preventive Measures

Lecture 5 - Bioterrorist Agents and Modes of Attack

Lecture 6 - History of Bioterrorism : Black Death

Lecture 7 - Bioweapons Used in Warfare and Biological Weapon and Toxin Convention (BWC)

Lecture 8 - Ebola and Marburg Virology in context to Biosensor Development

Lecture 9 - Bacillus Anthrax Bacteriology in context to Biosensor Development

Lecture 10 - Anthrax Types and Preventive Measures

Lecture 11 - Unraveling the Ingenious Bacillus Anthracis Attack and Case Study for Anthrax Sensor

Lecture 12 - Components for Designing Biosensors

Lecture 13 - Principle of Quartz Crystal Microbalance (QCM)

Lecture 14 - Sauerbrey Equation and QCM-D

Lecture 15 - Principle, Setup and Applications of E-QCM-D

Lecture 16 - Use of AFM Tool for Sensing - Part 1

Lecture 17 - AFM for Bio-sensing - Part 2

Lecture 18 - AFM and Recap Raman and IR Spectroscopy

Lecture 19 - Applications of Raman

Lecture 20 - AFM Cum Electrochemistry Workstation

Lecture 21 - Monoclonal Antibody

Lecture 22 - Monoclonal Antibody Production

Lecture 23 - MAB Production Via Hybridomas

Lecture 24 - Recognition Elements scFvs

Lecture 25 - SPR : Surface Plasmon Resonance

Lecture 26 - Design and Fabrication of Lateral-Flow Immunoassays

Lecture 27 - Sandwich (Non-Competitive) Assays

Lecture 28 - Botulism Toxin

Lecture 29 - Botox Therapy

Lecture 30 - Developing Biosensor for Botulinum Toxin

Lecture 31 - Story of Insulin

Lecture 32 - Setting the Stage for the Discovery of Insulin

Lecture 33 - Insulin Controversy

Lecture 34 - Insulin Chemistry

Lecture 35 - Insulin as Weapon of Murder

Lecture 36 - Electrochemical Biosensors

Lecture 37 - Electrode System in the Glucose Sensor

Lecture 38 - World of Electrochemical Biosensors

Lecture 39 - Glucose Sensor - Part 1

Lecture 40 - Glucose Sensor - Part 2

Lecture 41 - Non Enzymatic Glucose Sensor - Part 1

Lecture 42 - Non Enzymatic Glucose Sensor - Part 2

Lecture 43 - Summarizing Glucose Sensing - Part 1

Lecture 44 - Summarizing Glucose Sensing - Part 2

Lecture 45 - Summarizing Glucose Sensing - Part 3

Lecture 46 - Far-Infrared Spectroscopy

Lecture 47 - Metabolic Heat Conformation

Lecture 48 - Electromagnetic Sensing

Lecture 49 - World of Biohybrid Biosensors

Lecture 50 - Whole Cell Biosensor

Lecture 51 - Action Potential - Part 1

Lecture 52 - Action Potential - Part 2

Lecture 53 - Action Potential - Part 3

Lecture 54 - Action Potential - Part 4

Lecture 55 - Action Potential - Part 5

Lecture 56 - Cell Based Biosensors - Part 1

Lecture 57 - Cell Based Biosensors - Part 2

Lecture 58 - Cell Based Biosensors - Part 3

Lecture 59 - Cell Based Biosensors - Part 4

Lecture 60 - Cell Based Biosensors - Part 5

NPTEL : BioChemistry I (Biotechnology)

Co-ordinators : Prof. S. Dasgupta

Lecture 1 - Amino Acids - I

Lecture 2 - Amino Acids - II

Lecture 3 - Protein Structure - I

Lecture 4 - Protein structure - II

Lecture 5 - Protein Structure - III

Lecture 6 - Protein Structure - IV

Lecture 7 - Enzymes - I

Lecture 8 - Enzymes - II

Lecture 9 - Enzymes - III

Lecture 10 - Enzymes Mechanisms - I

Lecture 11 - Enzymes Mechanisms - II

Lecture 12 - Myoglobin and Hemoglobin

Lecture 13 - Lipids and Membranes - I

Lecture 14 - Lipids and Membranes - II

Lecture 15 - Membrane Transport

Lecture 16 - Carbohydrates - I

Lecture 17 - Carbohydrates - II

Lecture 18 - Vitamins and Coenzymes - I

Lecture 19 - Vitamins and Coenzymes - II

Lecture 20 - Nucleic Acids - I

Lecture 21 - Nucleic Acids - II

Lecture 22 - Nucleic Acids - III

Lecture 23 - Bioenergetics - I

Lecture 24 - Bioenergetics - II

Lecture 25 - Metabolism - I

Lecture 26 - Metabolism - II

Lecture 27 - Metabolism - III

Lecture 28 - Overview of the Course

NPTEL : NOC:Industrial Biotechnology (Biotechnology)

Co-ordinators : Prof. Debabrata Das

Lecture 1 - Industrial Biotechnology

Lecture 2 - Development of industrial strain

Lecture 3 - Medium characteristics and biochemical pathways

Lecture 4 - Chemical reaction kinetics

Lecture 5 - Chemical reaction analysis (Continued...)

Lecture 6 - Different types of reactors

Lecture 7 - Reactor analysis

Lecture 8 - Reactor analysis (Continued...)

Lecture 9 - Stoichiometry of bioprocesses

Lecture 10 - Stoichiometry of bioprocesses (Continued...)

Lecture 11 - Enzymatic reaction Kinetics

Lecture 12 - Enzymatic reaction Kinetics (Continued...)

Lecture 13 - Enzymatic reaction Kinetics (Continued...)

Lecture 14 - Immobilization techniques

Lecture 15 - Immobilization techniques (Continued...)

Lecture 16 - Life cycle of the microbial cell, Microbial growth kinetics, product formation and substrate degradation

Lecture 17 - Life cycle of the microbial cell, Microbial growth kinetics, product formation and substrate degradation (Continued...)

Lecture 18 - Life cycle of the microbial cell, Microbial growth kinetics, product formation and substrate degradation (Continued...)

Lecture 19 - Overview of the fermenter

Lecture 20 - Flow diagrams and pumps and valves used in fermentation industries

Lecture 21 - Upstream processing: Air sterilizer

Lecture 22 - Upstream processing: Medium sterilizer

Lecture 23 - Upstream processing: Medium sterilizer (Continued...)

Lecture 24 - Downstream processing: solid-liquid separators

Lecture 25 - Downstream processing: evaporator, crystallizer

Lecture 26 - Downstream processing: liquid-liquid extraction, distillation, chromatography

Lecture 27 - Ethanol fermentation

Lecture 28 - Ethanol fermentation (Continued...)

Lecture 29 - Brewing industry

Lecture 30 - Brewing industry (Continued...)

Lecture 31 - Wine industry

Lecture 32 - Vinegar production

Lecture 33 - Citric acid production

Lecture 34 - Citric acid production (Continued...)

Lecture 35 - Citric acid production (Continued...)

Lecture 36 - Lactic acid production

Lecture 37 - Lactic acid production (Continued...)

Lecture 38 - Glutamic acid production

Lecture 39 - Penicillin production

Lecture 40 - Penicillin production (Continued...)

Lecture 41 - Cephalosporin production

Lecture 42 - Streptomycin production

Lecture 43 - Bakerâ€™s yeast fermentation

Lecture 44 - Bakerâ€™s yeast fermentation (Continued...)

Lecture 45 - Fodder yeast production

Lecture 46 - Spirulina production

Lecture 47 - Alpha amylase production

Lecture 48 - High fructose corn syrup production

Lecture 49 - Metal leaching

Lecture 50 - Cheese production

Lecture 51 - Cheese production (Continued...)

Lecture 52 - Biodiesel production

Lecture 53 - Butanol production

Lecture 54 - Biofertilizer

Lecture 55 - Aerobic effluent treatment process

Lecture 56 - Aerobic effluent treatment process (Continued...)

Lecture 57 - Anaerobic effluent treatment process: Biomethanation process

Lecture 58 - Anaerobic effluent treatment process: Biomethanation process (Continued...)

Lecture 59 - 10 m^3 Pilot Plant operation for Biohydrogen production

Lecture 60 - Summary and conclusion

NPTEL : NOC:Aspects Of Biochemical Engineering (Biotechnology)

Co-ordinators : Prof. Debabrata Das

Lecture 1 - Introduction

Lecture 2 - Microbiology - I

Lecture 3 - Microbiology - II

Lecture 4 - Fundamentals of Biochemistry

Lecture 5 - Bioproducts and their market values

Lecture 6 - Stoichiometry of Biochemical Processes - I

Lecture 7 - Stoichiometry of Biochemical Processes - II

Lecture 8 - Stoichiometry of Biochemical Processes - III

Lecture 9 - Reaction Thermodynamics - I

Lecture 10 - Reaction Thermodynamics - II

Lecture 11 - Kinetics of homogeneous chemical reactions - I

Lecture 12 - Kinetics of homogeneous chemical reactions - II

Lecture 13 - Kinetics of homogeneous chemical reactions - III

Lecture 14 - Kinetics of homogeneous chemical reactions - IV

Lecture 15 - Kinetics of homogeneous chemical reactions - V

Lecture 16 - Different types of reactors

Lecture 17 - Reactor analysis - I

Lecture 18 - Reactor analysis - II

Lecture 19 - Reactor analysis - III

Lecture 20 - Reactor analysis - IV

Lecture 21 - Kinetics of enzyme catalyzed reactions using free enzymes - I

Lecture 22 - Kinetics of enzyme catalyzed reactions using free enzymes - II

Lecture 23 - Kinetics of enzyme catalyzed reactions using free enzymes - III

Lecture 24 - Kinetics of enzyme catalyzed reactions using free enzymes - IV

Lecture 25 - Kinetics of enzyme catalyzed reactions using free enzymes - V

Lecture 26 - Kinetics of enzyme catalyzed reactions using free enzymes - VI

Lecture 27 - Immobilization of Enzymes - I

Lecture 28 - Immobilization of Enzymes - II

Lecture 29 - Kinetics of enzyme catalyzed reactions using immobilized enzymes - I

Lecture 30 - Kinetics of enzyme catalyzed reactions using immobilized enzymes - II

Lecture 31 - Kinetics of substrate utilization, product formation and biomass production of microbial cells - I

Lecture 32 - Kinetics of substrate utilization, product formation and biomass production of microbial cells - II

Lecture 33 - Kinetics of substrate utilization, product formation and biomass production of microbial cells - III

Lecture 34 - Kinetics of substrate utilization, product formation and biomass production of microbial cells - IV

Lecture 35 - Kinetics of substrate utilization, product formation and biomass production of microbial cells - V

Lecture 36 - Kinetics of substrate utilization, product formation and biomass production of microbial cells - VI

Lecture 37 - Kinetics of substrate utilization, product formation and biomass production of microbial cells - VII

Lecture 38 - Kinetics of substrate utilization, product formation and biomass production of microbial cells - VIII

Lecture 39 - Kinetics of substrate utilization, product formation and biomass production of microbial cells - IX

Lecture 40 - Kinetics of substrate utilization, product formation and biomass production of microbial cells - X

Lecture 41 - Kinetics of substrate utilization, product formation and biomass production of microbial cells - XI

Lecture 42 - Design and analysis of activated sludge process - I

Lecture 43 - Design and analysis of activated sludge process - II

Lecture 44 - Design and analysis of anaerobic digestion process

Lecture 45 - Scale up of Bioreactor - I

Lecture 46 - Scale up of Bioreactor - II

Lecture 47 - Transport Phenomenon in Bioprocess - I

Lecture 48 - Transport Phenomenon in Bioprocess - II

Lecture 49 - Transport Phenomenon in Bioprocess - III

Lecture 50 - Transport Phenomenon in Bioprocess - IV

Lecture 51 - Air sterilization - I

Lecture 52 - Air sterilization - II

Lecture 53 - Medium sterilization - I

Lecture 54 - Medium sterilization - II

Lecture 55 - Operation of industrial fermenter and material analysis

Lecture 56 - Process control of the biochemical processes

Lecture 57 - Downstream processing - I

Lecture 58 - Downstream processing - II

Lecture 59 - Economic analysis of the biochemical processes

Lecture 60 - Summary and Conclusion

NPTEL : NOC:Biomicrofluidics (Biotechnology)

Co-ordinators : Prof. Tapas Kumar Maiti, Prof. Suman Chakraborty

Lecture 1 - Introduction to Biomicrofluidics

Lecture 2 - Introduction to Biomicrofluidics (Continued...)

Lecture 3 - Engineers' guide to the cell

Lecture 4 - Fluidics in living systems and mechanobiology

Lecture 5 - Pressure Driven Flows

Lecture 6 - Surface tension driven flows

Lecture 7 - Modulating surface tension

Lecture 8 - Lab on a CD

Lecture 9 - Introduction to Electrokinetics - Part I

Lecture 10 - Introduction to Electrokinetics - Part II

Lecture 11 - Microfluidic cell culture - Part I

Lecture 12 - Microfluidic cell culture - Part II

Lecture 13 - On-chip cellular assay techniques - Part I

Lecture 14 - On-chip cellular assay techniques - Part II

Lecture 15 - Microfluidics for understanding biology

Lecture 16 - Organ-on-a-chip

Lecture 17 - Lab-on-a-chip for genetic analysis

Lecture 18 - Microfluidic technology for monoclonal antibody production

Lecture 19 - Microfluidics for Healthcare

Lecture 20 - Microfluidics for Healthcare

NPTEL : NOC:Immunology (Biotechnology)

Co-ordinators : Prof. Agneyo Ganguly, Prof. S. K Ghosh

Lecture 1 - Basic Concepts in Immunology

Lecture 2 - Basic Concepts in Immunology (Continued...)

Lecture 3 - Basic Concepts in Immunology (Continued...)

Lecture 4 - Basic Concepts in Immunology (Continued...)

Lecture 5 - Basic Concepts in Immunology (Continued...)

Lecture 6 - Innate Immunity

Lecture 7 - Inflamatory Response

Lecture 8 - Adaptive Immunity

Lecture 9 - Adaptive Immunity (Humoral)

Lecture 10 - Effector Mechanisms

Lecture 11 - Stracture of antibody

Lecture 12 - Stracture of antibody and T-Cell Receptors

Lecture 13 - Generation of diversity (GOD) of lymphocyte antigen receptors (Continued...)

Lecture 14 - Generation of diversity (GOD) of lymphocyte antigen receptors (Continued...)

Lecture 15 - Generation of diversity (GOD) of lymphocyte antigen receptors (Continued...)

Lecture 16 - Generation of diversity (GOD) of lymphocyte antigen receptors (Continued...)

Lecture 17 - Structural variation in immunoglobulin constant regions and isotype switching

Lecture 18 - Structural variation in immunoglobulin constant regions and isotype switching (Continued...)

Lecture 19 - Antigen recognition by T cell : major histocompatibility complex

Lecture 20 - Antigen recognition by T cell : major histocompatibility complex (Continued...)

Lecture 21 - Antigen Recognition by T cell : Major Histocompatibility Complex (Continued...)

Lecture 22 - Antigen Recognition by T cell : Major Histocompatibility Complex (Continued...)

Lecture 23 - The Generation of Î± : Î² T - Cell receptor ligands

Lecture 24 - The Generation of Î± : Î² T - Cell receptor ligands (Continued...)

Lecture 25 - Summery of Immune system

Lecture 26 - Tools and Techniques

Lecture 27 - Tools and Techniques (Continued...)

Lecture 28 - Tools and Techniques (Continued...)

Lecture 29 - Tools and Techniques (Continued...)

Lecture 30 - Flow Cytometry

Lecture 31 - Development of T Lymphocytes

Lecture 32 - Development of T Lymphocytes (Continued...)

Lecture 33 - Development of T Lymphocytes (Continued...)

Lecture 34 - T Cell Mediated Immunity

Lecture 35 - T Cell Mediated Immunity (Continued...)

Lecture 36 - B-Cell Maturation - I

Lecture 37 - B-Cell Maturation - II

Lecture 38 - B-Cell Activation

Lecture 39 - B-Cell Activation and Differentiation

Lecture 40 - Effector T - Cells

Lecture 41 - Complement System Overview

Lecture 42 - Complement System Overview (Continued...)

Lecture 43 - Complement Biological Consequences

Lecture 44 - Complement Biological Consequences (Continued...)

Lecture 45 - Cytokines : Introduction

Lecture 46 - Cytokines : Introduction (Continued...)

Lecture 47 - Cytokines in Innate and Adaptive Immunity

Lecture 48 - Interferons

Lecture 49 - Hypersensitivity

Lecture 50 - Hypersensitivity (Continued...)

Lecture 51 - Autoimmunity

Lecture 52 - Autoimmunity (Continued...)

Lecture 53 - Autoimmunity (Continued...)

Lecture 54 - Transplantation or Graft vs. Host Reaction

Lecture 55 - Transplantation or Graft vs. Host Reaction (Continued...)

Lecture 56 - Active and Passive Immunity and Vaccination

Lecture 57 - Active and Passive Immunity and Vaccination (Continued...)

Lecture 58 - Active and Passive Immunity and Vaccination (Continued...)

Lecture 59 - Monoclonal Antibody

Lecture 60 - Monoclonal Antibody (Continued...)

NPTEL : NOC:Metabolic Engineering (Biotechnology)

Co-ordinators : Prof. Amit Ghosh, Prof. Pinaki Sar

Lecture 1 - Introduction to Metabolic Engineering

Lecture 2 - Essence of Metabolic Engineering - Part A

Lecture 3 - Essence of Metabolic Engineering - Part B

Lecture 4 - Essence of Metabolic Engineering - Part C

Lecture 5 - Essence of Metabolic Engineering - Part D

Lecture 6 - Review of Cellular Metabolism - Part A

Lecture 7 - Review of Cellular Metabolism - Part B

Lecture 8 - Review of Cellular Metabolism - Part C

Lecture 9 - Review of Cellular Metabolism - Part D

Lecture 10 - Review of Cellular Metabolism - Part E

Lecture 11 - Review of Cellular Metabolism - Part F

Lecture 12 - Introduction to Metabolic Networks

Lecture 13 - Introduction to Systems Biology

Lecture 14 - Regulatory Networks

Lecture 15 - Reconstruction of Metabolic Networks

Lecture 16 - The Stoichiometric Matrix: Representing Reconstructed Network Mathematically

Lecture 17 - Flux Balance Analysis (FBA)

Lecture 18 - Flux Variability Analysis (FVA) and Flux Coupling (FC)

Lecture 19 - Dynamic Flux Balance Analysis (DFBA) and Gene Deletion Algorithms

Lecture 20 - Optimization in MATLAB

Lecture 21 - Robustness Analysis and Phenotypic Phase Planes

Lecture 22 - Flux Sampling, Optknock and Optstrain

Lecture 23 - Extreme Pathways and Elementary modes

Lecture 24 - 13^C Metabolic Flux Analysis (13^C MFA)

Lecture 25 - 13 C Metabolic Flux Analysis (13C MFA)

Lecture 26 - Advancement in 13 C Metabolic Flux Analysis

Lecture 27 - E.coli core metabolic Network Optimization in MATLAB

Lecture 28 - Application of Metabolic Flux Analysis

Lecture 29 - CRISPR-Cas system and its application in metabolic engineering - Part I

Lecture 30 - CRISPR-Cas system and its application in metabolic engineering - Part II

Lecture 31 - CRISPR-Cas system and its application in metabolic engineering - Part III

Lecture 32 - CRISPR-Cas system and its application in metabolic engineering - Part IV

Lecture 33 - Examples of pathway manipulations by metabolic engineering - Biofuels

Lecture 34 - Metabolic engineering for biofuel production - Part A

Lecture 35 - Metabolic engineering for biofuel production - Part B

Lecture 36 - Metabolic engineering for biofuel production - Part C

Lecture 37 - Applications of metabolic engineering in amino acids production

NPTEL : NOC:Environmental Chemistry and Microbiology (Biotechnology)

Co-ordinators : Prof. Sudha Goel, Prof. Anjali Pal

Lecture 1 - Acids, Bases and Salts - Part I

Lecture 2 - Acids, Bases and Salts - Part II

Lecture 3 - Acids, Bases and Salts - Part III

Lecture 4 - Acids, Bases and Salts - Part IV

Lecture 5 - Acids, Bases and Salts - Part V

Lecture 6 - Chemical Equilibrium - I

Lecture 7 - Chemical Equilibrium - II

Lecture 8 - Chemical Equilibrium - III

Lecture 9 - Chemical Equilibrium - IV

Lecture 10 - Chemical Equilibrium - V

Lecture 11 - Chemical Kinetics - I

Lecture 12 - Chemical Kinetics - II

Lecture 13 - Chemical Kinetics - III

Lecture 14 - Chemical Kinetics - IV

Lecture 15 - Chemical Kinetics - V

Lecture 16 - Chemical Kinetics - Reaction Mechanism - Part A

Lecture 17 - Chemical Kinetics - Reaction Mechanism - Part B

Lecture 18 - Chemical Kinetics - Catalysis - Part A

Lecture 19 - Chemical Kinetics - Catalysis - Part B

Lecture 20 - Chemical Kinetics - Catalysis - Part C

Lecture 21 - Nitrogen chemistry - Part A

Lecture 22 - Nitrogen chemistry - Part B

Lecture 23 - Chlorine chemistry and disinfection - Part A

Lecture 24 - Chlorine chemistry and disinfection - Part B

Lecture 25 - Chlorine chemistry and disinfection - Part C

Lecture 26 - Radioactivity - Part A

Lecture 27 - Radioactivity - Part B

Lecture 28 - Radioactivity - Part C

Lecture 29 - Radioactivity - Part D

Lecture 30 - Radioactivity - Part E

Lecture 31 - Introduction - I

Lecture 32 - Introduction - II

Lecture 33 - Overview of microbial life - I

Lecture 34 - Overview of microbial life - II

Lecture 35 - Overview of microbial life - III

Lecture 36 - Cell chemistry - I

Lecture 37 - Cell chemistry - II

Lecture 38 - Cell Biology - I

Lecture 39 - Cell Biology - II

Lecture 40 - Cell Biology - III

Lecture 41 - Cell Biology - IV

Lecture 42 - Microscopy - I

Lecture 43 - Microscopy - II

Lecture 44 - Microbial Metabolism - I

Lecture 45 - Microbial Metabolism - II

Lecture 46 - Microbial Metabolism - III

Lecture 47 - Xenobiotics - I

Lecture 48 - Xenobiotics - II

Lecture 49 - Microbial Growth - I

Lecture 50 - Microbial Growth - II

Lecture 51 - Microbial Growth - III

Lecture 52 - Microbial Growth and Control - I

Lecture 53 - Microbial Growth and Control - II

Lecture 54 - Pathogens and diseases - I

Lecture 55 - Pathogens and diseases - II

Lecture 56 - Metabolic Diversity - I

Lecture 57 - Metabolic Diversity - II

Lecture 58 - Metabolic Diversity - III

Lecture 59 - Metabolic Diversity - IV

Lecture 60 - Metabolic Diversity - V

Lecture 61 - Metabolic Diversity - VI

Lecture 62 - Biogeochemical cycles - I

Lecture 63 - Biogeochemical cycles - II

NPTEL : NOC:Environmental Biotechnology (Biotechnology)

Co-ordinators : Prof. Pinaki Sar

Lecture 1 - Introduction of Environmental Biotechnology, Scope and applications of the subject

Lecture 2 - Introduction of Environmental Biotechnology, Scope and applications of the subject

Lecture 3 - Ecosystem : Basic concepts of structure and function

Lecture 4 - Ecosystem : Basic concepts of structure and function (Continued...)

Lecture 5 - Microbial Ecology

Lecture 6 - Microbial Ecology (Continued...)

Lecture 7 - Microbial Ecosystems and Biogeochemical Cycling

Lecture 8 - Biogeochemical Cycles

Lecture 9 - Microbial ecology and environmental biotechnology - Part A

Lecture 10 - Microbial ecology and environmental biotechnology - Part B

Lecture 11 - Microbial ecology and environmental biotechnology - Part B (Continued...)

Lecture 12 - Microbial ecology and environmental biotechnology - Part B (Continued...)

Lecture 13 - Microbial ecology and environmental biotechnology - Part C

Lecture 14 - Microbial ecology and environmental biotechnology - Part C (Continued...)

Lecture 15 - Microbial ecology and environmental biotechnology - Part C (Continued...)

Lecture 16 - Microbial Ecology and Environmental Biotechnology - Part C (Continued...)

Lecture 17 - Microbiology of Environmental Engineering System

Lecture 18 - Microbiology of Environmental Engineering System

Lecture 19 - Microbiology of Environmental Engineering System

Lecture 20 - Microbiology of Environmental Engineering System (Continued...)

Lecture 21 - Physiological Ecology and Resource Exploitation by Microorganisms

Lecture 22 - Physiological ecology and Resource Exploitation by Microorganisms (Continued...)

Lecture 23 - Physiological ecology and Resource Exploitation by Microorganisms (Continued...)

Lecture 24 - Physiological ecology and Resource Exploitation by Microorganisms (Continued...)

Lecture 25 - Methods in Microbial Ecology with Relevance to Environmental Biotechnology

Lecture 26 - Methods in Microbial Ecology with Relevance to Environmental Biotechnology (Continued...)

Lecture 27 - Methods in Microbial Ecology with Relevance to Environmental Biotechnology (Continued...)

Lecture 28 - Methods in Microbial Ecology with Relevance to Environmental Biotechnology (Continued...)

Lecture 29 - Methods in Microbial Ecology with Relevance to Environmental Biotechnology (Continued...)

Lecture 30 - Methods in Microbial Ecology with Relevance to Environmental Biotechnology (Continued...)

Lecture 31 - Methods in Microbial Ecology with Relevance to Environmental Biotechnology (Continued...)

Lecture 32 - Methods in Microbial Ecology with Relevance to Environmental Biotechnology (Continued...)

Lecture 33 - Methods in Microbial Ecology with Relevance to Environmental Biotechnology (Continued...)

Lecture 34 - Methods in Microbial Ecology with Relevance to Environmental Biotechnology (Continued...)

Lecture 35 - Bioremediation

Lecture 36 - Bioremediation (Continued...)

Lecture 37 - Bioremediation (Continued...)

Lecture 38 - Bioremediation (Continued...)

Lecture 39 - Biodegradation

Lecture 40 - Biodegradation

Lecture 41 - Biodegradation (Continued...)

Lecture 42 - Microbial Interactions with Heavy Metals and Metalloids

Lecture 43 - Microbial Interactions with Heavy Metals and Metalloids - Bioremediation

Lecture 44 - Biohydrometallurgy

Lecture 45 - Enhanced biological phosphorus removal process (EBPR)

Lecture 46 - Biological nitrogen removal

Lecture 47 - Microbially Enhanced Oil Recovery (MEOR)

Lecture 48 - Emerging Pollutants

Lecture 49 - Carbon capture, Carbon Sequestration and Utilization

Lecture 50 - Bioenergy and Environmental Biotechnology

Lecture 51 - Bioremediation case studies

Lecture 52 - Bioremediation case studies (Continued...)

NPTEL : NOC:Fundamentals of Protein Chemistry (Biotechnology)

Co-ordinators : Prof. Swagata Dasgupta

Lecture 1 - Amino Acids - I

Lecture 2 - Amino Acids - II

Lecture 3 - Amino Acids - III

Lecture 4 - The Peptide Bond

Lecture 5 - Discussion Class

Lecture 6 - Primary Structure

Lecture 7 - Secondary Structure

Lecture 8 - Tertiary and Quaternary Structure

Lecture 9 - Protein Interactions

Lecture 10 - Discussion Class

Lecture 11 - Protein folding and structure

Lecture 12 - Thermodynamics of Protein Folding

Lecture 13 - Protein Structure Methods

Lecture 14 - Protein Denaturation

Lecture 15 - Discussion Class

Lecture 16 - Protein Isolation Methods

Lecture 17 - Protein Purification

Lecture 18 - Biophysical Methods - I

Lecture 19 - Biophysical Methods - II

Lecture 20 - Biophysical Methods - III

Lecture 21 - Types of Protein ligand interactions

Lecture 22 - Kinetics and Thermodynamics of protein-ligand binding

Lecture 23 - Experimental methods in protein ligand interactions

Lecture 24 - Protein ligand docking

Lecture 25 - Discussion class

Lecture 26 - Enzymes I - Classification

Lecture 27 - Enzymes - II

Lecture 28 - Enzyme Mechanisms - I

Lecture 29 - Enzyme Mechanisms - II

Lecture 30 - Enzyme mechanisms - III

Lecture 31 - Enzyme Kinetics - I

Lecture 32 - Enzyme Kinetics - II

Lecture 33 - Enzyme Inhibition - I

Lecture 34 - Enzyme Inhibition - II

Lecture 35 - Discussion class

Lecture 36 - Motor Proteins - I

Lecture 37 - Motor Proteins - II

Lecture 38 - Metalloproteins - I

Lecture 39 - Metalloproteins - II

Lecture 40 - Myoglobin and Hemoglobin

Lecture 41 - Membrane Proteins - I

Lecture 42 - Membrane proteins - II

Lecture 43 - Membrane Transport - I

Lecture 44 - Membrane Transport - II

Lecture 45 - Electron Transport Chain

Lecture 46 - Protein Carbohydrate Interactions - I

Lecture 47 - Protein Carbohydrate Interactions - II

Lecture 48 - Protein Nucleic Acid Interactions - I

Lecture 49 - Protein Nucleic Acid Interactions - II

Lecture 50 - Protein Nucleic Acid Interactions - III

Lecture 51 - Protein Protein Interactions - I

Lecture 52 - Protein Protein Interactions - II

Lecture 53 - Protein Peptide Interactions

Lecture 54 - Chaperone proteins

Lecture 55 - Protein Nanoparticle Interactions

Lecture 56 - Oxidative stress in Proteins

Lecture 57 - Enzyme action and Proteolytic cleavage

Lecture 58 - Intrinsically disordered proteins

Lecture 59 - Viral proteins

Lecture 60 - Overview of Course

NPTEL : NOC:Introduction to Biomedical Imaging Systems (Biotechnology)

Co-ordinators : Dr. Arun K.Tangirala

Lecture 1 - Introduction - 1

Lecture 2 - Introduction - 2

Lecture 3 - Signals and Systems Overview

Lecture 4 - Important Signals

Lecture 5 - System

Lecture 6 - LSI Systems

Lecture 7 - Image Quality

Lecture 8 - Local Contrast

Lecture 9 - Blurring and Noise

Lecture 10 - Physics of Radiography

Lecture 11 - Types of Ionizing Radiations

Lecture 12 - EM Radiation

Lecture 13 - Attenuation Models

Lecture 14 - Radiation Dosimetry

Lecture 15 - PR_Instument

Lecture 16 - PR_Instru_CA

Lecture 17 - PR_Image_formation

Lecture 18 - Imaging Equation_updated

Lecture 19 - Film screen_Optical Density

Lecture 20 - PR_Image Quality

Lecture 21 - CT_Intsru

Lecture 22 - CT_Instru_finish

Lecture 23 - CT Back projection

Lecture 24 - CT_BP_finish

Lecture 25 - Fan beam_IQ

Lecture 26 - CT_IQ_Artifact

Lecture 27 - Nuclear Med_Phys

Lecture 28 - Nuclear_Med_Radiotracers

Lecture 29 - Planar_Scintigraphy_Instru

Lecture 30 - Planar_Scintigraphy_Im and IQ

Lecture 31 - Spect_Pet

Lecture 32 - Ultrasound_Intro_Phys

Lecture 33 - Ultrasound Phys_Interactions

Lecture 34 - US doppler and Instrumentation

Lecture 35 - US_Beampattern

Lecture 36 - Approximations

Lecture 37 - US_Imaging Equation_modes

Lecture 38 - Parameters of interest

Lecture 39 - Beam Steering : Phased Array

Lecture 40 - MRI_Intro_S1-S9

Lecture 41 - MRI_Phys_S10-S16

Lecture 42 - MRI_Phys_S17-S20

Lecture 43 - MRI_Phys_S21-S28

Lecture 44 - MRI_Phys_S29-S39

Lecture 45 - MRI_Phys_S40-S44

Lecture 46 - MRI_Phys_S45_S52

Lecture 47 - MRI_Instru_S1_S16

Lecture 48 - MRI_Instru_s17_s26

Lecture 49 - MRI_slice sel_S27_S41

Lecture 50 - MRI_Freq_Encode_S42_S60

Lecture 51 - MRI_DAQ_S61_S69

Lecture 52 - MRI_RECON_S70_S82

Lecture 53 - MRI_IQ_S83_S96

NPTEL : NOC:Next Generation Sequencing Technologies: Data Analysis and Applications (Biotechnology)

Co-ordinators : Prof. Riddhiman Dhar

Lecture 1 - Introduction

Lecture 2 - Next Generation Sequencing Technologies - 454 Sequencing

Lecture 3 - Illumina Sequencing By Synthesis (SBS)

Lecture 4 - Single Molecule Real Time (SMRT) Sequencing

Lecture 5 - Ion Torrent and Nanopore Sequencing

Lecture 6 - Sequencing Coverage, Quality Score and Experiment Design

Lecture 7 - Data Formats

Lecture 8 - Data Formats (Continued...)

Lecture 9 - Data Quality

Lecture 10 - Data QC and Trimming

Lecture 11 - Hands-on: Setting up the system

Lecture 12 - Basic Shell Commands

Lecture 13 - Data Download and Exploration

Lecture 14 - Hands-on 1 - Data exploration and QC

Lecture 15 - Hands-on 1 - Data QC and Trimming

Lecture 16 - Read Mapping

Lecture 17 - Mapping Algorithms

Lecture 18 - Suffix tree-based mapping algorithm

Lecture 19 - Burrows-Wheeler Transform (BWT)

Lecture 20 - Read Mapping with BWT

Lecture 21 - Bowtie2 tool

Lecture 22 - Mapping reads with Bowtie2

Lecture 23 - Bowtie2 output

Lecture 24 - SAM and BAM format

Lecture 25 - SAM format: Alignment section

Lecture 26 - Variant Calling

Lecture 27 - Calling SNP/SNVs and Indels

Lecture 28 - Hands-on analysis : Variant Calling

Lecture 29 - VCF Files

Lecture 30 - Variant Annotation

Lecture 31 - Analysis of CNVs and SVs

Lecture 32 - Introduction to RNA sequencing

Lecture 33 - RNA-seq data processing pipeline

Lecture 34 - Transcriptome Assembly and Quantification

Lecture 35 - Transcript Abundance Quantification

Lecture 36 - Biases in RNA-seq experiments

Lecture 37 - Data Normalization Methods

Lecture 38 - Data Normalization Methods (Continued...)

Lecture 39 - Differential Gene Expression (DGE) Analysis

Lecture 40 - DGE analysis results and visualizations

Lecture 41 - Multiple hypothesis testing correction

Lecture 42 - FDR correction and interpretation of DGE analysis results

Lecture 43 - Functional Enrichment Analysis

Lecture 44 - RNA-seq data analysis - Hands-on 2

Lecture 45 - Hands-on 2: Setting up the system

Lecture 46 - Hands-on 2: Preliminary Data Analysis

Lecture 47 - Sample Specific Bias Correction

Lecture 48 - Differential Gene Expression Analysis I

Lecture 49 - DGE Analysis with spike-ins

Lecture 50 - DGE Analysis Results and Functional Enrichment Analysis

Lecture 51 - Genome Assembly

Lecture 52 - Shortest Common Superstring (SCS) assembly

Lecture 53 - Overlap-Layout-Consensus (OLC) approach

Lecture 54 - de Bruijn Graph (DBG) based assembly

Lecture 55 - Assembly and Quality Control

Lecture 56 - Applications of NGS in Epigenomics

Lecture 57 - Detecting DNA Methylations

Lecture 58 - Genome-wide Transcription Factor(TF) Binding Sites

Lecture 59 - Chromatin Accessibility

Lecture 60 - Genome Organization in 3D

NPTEL : NOC:Computational Neuroscience (Biotechnology)

Co-ordinators : Prof. Sharba Bahdyopadhyay

Lecture 1 - Neuron Structure

Lecture 2 - Networks of Neurons and Synapses

Lecture 3 - Basic Structures in the Brain

Lecture 4 - Systems of neural processing

Lecture 5 - Methods of Recording Neural Activity

Lecture 6 - Membrane Potential and All or None Spike

Lecture 7 - Patch Clamp Measurements

Lecture 8 - Ion channels

Lecture 9 - Current injection: Synapses

Lecture 10 - Single Neuron Acitivity

Lecture 11 - Point and compartmental models of neurons

Lecture 12 - Hodgkin Huxley Equations - I

Lecture 13 - Hodgkin Huxley Equations - II

Lecture 14 - Reducing the HHE and Moris-Lecar Equations (MLE)

Lecture 15 - Properties of MLE

Lecture 16 - Phase Plane Analysis - I

Lecture 17 - Phase Plane Analysis - II

Lecture 18 - Phase Plane Analysis - III

Lecture 19 - Analysing HHE with Phase Plane Analysis - I

Lecture 20 - Analysing HHE with Phase Plane Analysis - II

Lecture 21 - Random variables and random process

Lecture 22 - Spike train statistics and response measure

Lecture 23 - Receptive fields and models of receptive fields

Lecture 24 - Stimulus to Response mapping (Coding) - I

Lecture 25 - Stimulus to Response mapping (Coding) - II

Lecture 26 - Stimulus to Response Mapping (Coding) - III

Lecture 27 - Response to Stimulus Mapping (Decoding)

Lecture 28 - Basics of Information Theory - I

Lecture 29 - Basics of Information Theory - II

Lecture 30 - Maximally Informative Dimensions

Lecture 31 - Intro to Discrimination based methods

Lecture 32 - Kullback Leibler Distance

Lecture 33 - Measuring Spike Train Distances - I

Lecture 34 - Measuring Spike Train Distances - II

Lecture 35 - Signal and Noise Correlations

Lecture 36 - Statistical Methods in Discrimination

Lecture 37 - Single Cell Decoding - I: Two Alternative Forced Choice task in Monkeys

Lecture 38 - Single Cell Decoding - II: Using ROC Curves for discrimination

Lecture 39 - Single Cell Encoding - I: Operant Conditioning Task in Ferrets

Lecture 40 - Single Cell Encoding - II: Learning in avoidance and approach methods in Ferrets

Lecture 41 - Plasticity - Synaptic Transmission and Synaptic Strength

Lecture 42 - Ways of modification of Synaptic Strength

Lecture 43 - Type of Plasticity

Lecture 44 - Short Term Plasticity - I

Lecture 45 - Short Term Plasticity - II

Lecture 46 - Long Term Plasticity

Lecture 47 - Spike Time Dependent Plasticity

Lecture 48 - Hebbian Plasticity

Lecture 49 - BCM Rule

Lecture 50 - Synaptic Normalization

Lecture 51 - Adaptation

Lecture 52 - Models of Short Term Plasticity

Lecture 53 - Attention - I

Lecture 54 - Attention - II

Lecture 55 - Developmental Cicuits

Lecture 56 - Optimal Coding in Visual System

Lecture 57 - Optimal Coding in Auditory System

Lecture 58 - Optimal Coding of Deviant Stimuli in Development

Lecture 59 - Spike Timing Dependent Plasticity - a theoretical Perspective

Lecture 60 - Important Problems in Neuroscience

NPTEL : NOC:Electrophysiology of Heart (Biotechnology)

Co-ordinators : Dr. Arijita Banerjee

Lecture 1 - Ionic basis of membrane potential

Lecture 2 - Physiology of voltage gated channels

Lecture 3 - Physiology of voltage gated channels

Lecture 4 - Cardiac muscle physiology

Lecture 5 - Action potential of cardiac muscle - 1

Lecture 6 - Action potential of cardiac muscle - 2

Lecture 7 - Conducting system of heart

Lecture 8 - ECG-Physiological basis

Lecture 9 - ECG-Normal, Technical aspects

Lecture 10 - ECG Interpretation

Lecture 11 - Abnormal ECG - 1

Lecture 12 - Abnormal ECG - 2

Lecture 13 - ECG and Myocardial Infarction

Lecture 14 - Heart rate and Blood pressure - Baroreflex pathway

Lecture 15 - ECG and Hypertension

Lecture 16 - Autonomic regulation of heart

Lecture 17 - Heart rate variability (HRV)

Lecture 18 - Heart rate variability-interpretation and clinical uses, Blood pressure variability

Lecture 19 - Autonomic Function Tests - 1

Lecture 20 - Autonomic Function Tests - 2

NPTEL : NOC:Pharmacognosy and Metabolic Engineering (Biotechnology)

Co-ordinators : Prof. Adinpunya Mitra

Lecture 1 - Pharmacognosy and Medicinal Plants

Lecture 2 - Plant Specialized Metabolites: Waste Products or Ecochemicals?

Lecture 3 - Evolution of Specialized Metabolism from Primary Metabolism

Lecture 4 - Production of specialized metabolites through cell and organ culture

Lecture 5 - Eliciting specialized metabolism in culture

Lecture 6 - Analysis of Specialized Metabolites - Tools and Techniques

Lecture 7 - Metabolic phytochemistry-based approaches for studying plant specialized metabolism

Lecture 8 - Metabolic engineering strategies in plants

Lecture 9 - Plant genetic transformation (through natural genetic engineer)

Lecture 10 - Design of vectors for Agrobacterium-mediated gene transfer; Transformed and co-

Lecture 11 - Introduction to alkaloids

Lecture 12 - Biosynthesis of tropane alkaloids

Lecture 13 - Engineering tropane alkaloid pathways in plants - I

Lecture 14 - Engineering tropane alkaloid pathways in plants - II : Engineering tropane alkaloid pathway

Lecture 15 - Isoquinoline alkaloids - Biosynthesis and tissue localization

Lecture 16 - Isoquinoline alkaloids - Late steps of biosynthetic pathway and tissue localization

Lecture 17 - Benzylisoquinoline alkaloids - Induced top1 mutant and natural T mutantEngineering

Lecture 18 - Benzylisoquinoline alkaloids - Metabolic pathway engineering

Lecture 19 - RNAi-mediated replacement of morphine with nornarcotic alkaloid reticuline in opium

Lecture 20 - Isoquinoline alkaloids - biosynthesis and tissue localization

Lecture 21 - Indole alkaloids - Early steps of biosynthesis

Lecture 22 - Indole alkaloids - Metabolic engineering of early steps of indole alkaloid pathway

Lecture 23 - Indole alkaloids - Environmental factors regulating indole alkaloid biosynthesis

Lecture 24 - Indole alkaloids - Role of elicitors in modulating alkaloids accumulation

Lecture 25 - Indole alkaloids - Late steps of indole alkaloid biosynthesis

Lecture 26 - Indole alkaloids - Regulatory roles of transcription factors in light-induced

Lecture 27 - Engineering indole alkaloid pathways in Catharanthus roseus hairy root cultures

Lecture 28 - Missing enzymes of vindoline biosynthetic pathway

Lecture 29 - Monoterpene indole alkaloid pathway cell and tissue localization

Lecture 30 - Model for biosynthesis and secretion of monoterpenoid indole alkaloids involving

Lecture 31 - Metabolic reprogramming of periwinkle plant culture

Lecture 32 - Engineered yeast brews precursors of anticancer drug vinblastine

Lecture 33 - Recent discovery of strychnine biosynthetic pathway

Lecture 34 - Indole alkaloid biosynthesis - a final overview

Lecture 35 - Recent discovery of colchicine biosynthetic pathway

Lecture 36 - Biosynthesis of terpenoids - an outline

Lecture 37 - Diversity of monoterpenoids

Lecture 38 - Biosynthesis of monoterpenoids

Lecture 39 - Diversity of sesquiterpenes, diterpenes, triterpenes and polyterpenes

Lecture 40 - Oleoresins and polyterpenes - an outline

Lecture 41 - Monoterpenoids as components of floral scent volatiles: Metabolic engineering of

Lecture 42 - Biosynthesis of carotenoids and carotenoid cleavage products

Lecture 43 - Metabolic engineering of carotenoid pathway

Lecture 44 - Metabolic engineering of carotenoid pathway: Golden Rice Story

Lecture 45 - Menthol story: Biosynthesis and pathway manipulation - I

Lecture 46 - Menthol story: Biosynthesis and pathway manipulation - II

Lecture 47 - Artemisinin, hyperforin and taxol - three promising candidates for biotechnological

Lecture 48 - Phenolics: Origin via shikimate pathway

Lecture 49 - Phenolics: Phenylpropanoids, benzenoids, coumarins, tannins

Lecture 50 - Phenolics: Monolignols, lignins and lignans

Lecture 51 - Phenolics: Metabolic engineering of monolignol pathways

Lecture 52 - Phenolics: Biosynthesis of lignans and podophyllotoxin; Caffeic acid esters

Lecture 53 - Phenolics: Flavonoids, Flavones, Isoflavonoids, Proanthocyanidins

Lecture 54 - Phenolics: Biosynthesis of anthocyanins; Metabolic pathway engineering for enhance

Lecture 55 - Phenolics: Metabolic engineering of anthocyanin pathways in flowers

Lecture 56 - Phenolics: Alcohol acetyl transferses and volatile phenolics

Lecture 57 - Phenolics: Biosynthesis of volatile benzenoids

Lecture 58 - Phenolics: Biosynthesis of vanillin in plants

Lecture 59 - Phenolics: Metabolic engineering for vanillin

Lecture 60 - Phenolics: Biosynthesis of shikonin

Lecture 61 - Phenolics: Metabolic engineering of shikonin pathway

Lecture 62 - Molecular Pharming: Transplastomic plants

Lecture 63 - Molecular Pharming: production of human somatotropin in tobacco

NPTEL : NOC:Introduction to Complex Biological Systems (Biotechnology)

Co-ordinators : Prof. Soumya De, Prof. Dibyendu Samanta

Lecture 1 - Fundamentals of a Living System

Lecture 2 - Discovery of Genetic Material

Lecture 3 - Chemical and Physical Properties of Nucleic Acids

Lecture 4 - Introduction to DNA Replication

Lecture 5 - Mechanistic Overview of DNA Replication

Lecture 6 - Gene expression and The Central Dogma of Molecular Biology

Lecture 7 - Transcription: Involved Machineries and Processes

Lecture 8 - Translation: Decoding the message of an mRNA

Lecture 9 - Time-space correlation and fidelity of transcription and translation

Lecture 10 - Regulation of gene expression

Lecture 11 - Amino acids, hierarchy of protein structure

Lecture 12 - Protein folding, Folding funnel, Anfinsenâ€™s experiment

Lecture 13 - Protein-ligand interactions

Lecture 14 - Allosteric regulation of proteins, e.g. haemoglobin

Lecture 15 - Membrane proteins

Lecture 16 - Introduction to enzymes

Lecture 17 - Theory of enzyme catalysis

Lecture 18 - Specificity of enzymes, e.g. Chymotrypsin

Lecture 19 - Enzyme inhibition. Types and mechanism of inhibitors. Design of inhibitors

Lecture 20 - Engineered enzymes and their applications

Lecture 21 - Introduction to cells

Lecture 22 - Visualizing cells

Lecture 23 - Cell division cycle

Lecture 24 - Stem Cells

Lecture 25 - Cancer

Lecture 26 - Overview of the development of multicellular organization

Lecture 27 - Pattern formation and growth

Lecture 28 - Cell division, cell death and tissue homeostasis

Lecture 29 - Cell Junctions and extracellular matrix

Lecture 30 - Introduction to Neuron and the action potential

Lecture 31 - Vitamins and introduction to bioenergetics

Lecture 32 - Glycolysis, Gluconeogenesis and PPP

Lecture 33 - Citric Acid Cycle and Oxidative Phosphorylation

Lecture 34 - Photosynthesis

Lecture 35 - Photosynthetic carbohydrate synthesis

Lecture 36 - Evolution of life on earth

Lecture 37 - Protein evolution

Lecture 38 - Mechanisms of evolution

Lecture 39 - Evolution of eye

Lecture 40 - Model orgamisms

Lecture 41 - Introduction to microbial world and infectious diseases

Lecture 42 - Cell organization and unique features of bacteria

Lecture 43 - Understanding viruses - The smallest enemy

Lecture 44 - Pathogenicity and infection

Lecture 45 - Antibacterial and Antiviral Drugs

Lecture 46 - Introduction to the immune system

Lecture 47 - Innate immunity: the first lines of defense

Lecture 48 - Adaptive immune response

Lecture 49 - Antibody - structure, function and diversity

Lecture 50 - Vaccines and immunotherapy

Lecture 51 - Visualizing and analyzing nucleic acids: Gel electrophoresis and PCR

Lecture 52 - Visualizing and analyzing nucleic acids: DNA Sequencing

Lecture 53 - Overview of genetic engineering and its impact on society

Lecture 54 - Genetic engineering: Methods and applications

Lecture 55 - Cloning and Gene manipulation

Lecture 56 - Characterization methods

Lecture 57 - Chromatographic methods

Lecture 58 - Protein - ligand interactions

Lecture 59 - Immunoassay techniques

Lecture 60 - Landmark experiments in biology

NPTEL : NOC:Biological Data Analysis and Visualization with R (Biotechnology)

Co-ordinators : Prof. Riddhiman Dhar

Lecture 1 - Introduction

Lecture 2 - Setting up R

Lecture 3 - Basic functions in R

Lecture 4 - Basic data structures in R

Lecture 5 - Data structures and File I/O

Lecture 6 - Basic statistical tests with R

Lecture 7 - Correlation Analysis

Lecture 8 - Analysis of Variance (ANOVA)

Lecture 9 - Basic data visualization techniques

Lecture 10 - Data visualization

Lecture 11 - Visualization with vioplot and ggplot2

Lecture 12 - R packages for plotting and data organization

Lecture 13 - Data transformation in R

Lecture 14 - Bioconductor packages

Lecture 15 - Flow cytometry data analysis in R/Bioconductor

Lecture 16 - Gene expression analysis and co-expression network

Lecture 17 - WGCNA package and Data Download

Lecture 18 - WGCNA hands-on: Data preprocessing

Lecture 19 - WGCNA hands-on: Soft-threshold

Lecture 20 - WGCNA: Module gene expression

Lecture 21 - Introduction to ChIP-seq

Lecture 22 - ChIP-seq data analysis

Lecture 23 - ChIP-seq data analysis: Peak calling

Lecture 24 - Peak calling and Visualization

Lecture 25 - ChIP-seq data analysis: bigWig/bw files

Lecture 26 - Regression models on Biological data

Lecture 27 - Predictive models with linear regression

Lecture 28 - Multicollinearity

Lecture 29 - Lasso regression

Lecture 30 - Non-linear regression

Lecture 31 - Dimensionality reduction

Lecture 32 - Principal Component Analysis (PCA)

Lecture 33 - PCA analysis hands-on

Lecture 34 - PCA analysis using â€˜PCAtoolsâ€™

Lecture 35 - UMAP analysis

Lecture 36 - Classification of biological samples

Lecture 37 - Penalized and Stepwise Logistic regression

Lecture 38 - Decision trees

Lecture 39 - Classification and Regression trees

Lecture 40 - Random Forests

NPTEL : NOC:Principles of Downstream techniques in Bioprocess (Biotechnology)

Co-ordinators : Prof. Mukesh Doble

Lecture 1 - Introduction

Lecture 2 - Mass balance, Heat Balance, flow sheet

Lecture 3 - Costing

Lecture 4 - Costing (continued), Physical and chemical principles in Downs stream

Lecture 5 - Problems in Mass balance, flow sheet

Lecture 6 - Cell Breakage

Lecture 7 - Cell breakage (Continued...)

Lecture 8 - Solid Liquid Separation

Lecture 9 - Solid Liquid Separation (Continued...)

Lecture 10 - Solid Liquid separation-problems

Lecture 11 - Pre-treatment and Filters

Lecture 12 - Adsorption

Lecture 13 - Adsorption

Lecture 14 - Adsorption

Lecture 15 - Adsorption

Lecture 16 - Liquid-Liquid Extraction

Lecture 17 - Liquid-Liquid Extraction

Lecture 18 - Liquid-Liquid Extraction

Lecture 19 - Liquid liquid extraction

Lecture 20 - Reversed micellar and aqueous two phase extraction

Lecture 21 - Membranes

Lecture 22 - Membranes

Lecture 23 - Membranes

Lecture 24 - Membranes

Lecture 25 - Precipitation

Lecture 26 - Chromatography

Lecture 27 - Chromatography

Lecture 28 - Chromatography

Lecture 29 - Chromatography

Lecture 30 - Chromatography

Lecture 31 - Chromatography

Lecture 32 - Chromatography

Lecture 33 - Crystallisation

Lecture 34 - Drying

Lecture 35 - Drying and distillation

Lecture 36 - Future trends

NPTEL : Thermodynamics (Biotechnology)

Co-ordinators : Prof. G.K. Suraishkumar

Lecture 1 - Introduction and Review

Lecture 2 - Need for Analysis Additional Thermodynamic Functions State and Path Variables

Lecture 3 - Equations for a Closed system Chemical Potential Concept Gibbs-Duhem Equation

Lecture 4 - Maxwellâ€™s relations

Lecture 5 - Inter-Relationships between Thermodynamic Variables

Lecture 6 - Some Useful Mathematical Manipulations

Lecture 7 - Thermodynamic Relations for a Closed System with 1 mole of a pure Substances

Lecture 8 - Maximum Work,Lost Work Review of Closed Systems

Lecture 9 - Open Systems

Lecture 10 - Equations of State - Virial Equations

Lecture 11 - Equations of State - Cubic Equations

Lecture 12 - Volume Estimation

Lecture 13 - Volume Estimation (Continued...) Generalized correlations

Lecture 14 - Generalized correlations (Continued...) Residual Properties

Lecture 15 - Residual Properties (Continued...)

Lecture 16 - Generalized Correlations and Residual Properties

Lecture 17 - Fugacity Coefficient Estimation

Lecture 18 - Review of Module 3

Lecture 19 - Learning Aspects Chemical Potential Formulations

Lecture 20 - Lewis and Randall rule partial Molar Properties

Lecture 21 - Partial Molar Property Estimation from Mixing Experiments

Lecture 22 - Partial Molar Property Estimation (Continued...) Excess Property

Lecture 23 - Activity Coefficient from Excess Property

Lecture 24 - Activity Coefficient from Excess Property (Continued...)

Lecture 25 - Activity Coefficient from Excess Property (Continued...) Models for Activity Coefficient in Binary Systems

Lecture 26 - Models for Activity Coefficient in Binary Systems (Continued...)

Lecture 27 - Review of Module 4

Lecture 28 - Criteria for Phase Equilibrium Phase Rule for Non-reacting Biosystems

Lecture 29 - Clausius - Clayperon Equation

Lecture 30 - Clausius - Clayperon Equation (Continued...) vapour-Liquid Equilibrium

Lecture 31 - Vapour-Liquid Equilibrium (Continued...) Estimation of Fugacity coefficient from Equilibrium P-V-T Data

Lecture 32 - Liquid/Liquid and Solid/Liquid Equilibria

Lecture 33 - Review of Module 5

Lecture 34 - Criteria for Bio-reaction Equilibria

Lecture 35 - Phase rule for Reacting Biosystems Equilibrium constants

Lecture 36 - Effect of Temperature and Pressure on the Equilibrium constants

Lecture 37 - Reaction in Liquid or Solid Phases

Lecture 38 - Free energy Changes for some Bioreactions

Lecture 39 - Electrolytes

Lecture 40 - Course Review

NPTEL : NOC:Principles of Downstream Techniques in Bioprocess (Biotechnology)

Co-ordinators : Prof. Mukesh Doble

Lecture 1 - Introduction

Lecture 2 - Mass balance, Heat Balance, Flow sheet

Lecture 3 - Costing

Lecture 4 - Cell Breakage

Lecture 5 - Solid Liquid Separation

Lecture 6 - Pre-treatment and Filters/centrifuge

Lecture 7 - Liquid-Liquid Extraction

Lecture 8 - Liquid-Liquid extraction (Continued...)

Lecture 9 - Adsorption

Lecture 10 - Reversed micellar and aqueous two phase extraction

Lecture 11 - Membranes

Lecture 12 - Membranes (Continued...)

Lecture 13 - Product stabilization, Drying, Lyophilisation

Lecture 14 - Precipitation and crystallization

Lecture 15 - Electrophoresis / SDS PAGE

Lecture 16 - Chromatography

Lecture 17 - Chromatography (Continued...1)

Lecture 18 - Chromatography (Continued...2)

Lecture 19 - Chromatography (Continued...3)

Lecture 20 - Future trends, Other downstream operations/Summary of the course

NPTEL : NOC:Biostatistics and Design of Experiments (Biotechnology)

Co-ordinators : Prof. Mukesh Doble

Lecture 1 - Introduction

Lecture 2 - Experimental Design Strategy

Lecture 3 - Data types : Binomial distribution

Lecture 4 - Poisson Distribution

Lecture 5 - Normal Distribution

Lecture 6 - Standardized Normal Distribution / t-distribution

Lecture 7 - t-distribution/confidence interval

Lecture 8 - Statistical tests

Lecture 9 - t-Test

Lecture 10 - t-Tests

Lecture 11 - t-test

Lecture 12 - F-tests

Lecture 13 - F-tests

Lecture 14 - ANOVA

Lecture 15 - ANOVA

Lecture 16 - Anova

Lecture 17 - Anova

Lecture 18 - Anova

Lecture 19 - Anova

Lecture 20 - Anova

Lecture 21 - Normality test / Odds ratio

Lecture 22 - Chi square distribution

Lecture 23 - Chi square distribution / test

Lecture 24 - Chi square test

Lecture 25 - Chi square test and Weibull Distribution

Lecture 26 - Weibull Distribution

Lecture 27 - Weibull distribution.

Lecture 28 - Non-parametric test

Lecture 29 - Non parametric test/homogeneity of variance / beta distribution

Lecture 30 - Exponential / hypergeometric distributions

Lecture 31 - Hypergeometric / Log norma distribution

Lecture 32 - Design of experiments (DOE) - Introduction

Lecture 33 - Factorial Design

Lecture 34 - Full factorial design

Lecture 35 - Fractional factorial design

Lecture 36 - Other designs

Lecture 37 - Second order designs

Lecture 38 - Second order design

Lecture 39 - Regression analysis

Lecture 40 - Control charts

NPTEL : NOC:Bioreactors (Biotechnology)

Co-ordinators : Prof. G.K. Suraishkumar

Lecture 1 - Introduction

Lecture 2 - Sterilization

Lecture 3 - Solution to PP 1.1

Lecture 4 - Some important concepts

Lecture 5 - Enzyme bioreactors, enzyme kinetics

Lecture 6 - Solution to PP 2.1

Lecture 7 - Inhibited enzyme kinetics

Lecture 8 - Solution to PP 2.2

Lecture 9 - Measurement principles and methods

Lecture 10 - Batch growth kinetics

Lecture 11 - Solution to PP 3.1

Lecture 12 - Bioreactor analysis: chemostat and fed-batch

Lecture 13 - Solution to PP 3.2

Lecture 14 - Bioreactor environment parameters

Lecture 15 - Bioreactor env. par. (DO)

Lecture 16 - Solution to PP 4.1

Lecture 17 - Shear stress, scale-up, scale-down

Lecture 18 - Cell view: stoichiometry; degree of reductance

Lecture 19 - Solution to PP 5.1

Lecture 20 - Culture status, metabolic flux analysis

Lecture 21 - Course summary

NPTEL : NOC:Medical Biomaterials (Biotechnology)

Co-ordinators : Prof. Mukesh Doble

Lecture 1 - Introduction to Biomaterials

Lecture 2 - Background history

Lecture 3 - History

Lecture 4 - Properties - Mechanical and Physico-chemical

Lecture 5 - Properties - Mechanical and Physico-chemical

Lecture 6 - Mechanical properties

Lecture 7 - Mechanical Properties (Continued...)

Lecture 8 - Resorbability, biodegradation

Lecture 9 - Resorbability, biodegradation (Continued...)

Lecture 10 - Biofilm

Lecture 11 - Biofilm (Continued...)

Lecture 12 - Biofilm (Continued...)

Lecture 13 - Biofilm (Continued...)

Lecture 14 - Material characterization - Analytical instruments

Lecture 15 - Analytical instruments

Lecture 16 - Analytical instruments (Continued...)

Lecture 17 - Analytical instruments (Continued...)

Lecture 18 - Biological responses, compatibility, cytotoxicity

Lecture 19 - Biological Responses

Lecture 20 - Cell-biomaterial interaction

Lecture 21 - Animal trials (in vivo)

Lecture 22 - Animal trials

Lecture 23 - Metals-types, classifications, applications

Lecture 24 - Metals - properties

Lecture 25 - Metals - properties (Continued...)

Lecture 26 - Metals - properties (Continued...)

Lecture 27 - Metals

Lecture 28 - Polymers-types, classifications, applications

Lecture 29 - Polymers

Lecture 30 - Polymers (Continued...)

Lecture 31 - Polymer blends

Lecture 32 - Natural biopolymers

Lecture 33 - Natural biopolymers - (Continued...)

Lecture 34 - Biopolymers- proteins / hydrogels

Lecture 35 - Hydrogels

Lecture 36 - Experiments

Lecture 37 - surface modification-Demonstration

Lecture 38 - Ceramics

Lecture 39 - Cardiovascular and ocular biomaterials

Lecture 40 - Sterilisation/Device failure

NPTEL : NOC:BioInformatics - Algorithms and Applications (Biotechnology)

Co-ordinators : Prof. M. Michael Gromiha

Lecture 1 - Concepts and importance of Bioinformatics

Lecture 2 - Complexities in biological systems

Lecture 3 - DNA sequence analysis

Lecture 4 - Sequence based parameters

Lecture 5 - Database

Lecture 6 - Database categories

Lecture 7 - Protein structure and function - I

Lecture 8 - Protein structure and function - II

Lecture 9 - Protein sequence databases - I

Lecture 10 - Protein sequence databases - II

Lecture 11 - Pairwise alignment - I

Lecture 12 - Pairwise alignment - II

Lecture 13 - Uniprot Demo

Lecture 14 - Sequence alignment - I

Lecture 15 - Sequence alignment - II

Lecture 16 - Sequence alignment: Online resources - I

Lecture 17 - Sequence alignment: Online resources - II

Lecture 18 - Conservation score - I

Lecture 19 - Conservation score - II

Lecture 20 - Blast Demo

Lecture 21 - Phylogenetic trees - I

Lecture 22 - Phylogenetic trees - II

Lecture 23 - Protein sequence analysis - I

Lecture 24 - Protein sequence analysis - II

Lecture 25 - Hydrophobicity profiles

Lecture 26 - Patterns and PSSM profiles

Lecture 27 - Construction of Non-redundant datasets - I

Lecture 28 - Non-redundant datasets - II

Lecture 29 - Protein secondary structure

Lecture 30 - Secondary structure prediction - I

Lecture 31 - Secondary structure prediction - II

Lecture 32 - Secondary structure prediction - III

Lecture 33 - Protein tertiary structure - I

Lecture 34 - Protein tertiary structure - II

Lecture 35 - Protein structure analysis - I

Lecture 36 - Protein structure analysis - II

Lecture 37 - Protein structure analysis - III

Lecture 38 - Demo: PDB or Pymol or PDBParam

Lecture 39 - Protein structure analysis - IV

Lecture 40 - Protein structure prediction - I

Lecture 41 - Protein structure prediction - II

Lecture 42 - Protein stability - I

Lecture 43 - Protein stability - II

Lecture 44 - Demo: Homology Modelling

Lecture 45 - Stabilizing residues

Lecture 46 - Thermodynamic database

Lecture 47 - Stability of proteins upon mutations - I

Lecture 48 - Stability of proteins upon mutations - II

Lecture 49 - Demo: ProTherm

Lecture 50 - Protein folding rate - I

Lecture 51 - Protein folding rate - II

Lecture 52 - Protein interactions - I

Lecture 53 - Protein interactions - II

Lecture 54 - Computer aided drug design - I

Lecture 55 - Computer aided drug design - II

Lecture 56 - Virtual screening - I

Lecture 57 - Virtual screening - II

Lecture 58 - QSAR - I

Lecture 59 - QSAR - II

Lecture 60 - Demo: Autodock

Lecture 61 - awk programming - I

Lecture 62 - awk programming - II

Lecture 63 - Development of algorithms - I

Lecture 64 - Development of algorithms - II

Lecture 65 - Applications of bioinformatics - I

Lecture 66 - Applications of bioinformatics - II

Lecture 67 - Overview - I

Lecture 68 - Overview - II

Lecture 69 - Demo: Weka

NPTEL : NOC:Demystifying the Brain (Biotechnology)

Co-ordinators : Dr. V Srinivasa Chakravarthy

Lecture 1 - The Whole and Its Parts: A History of Ideas about Brain

Lecture 2 - Understanding Brainâ€™s Shape - Segment 1 - Brain size and intelligence

Lecture 3 - Understanding Brainâ€™s Shape - Segment 2 - Save Wire Principle

Lecture 4 - Understanding Brainâ€™s Shape - Segment 3 - Brain Evolution

Lecture 5 - Neurons and Neural Signaling: Outline

Lecture 6 - Neural Signalling : Molecular and Cellular Basis

Lecture 7 - Networks that Learn - Segment 1

Lecture 8 - Multilayer Perceptrons Applications in Psychology and Neuroscience

Lecture 9 - Organization of the Central Nervous System-Segment 1 - Cortex

Lecture 10 - Organization of the Central Nervous System-Segment 2 - Subcortical Structures

Lecture 11 - Maps in the Brain - Segment 1

Lecture 12 - Maps in the Brain - Segment 2

Lecture 13 - Emotions in the Brain - Segment 1

Lecture 14 - Emotions in the Brain - Segment 2

Lecture 15 - Memories and Holograms - Segment 1

Lecture 16 - Memories and Holograms - Segment 2

Lecture 17 - Consciousness - Segment 1

Lecture 18 - Consciousness - Segment 2

NPTEL : NOC:Computational Systems Biology (Biotechnology)

Co-ordinators : Prof. Karthik Raman

Lecture 1 - Introduction

Lecture 2 - Introduction to Modelling

Lecture 3 - Introduction to Modelling

Lecture 4 - Fundamentals of Mathematical Modelling

Lecture 5 - Fundamentals of Mathematical Modelling

Lecture 6 - Fundamentals of Mathematical Modelling

Lecture 7 - Some Example Models

Lecture 8 - Representation of Biological Networks

Lecture 9 - Lab: MATLAB Basics

Lecture 10 - Lab: MATLAB Basics

Lecture 11 - Lab: MATLAB Basics

Lecture 12 - Lab: MATLAB Basics

Lecture 13 - Introduction to Networks

Lecture 14 - Introduction to Networks

Lecture 15 - Introduction to Network Biology

Lecture 16 - Introduction to Network Biology

Lecture 17 - Introduction to Network Biology

Lecture 18 - Network Biology

Lecture 19 - Network Models

Lecture 20 - Network Models

Lecture 21 - Biological Networks

Lecture 22 - Network Perturbations

Lecture 23 - Community Detection

Lecture 24 - Network Motifs

Lecture 25 - Lab: Cytoscape

Lecture 26 - Lab: Cytoscape

Lecture 27 - Lab: Network Biology

Lecture 28 - Network Biology: Recap

Lecture 29 - Lab: Network Models and Perturbations

Lecture 30 - Lab: Network Models and Perturbations

Lecture 31 - Reconstruction of Gene Regulatory Networks

Lecture 32 - Reconstruction of Protein Networks

Lecture 33 - Reconstruction of Signalling Networks

Lecture 34 - Reconstruction of Signalling Networks

Lecture 35 - Introduction to Dynamic Modelling

Lecture 36 - Introduction to Dynamic Modelling

Lecture 37 - Introduction to Dynamic Modelling

Lecture 38 - Lab: Solving ODEs in MATLAB

Lecture 39 - Lab: Example Biological Model

Lecture 40 - Parameter Estimation

Lecture 41 - Parameter Estimation

Lecture 42 - Parameter Estimation

Lecture 43 - Methods for Parameter Estimation

Lecture 44 - Direct Search Methods

Lecture 45 - Genetic Algorithms

Lecture 46 - Genetic Algorithms

Lecture 47 - Other Evolutionary Algorithms

Lecture 48 - PyGMO

Lecture 49 - Dynamic Modelling Recap

Lecture 50 - Lab: Parameter Estimation

Lecture 51 - Guest Lecture: Modelling in Drug Development

Lecture 52 - Guest Lecture: Modelling in Drug Development

Lecture 53 - Guest Lecture: Quantitative Systems Pharmacology

Lecture 54 - Guest Lecture: Quantitative Systems Pharmacology

Lecture 55 - Guest Lecture: Quantitative Systems Pharmacology

Lecture 56 - Constraint-based Modelling of Metabolic Networks

Lecture 57 - Flux Balance Analysis

Lecture 58 - Flux Balance Analysis

Lecture 59 - Flux Balance Analysis

Lecture 60 - Other Constraint-Based Approaches

Lecture 61 - Other Constraint-Based Approaches

Lecture 62 - Lab: FBA using MATLAB

Lecture 63 - Perturbations to Metabolic Networks: Deletions

Lecture 64 - Lab: COBRA Toolbox

Lecture 65 - Understanding FBA

Lecture 66 - Understanding FBA

Lecture 67 - Perturbations to Metabolic Networks: Over-expression

Lecture 68 - Perturbations to Metabolic Networks: Synthetic Lethals

Lecture 69 - Perturbations to Metabolic Networks: Synthetic Lethals

Lecture 70 - Constraint-based Modelling of Metabolic Networks

Lecture 71 - Lab: Gene Deletions

Lecture 72 - Integrating Regulatory Information into Constraint-Based Models

Lecture 73 - Elementary Modes

Lecture 74 - Elementary Modes

Lecture 75 - Constraint-based Modelling of Metabolic Networks: Applications

Lecture 76 - Constraint-based Modelling of Metabolic Networks: Applications

Lecture 77 - Constraint-based Modelling of Metabolic Networks: Applications

Lecture 78 - Lab: Gene Deletions

Lecture 79 - Constraint-based Modelling of Metabolic Networks: Recap

Lecture 80 - Constraint-based Modelling of Metabolic Networks: Recap

Lecture 81 - Constraint-based Modelling of Metabolic Networks: Recap

Lecture 82 - ^{13}C-Metabolic Flux Analysis using Mass Spectrometry

Lecture 83 - ^{13}C-Metabolic Flux Analysis using Mass Spectrometry

Lecture 84 - ^{13}C-Metabolic Flux Analysis using Mass Spectrometry

Lecture 85 - Lab: ^{13}C-Metabolic Flux Analysis using Mass Spectrometry

Lecture 86 - Modelling Gene Regulatory Networks

Lecture 87 - Modelling Gene Regulatory Networks

Lecture 88 - Modelling Gene Regulatory Networks

Lecture 89 - Lab: Modelling Gene Regulatory Networks

Lecture 90 - Lab: Modelling Gene Regulatory Networks

Lecture 91 - Computational Modelling of Host-Pathogen Interactions

Lecture 92 - Computational Modelling of Host-Pathogen Interactions

Lecture 93 - Robustness in Biological Systems

Lecture 94 - Robustness in Biological Systems: Mechanisms

Lecture 95 - Robustness in Biological Systems: Organising Principles

Lecture 96 - Robustness in Biological Systems: Trade-offs

Lecture 97 - Obustness and Evolvability

Lecture 98 - obustness and Evolvability

Lecture 99 - Introduction to Synthetic Biology

Lecture 100 - Advanced Topics

Lecture 101 - Advanced Topics

Lecture 102 - Advanced Topics

Lecture 103 - Course Recap

NPTEL : NOC:Material and Energy Balances (Biotechnology)

Co-ordinators : Prof.Vignesh Muthuvijayan

Lecture 1 - Fundamentals of Engineering Calculations

Lecture 2 - Process Parameters and Variables

Lecture 3 - Fundamentals of Material Balances

Lecture 4 - Material Balance Calculations for Single Units Without Reactions - Part 1

Lecture 5 - Material Balance Calculations for Single Units Without Reactions - Part 2

Lecture 6 - Material Balance Calculations for Single Units Without Reactions - Part 3

Lecture 7 - Material Balance Calculations for Single Units Without Reactions - Part 4

Lecture 8 - Material Balance Calculations for Multiple Units Without Reactions - Part 1

Lecture 9 - Material Balance Calculations for Multiple Units Without Reactions - Part 2

Lecture 10 - Fundamentals of Reactive Processes

Lecture 11 - Material Balance Calculations For Single Units With A Single Reaction

Lecture 12 - Material Balance Calculations for Single Units with A Single Reaction (Continued...)

Lecture 13 - Material Balance Calculations for Single Units with Multiple Reactions - Part 1

Lecture 14 - Material Balance Calculations for Single Units with Multiple Reactions - Part 2

Lecture 15 - Material Balance Calculations for Single Units with Multiple Reactions - Part 3

Lecture 16 - Material Balance Calculations for Multiple Units with Reactions - Part 1

Lecture 17 - Material Balance Calculations for Multiple Units with Reactions - Part 2

Lecture 18 - Material Balances on Reactive Processes - Tutorials

Lecture 19 - Combustion Reactions: An Introduction

Lecture 20 - Material Balances for Combustion Reactions

Lecture 21 - Biochemical Reactions: Enzyme Kinetics

Lecture 22 - Biochemical Reactions: Cell Growth

Lecture 23 - Recycle Without Reactions

Lecture 24 - Recycle with Reactions

Lecture 25 - Recycle: Tutorials

Lecture 26 - Bypass

Lecture 27 - Purge

Lecture 28 - Material Balance: A Review - Part 1

Lecture 29 - Material Balance: A Review - Part 2

Lecture 30 - Material Balance: A Review - Part 3

Lecture 31 - The Unreasonable Effectiveness of Material Balance

Lecture 32 - Constraint-based modelling

Lecture 33 - Flux balance analysis - Part 1

Lecture 34 - Flux balance analysis - Part 2

Lecture 35 - Energy Balance Terminologies and Concepts

Lecture 36 - Introduction to Energy Balances - Part 1

Lecture 37 - Introduction to Energy Balances - Part 2

Lecture 38 - Introduction to Energy Balances: Tutorials

Lecture 39 - Mechanical Energy Balances

Lecture 40 - Mechanical Energy Balances: Tutorials

Lecture 41 - Energy Balance Objectives and Procedures

Lecture 42 - Introduction to Nonreactive Processes Without Phase Change

Lecture 43 - Energy Balances on Single-Phase Nonreactive Processes

Lecture 44 - Energy Balances on Single-Phase Nonreactive Processes: Tutorials

Lecture 45 - Fundamentals of Nonreactive Phase Change Processes

Lecture 46 - Estimating Latent Heats

Lecture 47 - Energy Balances on Nonreactive Processes With Phase Change

Lecture 48 - Energy Balances on Nonreactive Processes With Phase Change: Tutorials - 1

Lecture 49 - Energy Balances on Nonreactive Processes With Phase Change: Tutorials - 2

Lecture 50 - Psychrometric Charts

Lecture 51 - Energy Balances Using Psychrometric Charts

Lecture 52 - Mixing and Solution

Lecture 53 - Mixing and Solution: Tutorials - 1

Lecture 54 - Mixing and Solution: Tutorials - 2

Lecture 55 - Fundamentals for Energy Balances on Reactive Processes - Part 1

Lecture 56 - Fundamentals for Energy Balances on Reactive Processes - Part 1 and Part 2

Lecture 57 - Fundamentals for Energy Balances on Reactive Processes - Tutorials

Lecture 58 - Energy Balances on Reactive Processes - Part 1

Lecture 59 - Energy Balances on Reactive Processes - Part 2

Lecture 60 - Energy Balances on Reactive Processes - Part 3

Lecture 61 - Energy Balances on Reactive Processes - Part 4

Lecture 62 - Energy Balances on Reactive Processes - Part 5

Lecture 63 - Energy Balances on Reactive Processes - Part 6

Lecture 64 - Energy Balances: A Review - Part 1

Lecture 65 - Energy Balances: A Review - Part 2

Lecture 66 - Energy Balances: A Review - Part 3

Lecture 67 - Energy Balances: A Review - Part 4

Lecture 68 - Unsteady State Material Balances

Lecture 69 - Unsteady State Energy Balances

NPTEL : NOC:Computer Aided Drug Design (Biotechnology)

Co-ordinators : Prof. Mukesh Doble

Lecture 1 - Introduction

Lecture 2 - Drug Discovery - Issues

Lecture 3 - Target and Lead Identification

Lecture 4 - Drug And Data bases

Lecture 5 - Drug Properties

Lecture 6 - Drug - Properties / SMILES

Lecture 7 - Drug Solubility

Lecture 8 - Drug Solubility / permeability

Lecture 9 - ADME

Lecture 10 - Drug - ADME

Lecture 11 - Drug - ADME

Lecture 12 - Drug - BBB

Lecture 13 - Pgp efflux/Drug Likeness

Lecture 14 - Drug Likeness

Lecture 15 - Molecular Modelling

Lecture 16 - Molecular Mechanics / Force Field

Lecture 17 - Molecular Mechanics / Force Field

Lecture 18 - Molecular Mechanics / Force Field

Lecture 19 - Molecular Mechanics / Force Field

Lecture 20 - ODES and Numerical methods

Lecture 21 - ODES and Numerical methods

Lecture 22 - Conformational Search / MD

Lecture 23 - Quantum Mechanics

Lecture 24 - Quantum Mechanics

Lecture 25 - Quantitative Struture Activity Relationship (QSAR)

Lecture 26 - Quantitative Struture Activity Relationship (QSAR)

Lecture 27 - Quantitative Struture Activity Relationship (QSAR)

Lecture 28 - Quantitative Struture Activity Relationship (QSAR)

Lecture 29 - Quantitative Struture Activity Relationship (QSAR)

Lecture 30 - Quantitative Struture Activity Relationship (QSAR)

Lecture 31 - 3D QSAR

Lecture 32 - Pharmacophore modelling

Lecture 33 - Target based drug design

Lecture 34 - Target based drug design

Lecture 35 - Target based drug design

Lecture 36 - Target based drug design

Lecture 37 - Docking

Lecture 38 - Docking

Lecture 39 - Pharmacokinetics / pharmacodynamics

Lecture 40 - Pharmacokinetics / pharmacodynamics

NPTEL : NOC:Plant Cell Bioprocessing (Biotechnology)

Co-ordinators : Prof. Smita Srivastava

Lecture 1 - Introduction to plant cell technology

Lecture 2 - History of plant cell and tissue culture

Lecture 3 - Anatomy of plant cells

Lecture 4 - Plant tissues and functions

Lecture 5 - Photosynthesis and Photorespiration

Lecture 6 - In-vitro culture initiation

Lecture 7 - Nutritional requirements of plant cells

Lecture 8 - Organogenesis and Regeneration

Lecture 9 - Somaclonal variation and Micropropagation

Lecture 10 - Somatic embryogenesis and Protoplast culture

Lecture 11 - Synthetic seeds, Cryopreservation and Freezing methods

Lecture 12 - Secondary metabolism in plant cells - Part 1

Lecture 13 - Secondary metabolism in plant cells - Part 2

Lecture 14 - Secondary metabolism in plant cells - Part 3

Lecture 15 - Secondary metabolism in plant cells - Part 4

Lecture 16 - Optimization strategies - Part 1

Lecture 17 - Optimization strategies - Part 2

Lecture 18 - Optimization strategies - Part 3

Lecture 19 - Optimization strategies - Part 4

Lecture 20 - Biotransformation in plant cultures

Lecture 21 - Immobilization of plant cells

Lecture 22 - Genetic transformations in plant cells - Part 1

Lecture 23 - Genetic transformations in plant cells - Part 2

Lecture 24 - Genetic transformations in plant cells - Part 3

Lecture 25 - Plant Cell Bioreactors - Part 1

Lecture 26 - Plant Cell Bioreactors - Part 2

Lecture 27 - Bioreactors for Hairy Root cultures

Lecture 28 - Case study - Part 1

Lecture 29 - Case study - Part 2

NPTEL : NOC:Tissue Engineering (Biotechnology)

Co-ordinators : Prof.Vignesh Muthuvijayan

Lecture 1 - Introduction to Tissue Engineering - Part 1

Lecture 2 - Introduction to Tissue Engineering - Part 2

Lecture 3 - Introduction to Tissue Engineering - Part 3

Lecture 4 - Scaffolds: Extracellular Matrix

Lecture 5 - Scaffolds: Natural Polymers

Lecture 6 - Scaffolds: Synthetic Polymers

Lecture 7 - Hydrogels - Part 1

Lecture 8 - Hydrogels - Part 2

Lecture 9 - Bioceramics

Lecture 10 - Scaffold fabrication strategies

Lecture 11 - Self Assembly

Lecture 12 - 3D Bioprinting

Lecture 13 - Material Characterization - Part 1

Lecture 14 - Material Characterization - Part 2

Lecture 15 - Material Characterization - Part 3

Lecture 16 - Cell Source

Lecture 17 - Cell Isolation - Part 1

Lecture 18 - Cell Isolation - Part 2

Lecture 19 - Tissue Dynamics

Lecture 20 - Cell Differentiation

Lecture 21 - Cell Adhesion

Lecture 22 - Cell Migration

Lecture 23 - Signaling and biomolecule delivery in Tissue Engineering

Lecture 24 - Bioreactors in Tissue Engineering

Lecture 25 - Challenges in Tissue Engineering

Lecture 26 - Host integration and immune responses - Part 1

Lecture 27 - Host integration and immune responses - Part 2

Lecture 28 - Bioethics of Tissue Engineering - Part 1

Lecture 29 - Bioethics of Tissue Engineering - Part 2

Lecture 30 - Skin Tissue Engineering - Part 1

Lecture 31 - Skin Tissue Engineering - Part 2

Lecture 32 - Bone Tissue Engineering - Part 1

Lecture 33 - Bone Tissue Engineering - Part 2

Lecture 34 - Bone Tissue Engineering - Part 3

Lecture 35 - Vascular Tissue Engineering

Lecture 36 - Corneal Tissue Engineering - Part 1

Lecture 37 - Corneal Tissue Engineering - Part 2

NPTEL : NOC:Thermodynamics for Biological Systems: Classical and Statistical Aspect (Biotechnology)

Co-ordinators : Prof. G.K. Suraishkumar, Prof. Sanjib Senapati

Lecture 1 - Introduction and review

Lecture 2 - Review (Continued...)

Lecture 3 - Need for analysis

Lecture 4 - Additional Thermodynamic Functions

Lecture 5 - State and Path Variables

Lecture 6 - Equations for a Closed System

Lecture 7 - Chemical Potential

Lecture 8 - Gibbs Duhem equation

Lecture 9 - Maxwellâ€™s relations

Lecture 10 - Inter-relationships between thermodynamic variables (Continued...)

Lecture 11 - Some useful mathematical manipulations

Lecture 12 - Thermodynamic relations for a closed system with 1 mole of pure substance

Lecture 13 - Maximum work

Lecture 14 - Open systems

Lecture 15 - Equations of state - Virial equations

Lecture 16 - Equations of state - Cubic equations

Lecture 17 - Volume estimation

Lecture 18 - Volume estimation (Continued...)

Lecture 19 - Generalized correlations

Lecture 20 - Generalized correlations (Continued...)

Lecture 21 - Residual properties

Lecture 22 - Residual properties (Continued...)

Lecture 23 - Generalized correlations and residual properties

Lecture 24 - Fugacity coefficient estimation

Lecture 25 - Review of module 3

Lecture 26 - Learning aspects

Lecture 27 - Chemical potential formulations

Lecture 28 - Lewis and Randall rule

Lecture 29 - Partial molar properties

Lecture 30 - Partial molar property estimation from mixing experiments

Lecture 31 - Partial molar property estimation (Continued...)

Lecture 32 - Activity coefficient from excess property

Lecture 33 - Activity coefficient from excess property (Continued...)

Lecture 34 - Models for activity coefficient in a binary system

Lecture 35 - Models for activity coefficient for a binary system (Continued...)

Lecture 36 - Review of module 4

Lecture 37 - Criteria for phase equilibrium

Lecture 38 - Phase rule for non-reacting systems

Lecture 39 - Clausius Clayperon equation

Lecture 40 - Clausius Clayperon equation (Continued...)

Lecture 41 - Vapour liquid equilibrium

Lecture 42 - Vapour liquid equilibrium (Continued...)

Lecture 43 - Estimation of fugacity coefficient from P-V-T data at equilibrium

Lecture 44 - Liquid-liquid and solid-liquid equilibria

Lecture 45 - Review of module 5

Lecture 46 - Criteria for bioreaction equilibria

Lecture 47 - Phase rule for reacting biosystems

Lecture 48 - Equilibrium constants

Lecture 49 - Effect of temperature on the equilibrium constants

Lecture 50 - Reaction in liquid or solid phases

Lecture 51 - Free energy changes for some bioreactions

Lecture 52 - Electrolytes

Lecture 53 - Review of the classical thermodynamics part

Lecture 54 - Introduction to Statistical thermodynamics

Lecture 55 - Concepts of macro and microstates

Lecture 56 - Thermodynamic probability

Lecture 57 - Boltzmann distribution law

Lecture 58 - Defining Î² in Boltzmann distribution law

Lecture 59 - Relationship between partition function and thermodynamic quantities

Lecture 60 - Partition function of mono atomic gases

Lecture 61 - Entropy in terms of probablity

Lecture 62 - Gibbs paradox

Lecture 63 - Thermodynamic probability for distinguishable particles

Lecture 64 - Thermodynamic probability for indistinguishable particles

Lecture 65 - Sackur - Tetrode equation

Lecture 66 - Partition function and Helmholtz and Gibbs free energy

Lecture 67 - Ensemble approach

Lecture 68 - Ensemble average, time average, Ergodic hypothesis

Lecture 69 - Partition function for classical systems

Lecture 70 - Pair potentials for atomic systems

Lecture 71 - Potential for molecular systems

Lecture 72 - Computer code for LJ potential

Lecture 73 - Introduction to computer simulations

Lecture 74 - Computer simulations of macromolecules

Lecture 75 - MD simulation examples

Lecture 76 - Link between theory and experiments

Lecture 77 - MD protocol

Lecture 78 - Computer simulation tricks

Lecture 79 - Understanding force fields

Lecture 80 - Idea of Z-matrix

Lecture 81 - Basics of MD simulations

Lecture 82 - Integration algorithms

Lecture 83 - Calculation of Columbic force

Lecture 84 - Calculation of LJ force

Lecture 85 - Monte Carlo simulations

Lecture 86 - Analysis of MD trajectory

Lecture 87 - Case study (water)

NPTEL : NOC:Transport Phenomena in Biological Systems (Biotechnology)

Co-ordinators : Prof. G.K. Suraishkumar

Lecture 1 - Introduction

Lecture 2 - Mass Conservation

Lecture 3 - Mass Conservation for a Macroscopic System

Lecture 4 - Mass Conservation for a Microscopic System

Lecture 5 - Useful Derivatives

Lecture 6 - Equation of Continuity

Lecture 7 - Mass Flux

Lecture 8 - Mass and Molar Fluxes

Lecture 9 - Shell Balance Approach

Lecture 10 - Continuity Equation Approach

Lecture 11 - Steady-state Diffusion

Lecture 12 - Steady-state Diffusion across Tubular Walls

Lecture 13 - Steady-state Radial Diffusion

Lecture 14 - Steady-state Diffusion with Reaction

Lecture 15 - Unsteady-state Diffusion

Lecture 16 - Unsteady-state Diffusion (Continued...)

Lecture 17 - Pseudo Steady State Approximation (Continued...)

Lecture 18 - Pseudo Steady State Approximation (Continued...)

Lecture 19 - Review of Mass Flux

Lecture 20 - Momentum Flux - Introduction

Lecture 21 - Rheology

Lecture 22 - Fluid Flow types

Lecture 23 - Shell Momentum Balances

Lecture 24 - Shell Momentum Balances (Continued...)

Lecture 25 - Equation of Motion

Lecture 26 - Equation of Motion (Continued...)

Lecture 27 - Application of Equation of Motion to Flow Over an Inclined Plane

Lecture 28 - Laminar Flow through a Pipe

Lecture 29 - Laminar Flow through a Pipe (Continued...)

Lecture 30 - Capillary Flow

Lecture 31 - Couette Flow

Lecture 32 - Non-dimensional Analysis

Lecture 33 - Unsteady State Flow

Lecture 34 - Unsteady State Flow (Continued...)

Lecture 35 - Pulsatile Flow

Lecture 36 - Turbulent Flow

Lecture 37 - Macroscopic Aspects: The Engineering Bernoulli Equation

Lecture 38 - Friction Factor for Flow through a Straight Horizontal Pipe

Lecture 39 - Application of the Engineering Bernoulli Equation to a Piping Network

Lecture 40 - Stenosis in an Artery

Lecture 41 - Friction Factor for Relative Motion between a Solid and a Liquid

Lecture 42 - Friction Factor for Packed Beds

Lecture 43 - Review of Momentum Flux

Lecture 44 - Review of Momentum Flux (Continued...)

Lecture 45 - Thermal Energy Flux

Lecture 46 - Equation of Energy

Lecture 47 - Temperature Profile in a Tissue

Lecture 48 - Unsteady-state Heat Conduction

Lecture 49 - Review of Heat Flux

Lecture 50 - Charge Flux

Lecture 51 - Charge Flux - Some Fundamentals

Lecture 52 - Charge Flux - Some More Fundamentals

Lecture 53 - Getting Useful Relationships through Maxwell's Equations

Lecture 54 - Charges/Ions in Solution

Lecture 55 - Charge Flux: Review

Lecture 56 - Fluxes Under Simultaneous, Multiple Driving Forces

Lecture 57 - Simultaneous Concentration Gradient and Electrical Potential Gradient

Lecture 58 - Mobility of Ions Across a Membrane

Lecture 59 - Electrical Circuit Representation of a Membrane

Lecture 60 - Action Potential and Axial Current

Lecture 61 - Electrophoresis

Lecture 62 - Simultaneous Concentration Gradient and Velocity Gradient

Lecture 63 - Simultaneous Concentration Gradient and Velocity Gradient - Bioreactor Kla

Lecture 64 - Gas-Liquid Interphase Transport

Lecture 65 - Gas-Liquid Interphase Transport (Continued...)

Lecture 66 - Bioreactor Kla Estimation

Lecture 67 - Liquid Phase Oxygen-Supply Strategy

Lecture 68 - LPOS and Its Mechanism

Lecture 69 - LPOS for Mold Cultivations

Lecture 70 - LPOS Optimization and Costs

Lecture 71 - Couette Flow Cultivations

Lecture 72 - Pseudo-Steady State Approximation Applied to Bio-oil Production

Lecture 73 - Pseudo-Steady State Approximation Applied to Cancer Treatment

Lecture 74 - Kinetics of a Process with an Enzyme Immobilized on a Non-porous Slab

Lecture 75 - Simultaneous Temperature Gradient and Velocity Gradient

Lecture 76 - Design of Heat Exchangers

Lecture 77 - Design of Heat Exchangers (Continued...)

Lecture 78 - Course Review - Part 1

Lecture 79 - Course Review - Part 2

Lecture 80 - Course Review - Part 3

Lecture 81 - Course Review - Part 4

NPTEL : NOC:Introduction to Developmental Biology (Biotechnology)

Co-ordinators : Prof. Subramaniam K

Lecture 1 - Introduction

Lecture 2 - Life cycles and evolution of developmental patterns

Lecture 3 - Experimental embryology

Lecture 4 - Differential gene expression - Part 1

Lecture 5 - Differential gene expression - Part 2

Lecture 6 - Differential gene expression - Part 3

Lecture 7 - Differential gene expression - Part 4

Lecture 8 - Genetic basis - Part 1

Lecture 9 - Genetic basis - Part 2

Lecture 10 - Genetic basis - Part 3

Lecture 11 - Genetic basis - Part 4

Lecture 12 - Genetic basis - Part 5

Lecture 13 - Cell-cell communication - Part 1

Lecture 14 - Cell-cell communication - Part 2

Lecture 15 - Cell-cell communication - Part 3

Lecture 16 - Cell-cell communication - Part 4

Lecture 17 - Genetics of axis formation in Drosophila - Part 1

Lecture 18 - Genetics of axis formation in Drosophila - Part 2

Lecture 19 - Genetics of axis formation in Drosophila - Part 3

Lecture 20 - Genetics of axis formation in Drosophila - Part 4

Lecture 21 - Plant Development - Part 1

Lecture 22 - Plant Development - Part 2

Lecture 23 - Plant Development - Part 3

Lecture 24 - Early Mammalian Development - Part 1

Lecture 25 - Early Mammalian Development - Part 2

Lecture 26 - Evolutionary Developmental Biology - Part 1

Lecture 27 - Evolutionary Developmental Biology - Part 2

Lecture 28 - Evolutionary Developmental Biology - Part 3

NPTEL : NOC:Bioreactor Design and Analysis (Biotechnology)

Co-ordinators : Prof. Smita Srivastava

Lecture 1 - Introduction to the course - Part 1

Lecture 2 - Introduction to the course - Part 2

Lecture 3 - Design of Batch Bioreactors - Part 1

Lecture 4 - Design of Batch Bioreactors - Part 2

Lecture 5 - Design of Batch Bioreactors - Part 3

Lecture 6 - Design of Batch Bioreactors - Part 4

Lecture 7 - Design of Batch Bioreactors - Practice problems

Lecture 8 - Design of Fed Batch bioreactors - Part 1

Lecture 9 - Design of Fed Batch bioreactors - Part 2

Lecture 10 - Design of Fed Batch bioreactors - Practice problems - Part 1

Lecture 11 - Design of Fed Batch bioreactors - Practice Problems - Part 2

Lecture 12 - Design of Fed Batch bioreactors - Practice Problems - Part 3

Lecture 13 - Design of Continuous Bioreactors - Part 1

Lecture 14 - Design of Continuous Bioreactors - Part 2

Lecture 15 - Design of Continuous Bioreactors - Part 3

Lecture 16 - Design of Continuous bioreactors - Practice Problems - Part 1

Lecture 17 - Design of Continuous bioreactors - Practice Problems - Part 1

Lecture 18 - Design of Continuous bioreactors - Practice Problems - Part 2

Lecture 19 - Mass Transfer in Bioreactors - Part 1

Lecture 20 - Mass Transfer in Bioreactors - Part 2

Lecture 21 - Mass Transfer in Bioreactors - Part 3

Lecture 22 - Rheology of fluids

Lecture 23 - Mass Transfer in Bioreactors - Practice Problems

Lecture 24 - Heterogeneous reactions in Bioreactors - Part 1

Lecture 25 - Heterogeneous reactions in Bioreactors - Part 2

Lecture 26 - Heterogeneous reactions in Bioreactors - Part 3

Lecture 27 - Heterogeneous reactions in Bioreactors - Practice Problems

Lecture 28 - Heat Transfer Operations in Bioreactors - Part 1

Lecture 29 - Heat Transfer Operations in Bioreactors - Part 2

Lecture 30 - Heat Transfer Operations in Bioreactors - Part 3

Lecture 31 - Heat Transfer Operations in Bioreactors - Part 4

Lecture 32 - Heat Transfer Operations in Bioreactors - Practice Problems

Lecture 33 - Scale up of Bioreactors - Part 1

Lecture 34 - Scale up of Bioreactors - Part 2

Lecture 35 - Scale up of Bioreactors - Part 3

Lecture 36 - Scale up of Bioreactors - Part 4

Lecture 37 - Scale up of Bioreactors - Practice Problems

Lecture 38 - Non-ideal reactors: design and analysis - Part 1

Lecture 39 - Non-ideal reactors: design and analysis - Part 2

Lecture 40 - Non-ideal reactors: design and analysis - Practice Problems

NPTEL : NOC:Biochemistry (IITM) (Biotechnology)

Co-ordinators : Prof. Subramaniam K

Lecture 1 - Introduction to Biomolecules - Part 1

Lecture 2 - Introduction to Biomolecules - Part 2

Lecture 3 - Stereochemistry and Properties of Water - Part 1

Lecture 4 - Properties of Water - Part 2 and Introduction to Proteins

Lecture 5 - Characteristics of Proteins and Chromatography techniques

Lecture 6 - Electrophoresis of Proteins and Protein Sequencing

Lecture 7 - Synthesis of Polypeptides and Enzymes - Part 1

Lecture 8 - Enzymes - Part 2

Lecture 9 - Enzymes - Part 3

Lecture 10 - Enzymes - Part 4

Lecture 11 - Enzymes - Part 5 and Carbohydrates - Part 1

Lecture 12 - Carbohydrates - Part 2 and Lipids - Part 1

Lecture 13 - Lipids - Part 2

Lecture 14 - Lipids - Part 3 and Introduction to Metabolism - Part 1

Lecture 15 - Introduction to metabolism - Part 2

Lecture 16 - Bioenergetics - Part 1

Lecture 17 - Bioenergetics - Part 2

Lecture 18 - Glycolysis - Part 1

Lecture 19 - Glycolysis - Part 2

Lecture 20 - Citric Acid Cycle - Part 1

Lecture 21 - Citric Acid Cycle - Part 2

Lecture 22 - Oxidative Phosphorylation - Part 1

Lecture 23 - Oxidative Phosphorylation - Part 2

Lecture 24 - Photosynthesis and Carbon assimilation - Part 1

Lecture 25 - Photosynthesis and Carbon Assimilation - Part 2

Lecture 26 - Photosynthesis and Carbon assimilation - Part 3

Lecture 27 - Nitrogen Metabolism

Lecture 28 - Catabolism of Amino acids

Lecture 29 - Urea cycle and Fatty acid catabolism - Part 1

Lecture 30 - Fatty acid catabolism - Part 2

Lecture 31 - Fatty Acid Biosynthesis

Lecture 32 - Cholestrol Biosynthesis and Lipid transport - Part 1

Lecture 33 - Cholestrol Biosynthesis and Lipid transport - Part 2

Lecture 34 - Hormonal Regulation and Integration of Mammalian Metabolism

NPTEL : NOC:Cellular Biophysics: A Framework for Quantitative Biology (Biotechnology)

Co-ordinators : Prof. R. Chaitanya A. Athale

Lecture 1 - Introduction - Part 1

Lecture 2 - Introduction - Part 2

Lecture 3 - Introduction - Part 3

Lecture 4 - Solids vs Fluids

Lecture 5 - Viscosity

Lecture 6 - Measuring Viscosity

Lecture 7 - Tutorial - Part 1

Lecture 8 - Tutorial - Part 2

Lecture 9 - Tutorial - Part 3

Lecture 10 - Macromolecular Nature and Hydrophobicity, Structure of Ice, Pauling-Bernal-Fowler Model of Water

Lecture 11 - Entropy and Probability of Water Conformations,Boltzmann Law of Entropy

Lecture 12 - Reynolds Number

Lecture 13 - Tutorial - Part 1

Lecture 14 - Tutorial - Part 2

Lecture 15 - Tutorial - Part 3

Lecture 16 - Hagen-Poisuielle Equation

Lecture 17 - Tutorial - Part 4

Lecture 18 - Sedimentation and Centrifugation - Part 1

Lecture 19 - Sedimentation and Centrifugation - Part 2

Lecture 20 - Blood Centrifugation

Lecture 21 - Review: Paperfuge for Hematology

Lecture 22 - Biology by Numbers

Lecture 23 - Biology by Numbers: Bomb Yield Solved

Lecture 24 - Order of Magnitude Estimates and Approximations

Lecture 25 - Physical Basis of Life

Lecture 26 - Approximating Cellular and Molecular Size Scales

Lecture 27 - Quantifying DNA and Chromatin

Lecture 28 - Protein Abundance and Spacing

Lecture 29 - Model Gene

Lecture 30 - Cell-Biology by Numbers

Lecture 31 - Experimental Techniques to Quantify Cells

Lecture 32 - Time-Scales in Cells

Lecture 33 - Energy Scale

Lecture 34 - Energy and Thermodynamics of Life - Part 1

Lecture 35 - Energy and Thermodynamics of Life - Part 2

Lecture 36 - Energy and Life- Osmotic Engine

Lecture 37 - Energy and Life- Interconversion of Energy

Lecture 38 - Random Walk Statistics, Stoke-Einstein - Part 1

Lecture 39 - Random Walk Statistics, Stoke-Einstein - Part 2

Lecture 40 - Demonstration of Diffusion of Micron Sized Particles

Lecture 41 - Macromolecular Crowding - Part 1

Lecture 42 - Macromolecular Crowding - Part 2

Lecture 43 - Cytoskeleton

Lecture 44 - Beam Theory Applied to Biopolymer

Lecture 45 - Understanding Chromosomes as Statistical Polymers - Part 1

Lecture 46 - Understanding Chromosomes as Statistical Polymers - Part 2

Lecture 47 - Brownian Ratchets and Molecular Motors

Lecture 48 - Polymerization Dynamics - Part 1

Lecture 49 - Polymerization Dynamics - Part 2

Lecture 50 - Polymerization Dynamics - Part 3

Lecture 51 - Python Programming - Part 1

Lecture 52 - Python Programming - Part 2

Lecture 53 - Python Programming - Part 3

Lecture 54 - Introduction to Membrane Mechanics

Lecture 55 - Membrane Deformation

Lecture 56 - Developmental Pattern Formation

Lecture 57 - Turing Model

Lecture 58 - Phyllotaxis - Part 1

Lecture 59 - Phyllotaxis - Part 2

Lecture 60 - Phyllotaxis - Part 3

NPTEL : NOC:Medical Image Analysis (Biotechnology)

Co-ordinators : Prof. Ganapathy Krishnamurthi

Lecture 1 - Medical Image Analysis - Introduction

Lecture 2 - X-ray imaging

Lecture 3 - MRI Physics

Lecture 4 - Magnetic Resonance Image Acquisition

Lecture 5 - Ultrasound Imaging

Lecture 6 - Radionuclide Imaging

Lecture 7 - Basic Image Processing Methods

Lecture 8 - Contrast Enhancement

Lecture 9 - Histogram Equalization

Lecture 10 - Edge Enhancement - Laplacian

Lecture 11 - Noise Reduction

Lecture 12 - Diffusion Filtering

Lecture 13 - Bayesian Image Restoration

Lecture 14 - Registration Introduction

Lecture 15 - Framework

Lecture 16 - Image Coordinates

Lecture 17 - Transforms

Lecture 18 - Metrics

Lecture 19 - NonRigid Registration

Lecture 20 - Demons part - 1

Lecture 21 - Demons part - 2

Lecture 22 - FFDBSplines

Lecture 23 - Endoscopy - Where are we with AI ?

Lecture 24 - Computer vision and DL in the operating room

Lecture 25 - ML in intraoperative tissue identification

Lecture 26 - Basic Image Processing Techniques Using MATLAB

Lecture 27 - Image Registration Using Matlab

Lecture 28 - Basic Image Processing Techniques Using Python

Lecture 29 - Calculus of variations

Lecture 30 - Snakes - Active Contour Models

Lecture 31 - Level Sets, Geodesic Active Contours, Mumford-Shah Functional, Chan-Vese

Lecture 32 - Mumford-Shah Functional, Chan-Vese

Lecture 33 - Segmentation Models Demo [Snakes (Active Contours) Chan-Vese segmentation, Geodesic active Contour]

Lecture 34 - Active Shape Models

Lecture 35 - Snake tutorial

Lecture 36 - Level Set Method

Lecture 37 - Chan Vese Segmentation

Lecture 38 - Neural Networks Introduction

Lecture 39 - Linear Regression

Lecture 40 - Gradient Descent Formulation

Lecture 41 - Linear Regression Demo

Lecture 42 - Feed forward neural Networks

Lecture 43 - Example with XOR

Lecture 44 - Introduction to CNNs

Lecture 45 - Max Pooling

Lecture 46 - Applications of Cnns

Lecture 47 - CNN Training

Lecture 48 - Semantic Segmentation

Lecture 49 - Classification Demo in Pytorch

Lecture 50 - Generative Models

Lecture 51 - GAN Final Demo

NPTEL : NOC:Organ Printing (Biotechnology)

Co-ordinators : Prof. Falguni Pati

Lecture 1 - Introduction to Organ Printing course and Content Discussion

Lecture 2 - Introduction to 3D Bioprinting

Lecture 3 - Introduction to Inkjet 3D Bioprinting

Lecture 4 - Introduction to Inkjet 3D Bioprinting (Continued...)

Lecture 5 - Introduction to Extrusion Bioprinting

Lecture 6 - Introduction to Extrusion 3D Bioprinting (Continued...)

Lecture 7 - Introduction to Laser-assisted Bioprinting

Lecture 8 - Comparison of Different Bioprinting Techniques - Part 1

Lecture 9 - Comparison of Different Bioprinting Techniques - Part 2

Lecture 10 - 3D Bioprinting in Support Bath

Lecture 11 - Introduction to Bioinks

Lecture 12 - Important material requirement for Bioink development

Lecture 13 - Crosslinking of Hydrogels for Bioprinting

Lecture 14 - Single-Material and Multimaterial Bioink Systems

Lecture 15 - Printability for Extrusion Bioprinting

Lecture 16 - What is required and how to print an organ?

Lecture 17 - Level of complexity in Tissues/Organs for Bioprinting

Lecture 18 - Design approaches in Bioprinting

Lecture 19 - Bioprinting of Vasculature

Lecture 20 - Direct printing of vasculature

Lecture 21 - Indirect printing of vasculature

Lecture 22 - Design of Cornea Tissue-Specific Bioink and 3D Bioprinting of Cornea

Lecture 23 - Design of Cornea Tissue-Specific Bioink and 3D Bioprinting of Cornea (Continued...)

Lecture 24 - Bioprinting of Heart

Lecture 25 - Bioprinting of Liver

Lecture 26 - Bioprinting of Kidney

Lecture 27 - Bioprinting of Lung

Lecture 28 - 4D Bioprinting - Part 1

Lecture 29 - 4D Bioprinting - Part 2

Lecture 30 - 4D Bioprinting - Part 3

Lecture 31 - In Situ Bioprinting

Lecture 32 - In Situ Bioprinting (Continued...)

Lecture 33 - Medical Modeling for Organ Printing

Lecture 34 - Medical Modeling for Organ Printing (Continued...)

Lecture 35 - Next Step in Bioprinting

Lecture 36 - Next Step in Bioprinting (Continued...)

Lecture 37 - Ethical Issues related to Organ Printing

NPTEL : NOC:Introduction to Cell Biology (Biotechnology)

Co-ordinators : Prof. Girish Ratnaparkhi

Lecture 1 - An Overview of Central Dogma of Molecular Biology - Part 1

Lecture 2 - An Overview of Central Dogma of Molecular Biology - Part 2

Lecture 3 - Central Dogma : The DNA Structure - Part 1

Lecture 4 - Central Dogma : The DNA Structure - Part 2

Lecture 5 - Central Dogma : The DNA Structure - Part 3

Lecture 6 - Central Dogma : Replication of DNA - Part 1

Lecture 7 - Central Dogma : Replication of DNA - Part 2

Lecture 8 - Central Dogma : Transcription - Part 1

Lecture 9 - Central Dogma : Transcription - Part 2

Lecture 10 - Central Dogma : Transcription - Part 3

Lecture 11 - Central Dogma : Tranlation - Part 1

Lecture 12 - Central Dogma : Tranlation - Part 2

Lecture 13 - Central Dogma : Tranlation - Part 3

Lecture 14 - Protein Structure, Folding and Function - Part 1

Lecture 15 - Protein Structure, Folding and Function - Part 2

Lecture 16 - Secondary Strcuture of Proteins: Ramachandran Plot - Part 1

Lecture 17 - Secondary Strcuture of Proteins: Ramachandran Plot - Part 2

Lecture 18 - Protein Structure, Folding and Function - Part 3

Lecture 19 - Protein Structure, Folding and Function - Part 4

Lecture 20 - Protein Structure, Folding and Function - Part 5

Lecture 21 - Protein Structure, Folding and Function - Part 6

Lecture 22 - Enzymes, Carbohydrates and Lipids

Lecture 23 - Introduction to Genetics - Part 1

Lecture 24 - Introduction to Genetics - Part 2

Lecture 25 - Introduction to Genetics - Part 3

Lecture 26 - Mendilian and Non-Mendilian Genetics - Part 1

Lecture 27 - Mendilian and Non-Mendilian Genetics - Part 2

Lecture 28 - Mendilian and Non-Mendilian Genetics - Part 3

Lecture 29 - Introduction to Microscopy - Part 1

Lecture 30 - Introduction to Microscopy - Part 2

Lecture 31 - Introduction to Microscopy - Part 3

Lecture 32 - Biology of Cells - Part 1

Lecture 33 - Biology of Cells - Part 2

Lecture 34 - Complexity and Compartmentalization in Cells - Part 1

Lecture 35 - Complexity and Compartmentalization in Cells - Part 2

Lecture 36 - Endosymbiont Theory

Lecture 37 - Structure of the Cell: Cell Wall and Cell Membrane

Lecture 38 - Structure of the Cell: Discussion Session

Lecture 39 - Plasma Membrane: The Boundaries of Life

Lecture 40 - Plasma Membrane: Discussion Session

Lecture 41 - Introduction to Cytoskeleton - Part 1

Lecture 42 - Cytoskeleton: Discussion Session 1

Lecture 43 - Introduction to Cytoskeleton - Part 2

Lecture 44 - Cytoskeleton: Discussion Session 2

Lecture 45 - Motor Proteins in Cell

Lecture 46 - Motor Proteins in Cell: Discussion Session

Lecture 47 - Discussion on Directionality of Motor Protein

Lecture 48 - Endomembrane System of Cells - Part 1

Lecture 49 - Endomembrane System of Cells: Discussion Session 1

Lecture 50 - Endomembrane System of Cells - Part 2

Lecture 51 - Endomembrane System of Cells: Discussion Session 2

Lecture 52 - Endomembrane System of Cells - Part 3

Lecture 53 - Endomembrane System of Cells: Discussion Session 3

Lecture 54 - Endomembrane System of Cells - Part 4

Lecture 55 - Endomembrane System of Cells: Discussion Session 4

Lecture 56 - Cell Division

Lecture 57 - Cell Division: Discussion session

Lecture 58 - Discussion Session on Organization and Function of a Cell

NPTEL : NOC:RNA Biology (Biotechnology)

Co-ordinators : Prof. Rajesh Ramachandran

Lecture 1 - Introduction to RNA Biology and RNA World - The Beginning

Lecture 2 - Introduction to RNA Biology and RNA World - Evidences

Lecture 3 - Introduction to RNA Biology and RNA World - Origin of Monomers

Lecture 4 - Introduction to RNA Biology and RNA World - Shift to DNA

Lecture 5 - Introduction to RNA Biology and RNA World - RNA Self Replication

Lecture 6 - Introduction to RNA Biology and RNA World - Origin of RNA Enzymes

Lecture 7 - RNA as Enzymes: The Ribozymes

Lecture 8 - RNA as Enzymes: Structure and Functions

Lecture 9 - RNA as Enzymes: The Present and Future

Lecture 10 - RNA Transcription: The Central Dogma

Lecture 11 - RNA Transcription: Initial Steps

Lecture 12 - RNA Transcription: Different Stages

Lecture 13 - RNA Transcription: Termination and RNA Modification

Lecture 14 - RNA Transcription: Different Polymerases

Lecture 15 - RNA Processing and Life Cycle: RNA Maturation and RNPs

Lecture 16 - RNA Processing and Life Cycle: RNA Splicing

Lecture 17 - RNA Processing and Life Cycle: Post Transcriptional Processing

Lecture 18 - Alternative RNA Processing and Editing: Alternative Splicing

Lecture 19 - Alternative RNA Processing and Editing: Implications of Introns

Lecture 20 - Alternative RNA Processing and Editing: Splicing and Pathology

Lecture 21 - Alternative RNA Processing and Editing: RNA Editing in Detail

Lecture 22 - Alternative RNA Processing and Editing: Relevance of RNA Editing

Lecture 23 - Alternative RNA Processing and Editing: Relevance in Immunology

Lecture 24 - RNA Splicing, Export and Stability: Relevance of Introns

Lecture 25 - RNA Splicing, Export and Stability: Introns in RNA Splicing

Lecture 26 - RNA Splicing, Export and Stability: Different Spliceosomes

Lecture 27 - RNA Splicing, Export and Stability: SMN Complex

Lecture 28 - snRNA, rRNA, miRNA, siRNA Processing, Export and Function: Introns and Link to Splicing

Lecture 29 - snRNA, rRNA, miRNA, siRNA Processing, Export and Function: RNA Helicases

Lecture 30 - snRNA, rRNA, miRNA, siRNA Processing, Export and Function: Nucleo Cytoplasmic Transport

Lecture 31 - snRNA, rRNA, miRNA, siRNA Processing, Export and Function: Nucleoporins and miRNAs

Lecture 32 - snRNA, rRNA, miRNA, siRNA Processing, Export and Function: RNA Export Mechanisms

Lecture 33 - snRNA, rRNA, miRNA, siRNA Processing, Export and Function: RNA Quality Control

Lecture 34 - Mechanisms of RNA Decay and Non Coding RNAs: Decay Pathways

Lecture 35 - Mechanisms of RNA Decay and Non Coding RNAs: The Exosomes

Lecture 36 - Mechanisms of RNA Decay and Non Coding RNAs: mRNA Surveillance

Lecture 37 - Mechanisms of RNA Decay and Non Coding RNAs: Mechanisms of RNA Decay

Lecture 38 - Mechanisms of RNA Decay and Non Coding RNAs: Autoregulation of RNAs

Lecture 39 - Mechanisms of RNA Decay and Non Coding RNAs: Introduction to Non-Coding RNAs

Lecture 40 - Dosage Compensation and X-Inactivation: SRP and Different Modes of Compensation

Lecture 41 - Dosage Compensation and X-Inactivation: Dosage Compensation of X

Lecture 42 - Dosage Compensation and X-Inactivation: Omprinted vs Random X Inactivation

Lecture 43 - Dosage Compensation and X-Inactivation: Molecular Basis of X-Inactivation

Lecture 44 - Dosage Compensation and X-Inactivation: ES Cells and X-Inactivation

Lecture 45 - Dosage Compensation, Xist and ncRNA in Imprinting: The Roles of YY1

Lecture 46 - Dosage Compensation, Xist and ncRNA in Imprinting: shRNAs and Gene Expression

Lecture 47 - Dosage Compensation, Xist and ncRNA in Imprinting: Mechanism of RNAi in Action

Lecture 48 - Dosage Compensation, Xist and ncRNA in Imprinting: Genomic Imprinting in Action

Lecture 49 - Dosage Compensation, Xist and ncRNA in Imprinting: Different ncRNAs and their Roles

Lecture 50 - Dosage Compensation, Xist and ncRNA in Imprinting: lncRNA-Induced Cancer

Lecture 51 - Dosage Compensation, Xist and ncRNA in Imprinting: Xist and Cancer

Lecture 52 - Telomere, Telomerase and Impact on Genomes: The Importance of Telomeres

Lecture 53 - Telomere, Telomerase and Impact on Genomes: Telomerase and Aging

Lecture 54 - Telomere, Telomerase and Impact on Genomes: Telomere Length as Marker of Aging

Lecture 55 - Telomere, Telomerase and Impact on Genomes: Telomeres and Cancer

Lecture 56 - Telomere, Telomerase and Impact on Genomes: Cell Cycle Arrest

Lecture 57 - Telomere, Telomerase and Impact on Genomes: Maintenance and Manipulation of Telomeres

Lecture 58 - Epitranscriptome and Protein Synthesis: Important RNA Modifications

Lecture 59 - Epitranscriptome and Protein Synthesis: Readers, Writes and Erasers

Lecture 60 - Epitranscriptome and Protein Synthesis: Biological Implications of RNA Modifications

Lecture 61 - Epitranscriptome and Protein Synthesis: Roles of RNAs in Translation

Lecture 62 - Epitranscriptome and Protein Synthesis: Mechanism of Translation

NPTEL : NOC:Biomechanics (Biotechnology)

Co-ordinators : Prof. Varadhan

Lecture 1 - Introduction to forces - Resolving forces, principle of transmissibility

Lecture 2 - Statics FBD and EOE

Lecture 3 - Example problems on FBD and EOE

Lecture 4 - Joints in human body

Lecture 5 - Machines and mechanical advantage

Lecture 6 - Levers and types of levers

Lecture 7 - Insertion point and torque

Lecture 8 - Practice problem - 1

Lecture 9 - Practice problem - 2

Lecture 10 - Key terminologies

Lecture 11 - Anatomical planes and axis

Lecture 12 - Sagittal plane movements

Lecture 13 - Coronal plane movements

Lecture 14 - Transverse plane movements

Lecture 15 - Muscles - Muscle fascicles

Lecture 16 - Muscle fibers- Pennation angle

Lecture 17 - More on pennation angle

Lecture 18 - Excitation contraction coupling

Lecture 19 - Sliding filament theory

Lecture 20 - Force length relationship

Lecture 21 - Shoulder joints and muscles

Lecture 22 - Shoulder problem - 1

Lecture 23 - Shoulder problem - 2

Lecture 24 - Elbow theory

Lecture 25 - Elbow problem - 1

Lecture 26 - Elbow problem - 2

Lecture 27 - Elbow problem - 3

Lecture 28 - Wrist theory

Lecture 29 - Finger theory

Lecture 30 - Finger muscles

Lecture 31 - Spine anatomy and movements

Lecture 32 - Spine muscles

Lecture 33 - Spine problem

Lecture 34 - Hip anatomy and movements

Lecture 35 - Hip muscles

Lecture 36 - Hip problem

Lecture 37 - Knee anatomy and movements

Lecture 38 - Knee muscles

Lecture 39 - Knee problem

Lecture 40 - Ankle anatomy and movements

Lecture 41 - Ankle muscles

Lecture 42 - Ankle problem

Lecture 43 - Grasping- reaching- chains

Lecture 44 - D.O.F mobility, open/closed chain

Lecture 45 - Forward kinematics and workspace

Lecture 46 - 2R inverse kinematics

Lecture 47 - 3R kinematics forward and inverse

Lecture 48 - D-H parameters

Lecture 49 - Velocity and jacobian

Lecture 50 - 3R velocity

Lecture 51 - Tissues and types of tissues

Lecture 52 - Bone microstructure and cells

Lecture 53 - Properties of bones

Lecture 54 - Wolffs Law and Hookean behavior

Lecture 55 - Elastic properties and stress strain relations

Lecture 56 - Stress strain curve and mechanical properties of biological materials

Lecture 57 - Bending of Bones

Lecture 58 - Viscolelastic modelling

Lecture 59 - Maxwell Model

Lecture 60 - Voight Model

Lecture 61 - Kelvin model

Lecture 62 - Viscoelasticity in bones

Lecture 63 - Tissues and its constituents

Lecture 64 - Cartilages, ligaments and tendons

Lecture 65 - Stress strain relations in tendons

Lecture 66 - Tendon forces and factors affecting tendon property

Lecture 67 - Gliding resistance, tendon wrapping and friction forces

Lecture 68 - Enslaving - Intertendinuos force transfer and motor units

Lecture 69 - Introduction to enslavement

Lecture 70 - Enslaving effects in finger force production - 1

Lecture 71 - Enslaving effects in finger force production - 2

Lecture 72 - Wrist posture and finger interdependence - 1

Lecture 73 - Wrist posture and finger interdependence - 2

Lecture 74 - Wrist posture and finger interdependence - 3

Lecture 75 - Measurement of orientation in 3D space - Devices

Lecture 76 - Rotation matrices in 2D and 3D2

Lecture 77 - Animating using rotation matrices- Matlab Examples

Lecture 78 - Composite rotation matrix and relative orientations

Lecture 79 - Complex numbers and quaternions

Lecture 80 - Singularity, Gimbal Lock, Advantages and disadvantages of parameterization methods

Lecture 81 - Single finger kinematics measurement using IMU's

Lecture 82 - IMU based Full hand kinematics measurement system (HKMS)

Lecture 83 - Demonstration of the Hand Kinematics Measurement System (HKMS)

Lecture 84 - Introduction to Gait and running

NPTEL : Introduction to Synthetic Biology (Biotechnology)

Co-ordinators : Prof. Karthik Raman

Lecture 1 - Introduction to Synthetic Biology - Day 1 Part 1

Lecture 2 - Introduction to Synthetic Biology - Day 1 Part 2

Lecture 3 - Introduction to Synthetic Biology - Day 1 Part 3

Lecture 4 - Introduction to Synthetic Biology - Day 1 Part 4

Lecture 5 - Introduction to Synthetic Biology - Day 2 Part 1

Lecture 6 - Introduction to Synthetic Biology - Day 2 Part 2

Lecture 7 - Introduction to Synthetic Biology - Day 2 Part 3

Lecture 8 - Introduction to Synthetic Biology - Day 2 Part 4

Lecture 9 - Introduction to Synthetic Biology - Day 3 Part 1

Lecture 10 - Introduction to Synthetic Biology - Day 3 Part 2

Lecture 11 - Introduction to Synthetic Biology - Day 3 Part 3

Lecture 12 - Introduction to Synthetic Biology - Day 3 Part 4

Lecture 13 - Introduction to Synthetic Biology - Day 4 Part 1

Lecture 14 - Introduction to Synthetic Biology - Day 4 Part 2

Lecture 15 - Introduction to Synthetic Biology - Day 4 Part 3

Lecture 16 - Introduction to Synthetic Biology - Day 5 Part 1

Lecture 17 - Introduction to Synthetic Biology - Day 5 Part 2

Lecture 18 - Introduction to Synthetic Biology - Day 5 Part 3

Lecture 19 - Introduction to Synthetic Biology - Day 5 Part 4

Lecture 20 - Introduction to Synthetic Biology - Day 6 Part 1

Lecture 21 - Introduction to Synthetic Biology - Day 6 Part 2

Lecture 22 - Introduction to Synthetic Biology - Day 6 Part 3

Lecture 23 - Introduction to Synthetic Biology - Day 7 Part 1

Lecture 24 - Introduction to Synthetic Biology - Day 7 Part 2

Lecture 25 - Introduction to Synthetic Biology - Day 7 Part 3

Lecture 26 - Introduction to Synthetic Biology - Day 8 Part 1

Lecture 27 - Introduction to Synthetic Biology - Day 8 Part 2

Lecture 28 - Introduction to Synthetic Biology - Day 9 Part 1

Lecture 29 - Introduction to Synthetic Biology - Day 9 Part 2

Lecture 30 - Introduction to Synthetic Biology - Day 9 Part 3

Lecture 31 - Introduction to Synthetic Biology - Day 10 Part 1

Lecture 32 - Introduction to Synthetic Biology - Day 10 Part 2

Lecture 33 - Introduction to Synthetic Biology - Day 10 Part 3

NPTEL : NOC:Computational Genomics (Biotechnology)

Co-ordinators : Prof. Vineet Kumar Sharma

Lecture 1 - Introduction to Different OMICS Approaches and their Applications

Lecture 2 - Genetic Information in Prokaryotic

Lecture 3 - Databases and Web Resources to Store and Access the Biological Data

Lecture 4 - First and Second Generation Sequencing Technologies

Lecture 5 - Long Read Sequencing and Linked Read Sequencing - Part 1

Lecture 6 - Long Read Sequencing and Linked Read Sequencing - Part 2

Lecture 7 - Sequence Formats and Databases for Genomic Analysis

Lecture 8 - Introduction to Linux

Lecture 9 - File Handling and Remote Connectivity in Linux

Lecture 10 - Running Linux Commands and Installation of Genomic Packages

Lecture 11 - Introduction to R and Applications in Genomic Analysis

Lecture 12 - Publicly Available Tools and Need for Workstations for Genomic Analysis

Lecture 13 - Overview of Genomic and Transcriptomic Analysis

Lecture 14 - Genomic and Transcriptomic Analysis of an Organism with Case Studies

Lecture 15 - How to Collect and Confirm Sample of the Species to be Sequenced and Transcriptome Sequencing Approaches

Lecture 16 - Estimating the Amount of Sequencing Coverage for a Genome and Hybrid Sequencing Approaches

Lecture 17 - Types of Reads, Quality Filtering, Estimating the Genome Complexity and Heterozygosity

Lecture 18 - Genome Assembly and its Completion Status, Assembly Algorithms

Lecture 19 - Commonly Used Assembly Tools

Lecture 20 - Linked-Read Sequencing and Processing

Lecture 21 - Long Reads Analysis and Assembly Workflow

Lecture 22 - De novo Assembly Using Genomic and Transcriptomic Reads

Lecture 23 - Merging Assemblies to Create Hybrid Assembly and Determining the Quality of Assembly

Lecture 24 - Chromosomal Level Assembly and Case Studies

Lecture 25 - Identification and Annotation of Repeats in Genomes

Lecture 26 - De novo Transcriptome Assembly and Making the Coding Gene Set

Lecture 27 - Prediction of tRNA, rRNA and miRNA in a Genome

Lecture 28 - Functional Annotation and Identification of Metabolic Pathways in a Genome

Lecture 29 - Comprehensive Functional Annotation of Predicted Genes in a Genome

Lecture 30 - Functional Annotation of Predicted Genes by Alternate Methods

Lecture 31 - Methods and Steps to Perform the Evolutionary Analysis of a Genome

Lecture 32 - Methods for Taxonomic Classification and Phylogeny Econstruction and Analysis

Lecture 33 - Epigenetics, ChIp-seq, Transcriptome and Microarrays for Regulation of Expression

Lecture 34 - Single Cell Genomics, 10X Chromium Linked-reads and Illumina Sequencing, Single Cell Gene Expression

Lecture 35 - Application of Multiomics Approaches in Human Health and Diseases Such as Cancer, Diabetes, etc.

Lecture 36 - Prokaryotic Genome Sequencing and Assembly Approaches

Lecture 37 - Gene Prediction Approaches and Common Methods for Bacterial Gene Prediction

Lecture 38 - Common Methods for Annotation of a Bacterial Genome, t-RNA, rRNA, Operon Prediction and Annotation

Lecture 39 - Phylogenetic Analysis of Bacterial Genomes

Lecture 40 - Metabolic and Comparative Analysis

Lecture 41 - Microbiome and Metagenome, Human, Organismal and Environmental Microbiomes

Lecture 42 - Sequencing and Assembly of Metagenomes, Gene Prediction, Annotation, MAGs - Part 1

Lecture 43 - Sequencing and Assembly of Metagenomes, Gene Prediction, Annotation, MAGs - Part 2

Lecture 44 - Taxonomic Analysis Using Amplicon Sequence Variants, Statistical Analysis

NPTEL : NOC:Human Physiology (Biotechnology)

Co-ordinators : Prof. Nishikant Subedar

Lecture 1 - Introduction to Homeostasis

Lecture 2 - Mechanisms of Homeostasis - Part 1

Lecture 3 - Mechanisms of Homeostasis - Part 2

Lecture 4 - Physiology of muscle - Part 1

Lecture 5 - Physiology of muscle - Part 2

Lecture 6 - Molecular Mechanism of muscle contractility - Part 1

Lecture 7 - Molecular Mechanism of muscle contractility - Part 2

Lecture 8 - How does the heart muscle work? - Part 1

Lecture 9 - How does the heart muscle work? - Part 2

Lecture 10 - Cardiac system : From stimuli to rhythmic muscle contraction - Part 1

Lecture 11 - Cardiac system : From stimuli to rhythmic muscle contraction - Part 2

Lecture 12 - Cardiac system : From stimuli to rhythmic muscle contraction - Part 3

Lecture 13 - Cardiac system : From stimuli to rhythmic muscle contraction - Part 4

Lecture 14 - Rhythemicity of heart beat - Part 1

Lecture 15 - Rhythemicity of heart beat - Part 2

Lecture 16 - Hemodynamics

Lecture 17 - Hemodynamics and Regulation - Part 1

Lecture 18 - Hemodynamics and Regulation - Part 2

Lecture 19 - Hemodynamics and Regulation - Part 3

Lecture 20 - Hemodynamics and Regulation - Part 4

Lecture 21 - Hemodynamics and Regulation - Part 5

Lecture 22 - Hemodynamics and Regulation - Part 6

Lecture 23 - Lymphatic system

Lecture 24 - Excretory system : Kidney - Part 1

Lecture 25 - Excretory system : Kidney - Part 2

Lecture 26 - Excretory system : Kidney - Part 3

Lecture 27 - Kidney and RBC production

Lecture 28 - Excretory system : Nephron - Part 1

Lecture 29 - Excretory system : Nephron - Part 2

Lecture 30 - Excretory system : Nephron - Part 2.1

Lecture 31 - Excretory system : Nephron - Part 3

Lecture 32 - Excretory system : Regulation of Osmolarity and counter-current mechanism - Part 1

Lecture 33 - Excretory system : Regulation of Osmolarity and counter-current mechanism - Part 2

Lecture 34 - Excretory system : Regulation of Osmolarity and counter-current mechanism - Part 3

Lecture 35 - Physiology and Introduction of Respiration - Part 1

Lecture 36 - Physiology and Introduction of Respiration - Part 2

Lecture 37 - Respiration - Part 1

Lecture 38 - Respiration - Part 2

Lecture 39 - Respiration - Part 3

Lecture 40 - Respiration - Part 4

Lecture 41 - Physiology of smooth muscles and digestive system - Part 1

Lecture 42 - Physiology of smooth muscles and digestive system - Part 2

Lecture 43 - Physiology of smooth muscles and digestive system - Part 3

Lecture 44 - Physiology of smooth muscles and digestive system - Part 4

Lecture 45 - Secretory functions of alimentary tract - Part 1

Lecture 46 - Secretory functions of alimentary tract - Part 2

Lecture 47 - Secretory functions of alimentary tract and Pancreas - Part 1

Lecture 48 - Secretory functions of alimentary tract and Pancreas - Part 2

Lecture 49 - Secretory functions of Pancreas and liver

Lecture 50 - Secretory functions of Liver and Gallbladder

Lecture 51 - Introduction to Endrocine system

Lecture 52 - Pituitary gland and growth hormone secretion - Part 1

Lecture 53 - Pituitary gland and growth hormone secretion - Part 2

Lecture 54 - Thyroid gland - Part 1

Lecture 55 - Thyroid gland - Part 2

Lecture 56 - Hormones of adrenal cortex - Part 1

Lecture 57 - Hormones of adrenal cortex - Part 2

Lecture 58 - Physiology of Glucocorticoids - Part 1

Lecture 59 - Physiology of Glucocorticoids - Part 2

Lecture 60 - Course Summary

NPTEL : NOC:I Think Biology (Biotechnology)

Co-ordinators : Prof. Kaustubh Rau, Prof. Sravanti Uppaluri, Prof. Divya Uma, Prof. Jayanti Ray Mukherjee, Prof. Sriram

Lecture 1 - What is Biology ?

Lecture 2 - Pillars of Biology

Lecture 3 - Biology and the City

Lecture 4 - The Process of Science

Lecture 5 - A Tale of Forgotten Scientists - Part I

Lecture 6 - A Tale of Forgotten Scientists - Part II

Lecture 7 - Numbers and Scales in Biology - Part I

Lecture 8 - Numbers and Scales in Biology - Part II

Lecture 9 - Experimentation vs Theory_Discussion

Lecture 10 - How to Find Reliable Information ?

Lecture 11 - How to Read a Scientific Article ?

Lecture 12 - Biomolecules - Part I

Lecture 13 - Biomolecules - Part II

Lecture 14 - Central Dogma

Lecture 15 - Gene Regulation

Lecture 16 - Non-Coding RNA

Lecture 17 - Introduction to Cells

Lecture 18 - Our Favourite Cells - Part I

Lecture 19 - Our Favourite Cells - Part II

Lecture 20 - Cell Cycle

Lecture 21 - Cell Cycle Control

Lecture 22 - Cancer Biology (Guest Lecture) - Dr. Ramray Bhat (IISc)

Lecture 23 - Discussion on Cancer Biology - Dr. Ramray Bhat (IISc) and Dr. Divya Uma (Azim Premji University)

Lecture 24 - Genetics - I

Lecture 25 - Genetics - II

Lecture 26 - Genetics - III

Lecture 27 - Gene Mutations and Genetic Disorders (Guest Lecture) Dr. Antara Das, Azim Premji University

Lecture 28 - Studying Human Genetic Disorders using Transgenic Animals - Research talk (Guest Lecture)

Lecture 29 - Bead Microscopy (Guest Lecture) Dr. Procheta Mallik (ISPF and ThinkTac)

Lecture 30 - Molecular Biology Techniques

Lecture 31 - Bacterial DNA Isolation and PCR - Hands-on (Guest Lecture) Dr. Beena DB (Azim Premji University)

Lecture 32 - BT Cotton - Part 1 (Case study)

Lecture 33 - Molecular Biology Techniques - BT Cotton - Part 2 (Case study)

Lecture 34 - Introduction to Evolution

Lecture 35 - Evidences of Evolution

Lecture 36 - Mechanism of Evolution

Lecture 37 - Misconceptions about Evolution - Discussion

Lecture 38 - Human Evolution

Lecture 39 - Species, Speciation and Biodiversity - I

Lecture 40 - Species, Speciation and Biodiversity - II

Lecture 41 - Measuring Biodiversity (Tutorial)

Lecture 42 - Speciation

Lecture 43 - Speciation (Case studies)

Lecture 44 - Introduction to Ecological Interactions - Part 1

Lecture 45 - Ecological Interactions - Part 2

Lecture 46 - Ecological Interactions - Part 3

Lecture 47 - Mutualism - Figs (Case Study)

Lecture 48 - Seed Dispersal (Case study)

Lecture 49 - Introduction to Public Health (Guest Lecture) Dr.Abha Rao (Public Health Foundation of India)

Lecture 50 - Public Health in India (Guest Lecture) Dr. Abha Rao (Public Health Foundation of India)

Lecture 51 - Discussion on Public Health - Dr. Abha Rao (PHFI) and Mr. Pratush Brahma (University of Florida)

Lecture 52 - Public Health - Rotavirus (Case study)

Lecture 53 - Public Health - Malaria (Case study) - Part 1

Lecture 54 - Public Health - Malaria (Case study) - Part 2

Lecture 55 - Biology and Climate Change - Part 1

Lecture 56 - Biology and Climate Change - Part 2

Lecture 57 - Biology and Climate Change - Part 3

Lecture 58 - Biodiversity Conservation (Guest Lecture) Dr. Krishnapriya Tamma (Azim Premji University)

Lecture 59 - Discussion on Biology and Society

Lecture 60 - Discussion on Art and Science

Lecture 61 - Biology and Society - Case study on Stray Dogs

Lecture 62 - Nature Relatedness

Lecture 63 - Course Wrap-Up

NPTEL : NOC:Classics in Neuroscience (Biotechnology)

Co-ordinators : Prof.Varadhan SKM

Lecture 1 - History of Neuroscience - Introduction - Part 1

Lecture 2 - History of Neuroscience - Introduction - Part 2

Lecture 3 - Factors that produce discoveries

Lecture 4 - Importance of the 1950s in Neuroscience

Lecture 5 - Advances in Molecular Biology (Genes to DNA)

Lecture 6 - Discovery of the structure of the DNA

Lecture 7 - How DNA works

Lecture 8 - Molecular biology of the human brain

Lecture 9 - Signaling molecule: The First growth Factor

Lecture 10 - Nerve Growth Factor

Lecture 11 - Organizing the Connections

Lecture 12 - Axonal Transport

Lecture 13 - Signaling molecules: The First Neurotransmitter in the brain

Lecture 14 - The concept of Lock and Key

Lecture 15 - The Soup vs Sparks Debate

Lecture 16 - Intracellular Electrode, Neurotransmitter in the Brain, Dales Law

Lecture 17 - Early evidence of Acetylcholine and Glutamate

Lecture 18 - Early evidence of GABA and Serotonin

Lecture 19 - Catecholamine and Hormones

Lecture 20 - Second messengers and Hormones

Lecture 21 - Pheromones

Lecture 22 - Revolution in Cytology

Lecture 23 - Synapse and the 'Neuronism vs Reticularism' debate

Lecture 24 - Contributions by Rene Couteaux and George Koelle

Lecture 25 - Chemical Synapse

Lecture 26 - Synapse and the Neuromuscular Junction

Lecture 27 - The Electrical Synapse and Myelin

Lecture 28 - Physiology: The Action Potential - Part 1

Lecture 29 - Recording nerve impulses and single action potentials

Lecture 30 - Recording from nerve and plant cells

Lecture 31 - Recording Local circuits, Hodgkin and Huxely contributions - Part 1

Lecture 32 - Hodgkin and Huxely model - Part 2 and Kenneth Cole Contributions

Lecture 33 - GHK equation and HH action potentials

Lecture 34 - First Electrophysiological Evidence for Synaptic Transmission

Lecture 35 - Bernard Katz

Lecture 36 - End-Plate Potential and Synaptic Quanta

Lecture 37 - Eccles and Spinal motor neuron

Lecture 38 - Invertebrate simple systems: Aplysia

Lecture 39 - Other studies of sensory responses

Lecture 40 - Legacy of Golgi and Ramo`n y Cajal

Lecture 41 - Dynamic polarization of Neuron

Lecture 42 - Modern Research

Lecture 43 - Synaptic Integration and Action Potential Initiation

Lecture 44 - Active properties of dendrites

Lecture 45 - Dendritic dominance

Lecture 46 - Dendritic spines

Lecture 47 - Rethinking the concept of Neuron Doctrine

Lecture 48 - Muscle spindles

Lecture 49 - Spinal cord pathways

Lecture 50 - Retinal Processing

Lecture 51 - Keffler Hartline

Lecture 52 - Stephen Kuffler and Horace Barlow

Lecture 53 - Expansion of the Reflex concept

Lecture 54 - Central Pattern generators

Lecture 55 - The cortical column

Lecture 56 - Vernon Mountcastle

Lecture 57 - Central Visual Processing

Lecture 58 - Central Visual Processing and Feature Detectors

Lecture 59 - Intracellular recordings from the brain - Part 1

Lecture 60 - Intracellular recordings from the brain - Part 2

Lecture 61 - Two motor systems

Lecture 62 - Auditory cortex and The pattern theory of olfaction

Lecture 63 - Arousal and Reticular activating system

Lecture 64 - Sleep and Rapid Eye Movements

Lecture 65 - Operant Conditioning by brain stimulation

Lecture 66 - Hypothalamus and Feeding Behavior

Lecture 67 - Brain as a gland

Lecture 68 - Hypothalamic-Neurohypophyseal System

Lecture 69 - Hypothalamic-Adenohypophyseal System

Lecture 70 - Founding Modern Neuroanatomy

Lecture 71 - Psychology and Ethology

Lecture 72 - Karl Lashley

Lecture 73 - Donald Hebb

Lecture 74 - Limbic system-Limbic Lobe and Papez Circuit

Lecture 75 - Limbic system-Kluver-Bucy Syndrome

Lecture 76 - The Limbic system and Amygdala

Lecture 77 - The Hippocampus and Patient H.M

Lecture 78 - Brenda Milner

Lecture 79 - Neurology: Foundations of Brain Imaging

Lecture 80 - The Neurological unit of the Boston City Hospital

Lecture 81 - Derek Denny-Brown, Raymond Adams and C. Miller Fisher

Lecture 82 - Montreal Neurological Institute

Lecture 83 - Cerebral Circulation

Lecture 84 - Spreading depression of Leo and Migraine

Lecture 85 - The Eradication of Polio

Lecture 86 - Origin of Neurosurgery

Lecture 87 - Harvey Cushing

Lecture 88 - Pituitary Surgery

Lecture 89 - Stereotaxy

Lecture 90 - Epilepsy

Lecture 91 - Psychosurgery

Lecture 92 - Antipsychotic Drugs

Lecture 93 - Reserpine

Lecture 94 - Monoamine Oxidase Inhibitors

Lecture 95 - Lithium

Lecture 96 - Benzodiazepines

Lecture 97 - Stress

Lecture 98 - Theoretical Neuroscience: Brain as computer and Computer as Brain

Lecture 99 - John Atanasoff

Lecture 100 - John von Newmann

Lecture 101 - Game and Information theory

Lecture 102 - Cybernetics and Artificial Intelligence

Lecture 103 - Towards Networks of Realistic Neurons: von Newman's Last word

Lecture 104 - Santiago Ramon y Cajal, 'The Peasant Genius'

Lecture 105 - 'Cajal- a giant wakes up'

Lecture 106 - Cajal's modifications to the Golgi method and studies of embryos and various systems

Lecture 107 - Law of dynamic polarization, support from others studies

Lecture 108 - Santiago Ramon y Cajal - Career turning point and Palm Sunday years

Lecture 109 - Cajalâ€™s trailblazing discoveries that earned him the Nobel Prize

Lecture 110 - 'Enduring Legacy of Cajal'

Lecture 111 - Robert Barany - Early life and prior work done by other scientists

Lecture 112 - Robert Barany - The serendipitous discovery of the caloric test

Lecture 113 - Robert Barany - Vestibular System and connection to Cerebellum

Lecture 114 - Robert Barany - Modern Applications of Barany's work - Space medicine and Astronaut training

Lecture 115 - Robert Barany - Summary of Contributions

Lecture 116 - Charles Sherrington Personal Background

Lecture 117 - Charles Sherrington - quiet mind expt, Neuroplasiticity, animal locomotion studies

Lecture 118 - Charles Sherrington - Reciprocal innervation, Pain and Emotion, Mind and Body

Lecture 119 - Charles Sherrington's Magnum Opus - The integrative action of the nervous system

Lecture 120 - Charles Sherrington - Insights into life and work by Molnar and Brown

Lecture 121 - Charles Sherrington - Summary of contributions

Lecture 122 - Edgar Adrian, Keith Lucas and Novel instruments used in Neurophysiology

Lecture 123 - Edgar Adrian - Early life, All or none principle in neurons, Key findings with Keith Lucas

Lecture 124 - Edgar Adrian - Work with Alexander Forbes, Gasser and Erlanger (St. Louis connection)

Lecture 125 - Edgar Adrian - 'Failed experiment', Perseverance in science

Lecture 126 - Edgar Adrian - Recording from single sensory and motor neurons

Lecture 127 - Edgar Adrian - Nobel Prize, Admin work, Legacy

Lecture 128 - Edgar Adrian - Adventures with EEG

Lecture 129 - Edgar Adrian - Mapping cerebellar cortex, Cerebral cortex, Brain and Behavior, Olfaction

Lecture 130 - Hodgkin and Huxley - Biographical background, Scientific backdrop and state of Neurophysiology

Lecture 131 - Hodgkin and Huxley - Meeting of great minds and Challenges faced - Part 1

Lecture 132 - Hodgkin and Huxley - Meeting of great minds and Challenges faced - Part 2

Lecture 133 - Bernard Katz - personal background, scientific backdrop, soup vs spark debate

Lecture 134 - Bernard Katz - Quantal nature of synaptic transmission, Vesicle hypothesis, foundational work

Lecture 135 - Bernard Katz - del Castillo model of receptor activation, role of calcium in synapses, sodium

Lecture 136 - Bernard Katz Paper: The fine structure of neuromuscular junction of the frog

Lecture 137 - Roger Sperry - Personal Background, Split brain patients, Hemispheric specialization

Lecture 138 - Roger Sperry: Split Brain patients and Dichotomous consciousness

Lecture 139 - Roger Sperry: Unified consciousness and Behavioural differences in split brain patients,

Lecture 140 - Roger Sperry, Gazzaniga's Interpreter theory, Impact on Psychology and Neuroscience, Nobel Prize

Lecture 141 - Roger Sperry's Chemoaffinity hypothesis paper

Lecture 142 - Roger Sperry paper 'Mentalism: Yes, Dualism:No'

Lecture 143 - Jens Christian Skou Part 1 : The Story of Jens Christian Skou's life in science

Lecture 144 - Jens Christian Skou: Sodium Potassium pump overview and Nobel Prize

Lecture 145 - Jens Christian Skou: Paper - 'The Influence of Some Cations on an Adenosine Triphosphate

Lecture 146 - Arvid Carlsson - Personal Background, Education and Early Career, Pivot, Nobel prize contributions

Lecture 147 - Arvid Carlsson - History of L Dopa

Lecture 148 - Arvid Carlsson - Antipsychotics, Dopamine hypothesis, Serotonin and SSRIs, Omeprazole

Lecture 149 - Eric Kandel - Early life and nobel prize winning work

Lecture 150 - Eric Kandel - Synaptic Plasticity

Lecture 151 - Eric Kandel - Aplysia work, Short and long term memory and mechanisms

Lecture 152 - Paul Greengard - The Phosphorylation Paradigm

Lecture 153 - David Hubel and Torsten Wiesel - early life, education and collaboration

Lecture 154 - Hubel and Wiesel - Effect of early visual deprivation on cortical function

Lecture 155 - Hubel and Wiesel - Effect of visual misalignment on binocular integration

Lecture 156 - Hubel and Wiesel - Limited capacity for recovery following early visual deprivation

NPTEL : NOC:Advances in Omics (Biotechnology)

Co-ordinators : Prof. Nagarjun Vijay

Lecture 1 - Introduction to Genomics - 1

Lecture 2 - Introduction to Genomics - 2

Lecture 3 - Advent of NGS

Lecture 4 - Genome Assembly: Few Concepts and Terminology

Lecture 5 - Genome Assembly Approaches

Lecture 6 - Pyrosequencing

Lecture 7 - Reversible Chain Termination Based Sequencing

Lecture 8 - Ph Sequencing

Lecture 9 - Sequencing by Ligation (Solid)

Lecture 10 - Sequencing by Ligation (Complete Genomics)

Lecture 11 - Other Short-Read Sequencing Technologies - Part 1

Lecture 12 - Other Short-Read Sequencing Technologies - Part 2

Lecture 13 - Long-Read Sequencing

Lecture 14 - Single Molecule Long-Read Sequencing

Lecture 15 - The Omics Data Avalanche

Lecture 16 - Evolutionary Biology and Genomics

Lecture 17 - Ancient Genomics

Lecture 18 - Whole-Genome Duplication

Lecture 19 - Tests of Selection

Lecture 20 - Genomics in Experimental Evolution

Lecture 21 - Making Sense of Genomic Sequences

Lecture 22 - Transcriptomics: New Tools Leading to Deeper Insights

Lecture 23 - Single Cell Transcriptomics and Beyond

Lecture 24 - Proteomics: A Brief Introduction

Lecture 25 - Protein Quantification

Lecture 26 - Introduction to Linux for Omics

Lecture 27 - The Linux Command Line Interface

Lecture 28 - Using the CLI-1: NCBI Datasets

Lecture 29 - Using the CLI-2: Short Read Archive Toolkit

Lecture 30 - UCSC and IGV genome browsers

Lecture 31 - Mega Omics Projects

Lecture 32 - Genotype-Tissue Expression (GTEx)

Lecture 33 - Encyclopedia of DNA Element (ENCODE)

Lecture 34 - The Cancer Genome Atlas (TCGA)

Lecture 35 - Eukaryotic Genome Sequencing Consortia

Lecture 36 - The Postomics Era

Lecture 37 - RNA-Seq Differential Expression Analysis

Lecture 38 - Gene Loss and its Consequences

Lecture 39 - Establishing Gene loss: Few Examples

Lecture 40 - Course Summary

NPTEL : NOC:Statistics for Biomedical Engineers (Biotechnology)

Co-ordinators : Prof. Babji Srinivasan

Lecture 1 - Statistics - Motivation

Lecture 2 - Statistics - Introduction

Lecture 3 - Statistics: Definition and Terminology - Part I

Lecture 4 - Statistics: Definition and Terminology - Part II

Lecture 5 - Data: Primary vs Secondary

Lecture 6 - Data: Quantitative vs Qualitative

Lecture 7 - Data: Presentation

Lecture 8 - Data: Static vs Dynamic

Lecture 9 - Data: Box Plot and Spyder Graphs

Lecture 10 - Data: Summarising Data

Lecture 11 - Probability: Event and Sample space

Lecture 12 - Probability: Mutually exclusive and Independent Events

Lecture 13 - Probability: Random Variables

Lecture 14 - Probability: Expectation of Random Variable

Lecture 15 - Probability: Variance of Random Variable

Lecture 16 - Probability Distribution: Binomial, Poisson, Bernoulli

Lecture 17 - Probability Distribution: Normal Distribution

Lecture 18 - Central Limit Theorem: Statement

Lecture 19 - Central Limit Theorem: Illustration

Lecture 20 - Confidence Interval

Lecture 21 - Determining Sample Size

Lecture 22 - Hypothesis Test: Introduction

Lecture 23 - Hypothesis Test: Example

Lecture 24 - Hypothesis: P value

Lecture 25 - Hypothesis: Type 2 error

Lecture 26 - Hypothesis: Chi square Distribution - Part 1

Lecture 27 - Hypothesis: Chi square Distribution - Part 2

Lecture 28 - Hypothesis: Probability Plots

Lecture 29 - Hypothesis: Contingency Table Test

Lecture 30 - Multivariate Hypothesis: Two Sample Test

Lecture 31 - Multivariate Hypothesis: Paired T test

Lecture 32 - Multivariate Hypothesis: Paired vs Unpaired Testing

Lecture 33 - Multivariate Hypothesis: Two population variances

Lecture 34 - Multivariate Hypothesis: Multiple Random Variables - Part 1

Lecture 35 - Multivariate Hypothesis: Multiple Random Variables - Part 2

Lecture 36 - Multivariate Hypothesis: Covariance and Correlation

Lecture 37 - One Way ANOVA: Motivation and Assumptions

Lecture 38 - One Way ANOVA: Fixed and Random effects Model

Lecture 39 - One Way ANOVA: Derivation and Confidence Interval

Lecture 40 - One Way ANOVA: Confidence Interval

Lecture 41 - One Way ANOVA: Unbalanced Experiment and Residuals

Lecture 42 - One Way ANOVA: Interpretation of Results

Lecture 43 - Statistical Modeling: Introduction

Lecture 44 - Statistical Modeling: Linear Regression Derivation

Lecture 45 - Statistical Modeling: Linear Regression - Assumption and Residuals

Lecture 46 - Statistical Modeling: Multi Linear Regression

Lecture 47 - Statistical Modeling: Logistic Regression

Lecture 48 - Statistical Modeling: Cross Entropy Loss

Lecture 49 - Statistical Modeling: Gradient Descent

Lecture 50 - Statistical Modeling: One Way Anova via Linear Regression

Lecture 51 - Design Of Experiments: Randomised Complete Block Design - Part 1

Lecture 52 - Design Of Experiments: Randomised Complete Block Design - Part 2

Lecture 53 - RCBD: Math Formulation and Derivation

Lecture 54 - RCBD: Necessity and Application

Lecture 55 - Latin Square: Introduction

Lecture 56 - Latin Square: Math and Formulation

Lecture 57 - Graeco - Latin Square

Lecture 58 - Interaction Among Variables

Lecture 59 - Two-Way ANOVA: Introduction - Part 1

Lecture 60 - Two-Way ANOVA: Introduction - Part 2

Lecture 61 - Two-Way ANOVA: Math and Formulation

Lecture 62 - Factorial Design: 2^2 Experiments

Lecture 63 - Factorial Design: 2^k Experiments - Part 1

Lecture 64 - Factorial Design: 2^k Experiments - Part 2

Lecture 65 - Factorial Design: Blocking

Lecture 66 - Introduction to Python Programming for Biomedical Engineers

NPTEL : NOC:Advanced Fluorescence Microscopy and Image Processing (Biotechnology)

Co-ordinators : Prof. Gunjan Mehta

Lecture 1 - Introduction to Fluorescence Microscopy

Lecture 2 - Introduction to Optics

Lecture 3 - Design of a fluorescence microscope

Lecture 4 - Fluorescent proteins, organic dyes, and protein labelling strategies

Lecture 5 - LIVE Demonstration of the fluorescence microscope, its design and components

Lecture 6 - 6D imaging, live cell imaging, time lapse imaging

Lecture 7 - Quantifying protein dynamics using FRAP, FLIP, FRET

Lecture 8 - LIVE Demonstration for 6D imaging of live cells on a Leica DMi8 inverted fluorescence microscope

Lecture 9 - Types of Illumination Epi, TIRF, HILO, light sheet, two photon

Lecture 10 - Confocal microscopy

Lecture 11 - LIVE Demonstration of the Nikon N-SPARC confocal microscope

Lecture 12 - Super-Resolution Microscopy (SIM, STED, STORM/PALM)

Lecture 13 - Nanomaterials for fluorescence imaging

Lecture 14 - Immunofluorescence IF and Immunohistochemistry IHC

Lecture 15 - Fluorescence In Situ Hybridization FISH, RNA FISH

Lecture 16 - LIVE Demonstration for immunofluroescence procedure

Lecture 17 - Digital images and camera technologies for microscopy

Lecture 18 - CCD, EMCCD, sCMOS Camera

Lecture 19 - LIVE Demonstration for digital images and adjustments

Lecture 20 - Basic operations of ImageJ/FIJI, montage preparation

Lecture 21 - Image filtering and object segmentation

Lecture 22 - Macros, intensity measurement, scale bar, time stamp, colocalization

Lecture 23 - LIVE Demonstration of ImageJ/Fiji based image processing

Lecture 24 - Single molecule imaging and tracking

Lecture 25 - Optical tweezers and traction force microscopy

Lecture 26 - LIVE Demonstration for single-molecule imaging under HILO illumination

Lecture 27 - Spatial transcriptomics and proteomics RNAscope, MERFISH, CODEX

Lecture 28 - High content imaging

Lecture 29 - Designing a fluorescence microscopy experiment

NPTEL : Analytical Technologies in Biotechnology (Biotechnology)

Co-ordinators : Dr. Ashwani K. Sharma

Lecture 1 - Basic concepts in microscopy - 1

Lecture 2 - Basic concepts in microscopy - 2

Lecture 3 - Dark-field and phase contrast microscopy

Lecture 4 - Differential interference contrast and polarization

Lecture 5 - Fluorescence and confocal microscopy

Lecture 6 - Transmission electron microscopy

Lecture 7 - Transmission electron microscopy cont. and scanning electron microscopy

Lecture 8 - Basic concepts - 1

Lecture 9 - Basic concepts - 2

Lecture 10 - GM counting and Scintillation counting

Lecture 11 - Scintillation counting continued

Lecture 12 - Autoradiography and RIA

Lecture 13 - Safety aspects and applications

Lecture 14 - Introduction and Basic concepts in chromatography - 1

Lecture 15 - Basic concepts in chromatography - 2

Lecture 16 - Low-pressure liquid chromatography (LPLC) and high performance liquid chromatography (HPLC)

Lecture 17 - Ion-exchange chromatography

Lecture 18 - Gel-filtration chromatography

Lecture 19 - Affinity chromatography

Lecture 20 - Gas-liquid chromatography

Lecture 21 - Basic concepts in electrophoresis

Lecture 22 - Horizontal and vertical gel electrophoresis

Lecture 23 - Native gel electrophoresis and SDS-PAGE

Lecture 24 - Isoelectric focusing (IEF), 2-D gel electrophoresis and protein detection methods

Lecture 25 - Electrophoresis of nucleic acids

Lecture 26 - Immunoelectrophoresis and capillary electrophoresis

Lecture 27 - Introduction and Basic Concepts - 1

Lecture 28 - Basic concepts - 2

Lecture 29 - Types of centrifuges and analytical ultracentrifugation method

Lecture 30 - Separation methods in preparative ultracentrifuges

Lecture 31 - Types of rotors

Lecture 32 - Types of rotors cont. and care of rotors

Lecture 33 - Introduction and basic concepts

Lecture 34 - UV-Visible spectroscopy

Lecture 35 - Infrared and fluorescence spectroscopy

Lecture 36 - Circular dichroism (CD) spectroscopy

Lecture 37 - Nuclear magnetic resonance (NMR) spectroscopy and X-ray crystallography

Lecture 38 - Atomic spectroscopy and mass spectrometry

Lecture 39 - Polymerase chain reaction(PCR)

Lecture 40 - DNA sequencing methods

Lecture 41 - Enzyme linked immunosorbent assay (ELISA)

NPTEL : NOC:Biomedical Nanotechnology (Biotechnology)

Co-ordinators : Prof. P.Gopinath

Lecture 1 - Introduction to Nano

Lecture 2 - Nano-Biomimicry

Lecture 3 - Synthesis of nanomaterials by Physical and Chemical Methods

Lecture 4 - Synthesis of nanomaterials by Biological Methods

Lecture 5 - Characterisation of Nanomaterials

Lecture 6 - DNA Nanotechnology

Lecture 7 - Protein and Glyco Nanotechnology

Lecture 8 - Lipid Nanotechnology

Lecture 9 - Bio-Nanomachines

Lecture 10 - Carbon nanotubes and Its Bio-Applications

Lecture 11 - Nanomaterials for Cancer Diagnosis

Lecture 12 - Nanomaterials for Cancer therapy

Lecture 13 - Nanotechnology in Tissue Engineering

Lecture 14 - Nano artificial cells

Lecture 15 - Nanotechnology in Organ Printing

Lecture 16 - Nanotechnology in Point-of-Care Diagnostics

Lecture 17 - Nano-Pharmacology and Drug Targeting

Lecture 18 - Cellular uptake mechanisms of nanomaterials

Lecture 19 - In vitro Methods to study antibacterial and anticancer properties of nanomaterials

Lecture 20 - Nanotoxicology

NPTEL : NOC:Plant Developmental Biology (Biotechnology)

Co-ordinators : Prof. Shri Ram Yadav

Lecture 1 - Life Cycle of an Angiosperm

Lecture 2 - Characteristics of Plant Growth and Development - I

Lecture 3 - Characteristics of Plant Growth and Development - II

Lecture 4 - Molecular Genetics of Plant Development - I

Lecture 5 - Molecular Genetics of Plant Development - II

Lecture 6 - Molecular Genetics of Plant Development - III

Lecture 7 - Molecular Genetics of Plant Development - IV

Lecture 8 - Molecular Genetics of Plant Development (Continued...) - I

Lecture 9 - Molecular Genetics of Plant Development (Continued...) - II

Lecture 10 - Molecular Genetics of Plant Development (Continued...) - III

Lecture 11 - Root Development

Lecture 12 - Root Development (Continued...)

Lecture 13 - Root Development (Vascular Development)

Lecture 14 - Root Branching: Lateral Root Development

Lecture 15 - Shoot Development: SAM Maintenance

Lecture 16 - Shoot Development: Organogenesis

Lecture 17 - Shoot Development: Leaf Development

Lecture 18 - Shoot Development: Flowering

Lecture 19 - Cell-Cell Communication During Plant Development

Lecture 20 - Techniques Used in Lab

NPTEL : NOC:Structural Biology (Biotechnology)

Co-ordinators : Prof. Saugata Hazra

Lecture 1 - Introduction: Why to Study Structural Biology

Lecture 2 - Introduction to Biological Macromolecules

Lecture 3 - Introduction: Decoding Biological Macromolecules

Lecture 4 - Introduction: Genome Sequencing

Lecture 5 - Introduction: Post Genomic Era

Lecture 6 - Amino acids and their properties

Lecture 7 - Protein: Protein Chemistry, Chirality, Peptide bond and Levels of protein structures

Lecture 8 - Protein: Dihedral angles, Peptide bond and Ramachandran Plot

Lecture 9 - Protein: Super Secondary Structures, Motif, Domains, Non-covalent interactions

Lecture 10 - Protein: Folding of Protein, Thermodynamics and Kinetics of protein folding, Characterization of Proteins

Lecture 11 - Introduction to Structural Biology Techniques - Part I

Lecture 12 - Introduction to Structural Biology Techniques - Part II

Lecture 13 - X-ray Crystallography: Crystallization - Part I

Lecture 14 - X-ray Crystallography: Crystallization - Part II

Lecture 15 - X-ray Crystallography: Crystal Mounting

Lecture 16 - X-ray Crystallography: Production of X-ray and its properties

Lecture 17 - X-ray Crystallography: Journey to 3D land

Lecture 18 - X-ray Crystallography: Crystal Symmetry

Lecture 19 - X-ray Crystallography: Instrumentation in X-ray Crystallography

Lecture 20 - X-ray Crystallography: Data collection and processing

Lecture 21 - X-ray Crystallography: Data Analysis - Part I

Lecture 22 - X-ray Crystallography: Data Analysis - Part II

Lecture 23 - X-ray Crystallography: Phase Problem - Part I

Lecture 24 - X-ray Crystallography: Phase Problem - Part II

Lecture 25 - X-ray Crystallography: Refinement and Structure deposition to PDB

Lecture 26 - Introduction to Spectroscopy and NMR

Lecture 27 - Basic Principles of NMR and Instrumentation

Lecture 28 - NMR Sample Preparation and Chemical Shift related concepts

Lecture 29 - Factors effecting NMR Spectra (1D and 2D)

Lecture 30 - 2D and 3D NMR Spectroscopy focusing on protein structure

Lecture 31 - Introduction to Spectroscopy

Lecture 32 - UV-Vis and CD spectroscopy

Lecture 33 - Fluorescence Spectroscopy and Green Fluorescence Protein (GFP)

Lecture 34 - Infrared and Raman Spectroscopy for protein

Lecture 35 - Raman Spectroscopy, Raman Microscopy and Raman Crystallography for studying protein

Lecture 36 - Introduction to Microscopy

Lecture 37 - Functioning details of Cryo Electron Microscopy (Cryo EM)

Lecture 38 - Cryo Electron Microscopy: Data Collection and Analysis

Lecture 39 - A concise story of advancement Cryo-EM

Lecture 40 - Protein Data Bank

Lecture 41 - History of Molecular Visualizations of Biological Macromolecules

Lecture 42 - Description of structure related files (.pdb, .mmcif, .mtz, etc.)

Lecture 43 - Demonstration of COOT

Lecture 44 - 3D visualization using Pymol

Lecture 45 - Demonstration of Pymol

Lecture 46 - Why we need MD Simulation

Lecture 47 - Molecular Dynamic Simulation Process - Part I

Lecture 48 - Molecular Dynamic Simulation Process - Part II

Lecture 49 - Molecular Dynamic Simulation Process - Part III

Lecture 50 - Application of Molecular Dynamic Simulation

Lecture 51 - What, How and Which of Protein Engineering

Lecture 52 - How to make logical Protein Engineering: Process of Rational design

Lecture 53 - Success story of Rational Protein designing: Focusing on De Novo Process

Lecture 54 - Designing Protein by mimicking nature: Process of Directed Evolution

Lecture 55 - Achievement, Challenges, and Future direction in the field of Protein Engineering

Lecture 56 - Introduction to Structure Based Drug Discovery (SBDD)

Lecture 57 - Rational Drug Discovery

Lecture 58 - Docking Based Virtual Screening: Progress, Challenges and Future perspective

Lecture 59 - What makes a small molecule an ideal drug: Developing in silico ADMETox Model

Lecture 60 - Structure Based Drug Discovery: Case study and Conclusion

NPTEL : NOC:Experimental Nanobiotechnology (Biotechnology)

Co-ordinators : Prof. P. Gopinath

Lecture 1 - Synthesis of Nanomaterials Using Ball Milling

Lecture 2 - Synthesis Of Gold Nanoparticles

Lecture 3 - Biological Synthesis of Nanomaterials

Lecture 4 - Synthesis Of Carbon Dots

Lecture 5 - Synthesis Of Polymeric Nanoparticles

Lecture 6 - UV-Visible and Fluorescence Spectroscopy

Lecture 7 - Dynamic Light Scattering and Zeta Potential Analysis

Lecture 8 - Fourier Transform Infrared Spectroscopy

Lecture 9 - X-Ray Diffraction

Lecture 10 - Electron Microscopy

Lecture 11 - Atomic Force Microscopy

Lecture 12 - Electrochemical Nano-Biosensor

Lecture 13 - Fabrication of Nanofibers Using Electrospinning

Lecture 14 - Synthesis of Hydrogel and Nanogel

Lecture 15 - In vitro 3D Cell Culture

Lecture 16 - 3D Bioprinting

Lecture 17 - In vitro Methods to Study Antibacterial Properties of Nanomaterials

Lecture 18 - In vitro Cytotoxicity Analysis

Lecture 19 - In vitro Methods to Study the Apoptotic Potential of Nanomaterials

Lecture 20 - In vitro Hemocompatibility Test

Lecture 21 - In vivo Toxicity Studies Using Zebrafish Embryo

NPTEL : NOC:Learning about Learning: A Course on Neurobiology of Learning and Memory (Biotechnology)

Co-ordinators : Prof. Balaji Jayaprakash

Lecture 1 - Introduction to Learning and Memory - I : Historical perspective

Lecture 2 - Introduction to Learning and Memory - II : Classification

Lecture 3 - Associative Learning I : Rules of Associative learning

Lecture 4 - Associative learning II : Garcia and KoellingÃ¢â,¬â„¢s Experiment, KaminÃ¢â,¬â„¢s Blocking Experiment

Lecture 5 - Introduction to the Rescorla Wagner Model

Lecture 6 - Application of Rescorla Wagner Model - I

Lecture 7 - Application of Rescorla Wagner Model - II

Lecture 8 - Application of Rescorla Wagner Model - III

Lecture 9 - Application of Rescorla Wagner Model - IV

Lecture 10 - Limitations of Rescorla Wagner Model

Lecture 11 - Introduction of Reinforcement Learning - I : ThorndikeÃ¢â,¬â„¢s view, TolmanÃ¢â,¬â„¢s views, Skinner Box

Lecture 12 - Introduction of Reinforcement Learning - II : Classification, ThorndikeÃ¢â,¬â„¢s view, TolmanÃ¢â,¬â„¢s views, Skinner Box (Continued...)

Lecture 13 - Introduction of Reinforcement Learning - III : Understanding scheduling of reinforcers in operant conditioning

Lecture 14 - Sign Tracking vs Goal Oriented/Tracking; Linking complex behaviors to simple molecules

Lecture 15 - Sign Tracking vs Goal Oriented; Learning Linking complex behaviors to simple molecules - II

Lecture 16 - Memory in Molecular Terms - I : Protein synthesis in memory consolidation

Lecture 17 - Memory in Molecular Terms - II : Long term potentiation

Lecture 18 - Memory in Molecular Terms - III : Properties of a memory molecule

Lecture 19 - Memory in Molecular Terms - IV : Remote memory and its characteristics

Lecture 20 - Memory in Molecular Terms - V : Selective labelling of memory encoding neurons and their manipulation

NPTEL : NOC:Drug Delivery: Principles and Engineering (Biotechnology)

Co-ordinators : Rachit Agarwal

Lecture 1 - Drug Delivery Introduction and Pharmacokinetics

Lecture 2 - Pharmacokinetics (Continued...)

Lecture 3 - Pro-drugs and Polymers Introduction

Lecture 4 - Polymers - Synthesis

Lecture 5 - Polymers - Properties

Lecture 6 - Biomedical Polymers

Lecture 7 - Biodegradable Polymers and Polymer Drug Conjugates - I

Lecture 8 - Polymer Drug Conjugates - II

Lecture 9 - Research Paper Discussion and Diffusion Controlled Systems

Lecture 10 - Controlled Release: Reservoir System - I

Lecture 11 - Controlled Release: Reservoir Systems and Non-erodible Systems

Lecture 12 - Controlled Release: Non-erodible Systems and Erodible systems

Lecture 13 - Math Exercise

Lecture 14 - Hydrogels - I

Lecture 15 - Hydrogels - II

Lecture 16 - Hydrogels - III

Lecture 17 - Hydrogels - IV

Lecture 18 - Nano and Micro-particles - I

Lecture 19 - Nano and Micro-particles - II

Lecture 20 - Nano and Micro-particles - III

Lecture 21 - Nano and Micro-particles - IV

Lecture 22 - Nano and Micro-particles - V

Lecture 23 - Nano and Micro-particles - VI

Lecture 24 - Nano and Micro-particles - VII

Lecture 25 - Protein Adsorption - I

Lecture 26 - Protein Adsorption - II

Lecture 27 - Protein Adsorption - III

Lecture 28 - Tissue Engineering - I

Lecture 29 - Tissue Engineering - II

Lecture 30 - Tissue Engineering - III

Lecture 31 - Drug Delivery in Tissue Engineering - I

Lecture 32 - Drug Delivery in Tissue Engineering - II

Lecture 33 - Implant Associated Infections - I

Lecture 34 - Implant Associated Infections - II

Lecture 35 - Route Specific Delivery: Oral Route - I

Lecture 36 - Route Specific Delivery: Oral Route - II

Lecture 37 - Route Specific Delivery: Oral and Subcutaneous Route

Lecture 38 - Route Specific Delivery: Intramuscular, Transdermal - I

Lecture 39 - Route Specific Delivery: Transdermal - II

Lecture 40 - Route Specific Delivery: Transdermal and Inhalation Route

Lecture 41 - Route Specific Delivery: Inhalation - II, Buccal and Rectal Administration

Lecture 42 - Research Paper Discussion: Dry Powder Particle Delivery

Lecture 43 - Route Specific Delivery: Intra-articular and Intravenous Administration

Lecture 44 - Intravenous Administration: Approved Nanocarriers and Immune System

Lecture 45 - Immune System - II

Lecture 46 - Complement System and Blood Clotting

Lecture 47 - Blood Clotting and Hemocompatibility of Materials; Adaptive Immune Response

Lecture 48 - Adaptive Immune Response and Vaccine

Lecture 49 - Vaccines

Lecture 50 - Vaccines and Immuno-isolated Cell Therapy

Lecture 51 - Immuno-isolated Cell Therapy

Lecture 52 - Immuno-isolated Cell and Gene Therapy

Lecture 53 - Gene Delivery: Vectors

Lecture 54 - Gene Delivery: Polymers

Lecture 55 - Genes as Vaccines

Lecture 56 - Vaccines: Gene Delivery and Other Variants

Lecture 57 - Cancer Vaccines

Lecture 58 - Cancer Vaccine: Immunotherapy

Lecture 59 - Responsive Delivery Systems - I

Lecture 60 - Responsive Delivery Systems - II

Lecture 61 - Targeted Drug Delivery System

Lecture 62 - Targeted Drug Delivery System: Research Paper Discussion

Lecture 63 - Nanotoxicology and Translation Pathways

NPTEL : NOC:Fundamentals of Micro and Nanofabrication (Biotechnology)

Co-ordinators : Prof. Shankar Selvaraja

Lecture 1 - Introduction

Lecture 2 - Substrate

Lecture 3 - Substrate (Continued...)

Lecture 4 - Introduction to cleanroom

Lecture 5 - Contamination and surface cleaning

Lecture 6 - Advanced cleaning techniques

Lecture 7 - Defects

Lecture 8 - Diffusion

Lecture 9 - Diffusion - Advanced Concepts

Lecture 10 - Ion Implantation

Lecture 11 - Ion Implantation (Continued...)

Lecture 12 - Native Films

Lecture 13 - Native Films: Advanced Concepts

Lecture 14 - Native Films: Defects at Si/SiO2 interface

Lecture 15 - Methods and Some Definitions

Lecture 16 - Chemical Vapor Depostion: Basics

Lecture 17 - Chemical Vapor Depostion: Precursor Transport

Lecture 18 - Chemical Vapor Depostion: Types of CVD Equipment

Lecture 19 - Chemical Vapor Depostion: Nucleation and Growth

Lecture 20 - Chemical Vapor Depostion: Other Details

Lecture 21 - Atomic Layer Depostion

Lecture 22 - Atomic Layer Depostion (Continued...)

Lecture 23 - Physical Vapor Deposition: Basics

Lecture 24 - Physical Vapor Deposition: Evaporation

Lecture 25 - Physical Vapor Deposition: Sputtering

Lecture 26 - Mettalization: Contact resistance

Lecture 27 - Mettalization: Electromigration and Epilogue

Lecture 28 - Pattern Transfer Bascis

Lecture 29 - Optical lithography basics: resist process - 1

Lecture 30 - Optical lithography basics: resist process - 2

Lecture 31 - Optical Lithography: Contact and Proximity printing

Lecture 32 - Optical Lithography: Stepper and Scanner

Lecture 33 - Projection Lithography: Image formation basics

Lecture 34 - Projection Lithography: Image formation in photoresist

Lecture 35 - Optical lithography: Surface Reflection

Lecture 36 - Optical Lithography: Mask Technology

Lecture 37 - Lithography process technology glossary

Lecture 38 - Optical Lithography: Resolution enhancement

Lecture 39 - Electron beam lithography: Basics

Lecture 40 - Electron beam lithography: Resist process

Lecture 41 - Emerging lithography techniques

Lecture 42 - Etching Figures of Merit

Lecture 43 - Wet etching Basics

Lecture 44 - Wet Ething Recipes

Lecture 45 - Wet Ething Recipes

Lecture 46 - Dry etch: Plasma Basics

Lecture 47 - Dry etch: Plasma etching basics

Lecture 48 - Dry etch: Plasma tool configuration

Lecture 49 - Dry etch: Etch mechanism

Lecture 50 - Dry etch: Etch chemistry

Lecture 51 - Chemical Mechanical Polishing (CMP): Basics

Lecture 52 - Chemical Mechanical Polishing (CMP): Tool and process

Lecture 53 - Design for Manufacturability - 1

Lecture 54 - Design for Manufacturability - 2

Lecture 55 - Design for Manufacturability: Case study

Lecture 56 - Process integration

Lecture 57 - PV integration

Lecture 58 - CMOS integration

Lecture 59 - Lab demo: Silicon Nitride cantilever fabrication - 1

Lecture 60 - Lab demo: Silicon Nitride cantilever fabrication - 2

Lecture 61 - CMOS process for photonics application

NPTEL : NOC:Optical Spectroscopy and Microscopy: Fundamentals of Optical Measurements and Instrumentation (Biotechnology)

Co-ordinators : Prof. Balaji Jayaprakash

Lecture 1 - Optical Focus and Localisation of Light

Lecture 2 - Relating Photon's Momentum to Spot Size

Lecture 3 - Shortest Pulse of Light: How fast can we shutter the light?

Lecture 4 - Behaviour of light through polarizers: Introduction

Lecture 5 - Nature of Light: Introduction to Photo Multiplier Tubes

Lecture 6 - Revisiting Polarisation Through Ket Vectors

Lecture 7 - Light through Polarisers: Detailed Description - I

Lecture 8 - Light through Polarisers: Detailed Description - II

Lecture 9 - Time Dependent Perturbation Theory (TDPT): Overview

Lecture 10 - TDPT in Steps-1: Unperturbed and Perturbed Hamiltonian

Lecture 11 - TDPT in Steps-2: Introducing the switch and first approximation

Lecture 12 - TDPT in Steps-3: Finding the co-efficients

Lecture 13 - Fermi's Golden Rule

Lecture 14 - Beer Lambert's Law from TDPT

Lecture 15 - Einstein's Phenomenology

Lecture 16 - Einstein's Coefficients, Fluorescence and Lifetime

Lecture 17 - Fock States and Photonic Treatment of Light

Lecture 18 - Operators in Fock State Space

Lecture 19 - Light Matter Interaction and Rudimentary Feynman Diagrams

Lecture 20 - Emergence of Spontaneous and Stimulated Emission Processes

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

Lecture 26 - Introduction to LASER

Lecture 27 - LASER population dynamics

Lecture 28 - LASER population dynamics - Part- 2

Lecture 29 - Real world LASER and characteristics of LASER emission

Lecture 30 - Temporal and Spatial Coherence

Lecture 31 - Transverse and Longitudinal modes of LASER

Lecture 32 - Pulsed LASER

Lecture 33 - Q-switching in detail

Lecture 34 - Q-switching in detail - Part 2

Lecture 35 - Basics of mode locking

Lecture 36 - Basics of mode locking - Part 2

Lecture 37 - Pulse compression

Lecture 38 - Real world system (Mode lock Part-2)

Lecture 39 - TEM mode

Lecture 40 - Alignment basics

Lecture 41 - Non-Linear Optics

Lecture 42 - Confocal Detection

Lecture 43 - Interference Filters

Lecture 44 - Laser Scanning System - 1

Lecture 45 - Laser Scanning System - 2

Lecture 46 - Alignment of Moving Beams

Lecture 47 - Decoding an Objective Lens - 1

Lecture 48 - Decoding an Objective Lens - 2

Lecture 49 - Designing Lens Systems

Lecture 50 - Astigmatism and Field Curvature

Lecture 51 - Intro to Lab Session

Lecture 52 - Optics in LAB: Aligning light through an optical fiber - 1

Lecture 53 - Optics in Lab: Telescope

Lecture 54 - Kinematic Mounts

Lecture 55 - Alignment with out iris

Lecture 56 - Fluorescecne Spectrometer - 1

Lecture 57 - Fluorescecne Spectrometer - 2

Lecture 58 - Ti:Sapphire Laser and Two Photon Fluorescecne

NPTEL : NOC:Cell Biology: Cellular Organization, Division and Processes (Biotechnology)

Co-ordinators : Prof. Shikha Laloraya

Lecture 1 - Introduction to Cell Biology, Cell components, organization and processes - Part I

Lecture 2 - Introduction to Cell Biology, Cell components, organization and processes - Part II

Lecture 3 - DNA: The genetic material - Part I

Lecture 4 - DNA: The genetic material - Part II

Lecture 5 - Regulation of the cell cycle - Part I

Lecture 6 - Regulation of the cell cycle - Part II

Lecture 7 - Checkpoints: The DNA damage and DNA replication checkpoints

Lecture 8 - The Ubiquitin Proteasome system

Lecture 9 - S-phase: Regulation of entry into S-phase and DNA Replication

Lecture 10 - DNA replication - Part I

Lecture 11 - DNA Replication - Part II

Lecture 12 - DNA Replication - Part III

Lecture 13 - DNA Replication - Part IV

Lecture 14 - Mitosis - Part I

Lecture 15 - Cytokinesis

Lecture 16 - Aging and Senescence

Lecture 17 - Apoptosis - Part I

Lecture 18 - Apoptosis - Part II

Lecture 19 - Meiosis - Part I

Lecture 20 - Meiosis - Part II

Lecture 21 - Nuclear organization

Lecture 22 - SMC proteins and chromosome organization - Real-Time imaging of DNA loop-extrusion by SMC complexes

Lecture 23 - The cohesin complex and its functions - The mysterious biological function of chromosome loops

Lecture 24 - Chromatin organization

Lecture 25 - SMC proteins and chromosome organization - Introduction

Lecture 26 - Meiosis - Part III

Lecture 27 - Mitosis - Part II

Lecture 28 - Cell diversity and properties of specialized cells-Budding yeast as a model system

Lecture 29 - The Plant Cell

Lecture 30 - Stem cells - Part I Intro-SL

Lecture 31 - Stem cells - Part II

Lecture 32 - Nerve cells

Lecture 33 - The Cancer Cell

NPTEL : NOC:Microsensors, Implantable Devices and Rodent Surgeries for Biomedical Applications (Biotechnology)

Co-ordinators : Prof. Shabari Girishan K V, Prof. Hardik J. Pandya

Lecture 1 - Course Introduction - I

Lecture 2 - Course Introduction - II

Lecture 3 - Neuro anatomy for Neurosurgery

Lecture 4 - Neural Implant Fabrication: PVD - I

Lecture 5 - Neural Implant Fabrication: PVD - II

Lecture 6 - Rodent Neuroanatomy

Lecture 7 - Basics of BCI and Signal Processing

Lecture 8 - Neural Implant Fabrication: Sputtering and CVD

Lecture 9 - Principles of Stereotactic Rodent MicroNeurosurgery

Lecture 10 - Neural Signal Processing: Demonstrations

Lecture 11 - Neural Implant Fabrication: Photolithography - I

Lecture 12 - Neural Implant Fabrication: Photolithography - II

Lecture 13 - Craniotomy and Stereotactic Implantation Surgeries

Lecture 14 - Lithography Numericals

Lecture 15 - IDE Patterning

Lecture 16 - Etching

Lecture 17 - Introduction to Cleanroom and Gowning

Lecture 18 - E-Beam Evaporation Demonstration

Lecture 19 - Craniotomy and Cranial Window Surgeries

Lecture 20 - Flexible MEA: Introduction and Process Flow

Lecture 21 - Flexible MEA: EIB, Characterization and Analyses

Lecture 22 - Stereotactic Implantation Surgeries

Lecture 23 - Sputtering Demonstration

Lecture 24 - 3D Printing - Part I

Lecture 25 - Bioresorbable Microelectrode Array-based System

Lecture 26 - Fundamentals of Spinal Neuroanatomy

Lecture 27 - 3D Printing - Part II

Lecture 28 - Neural Implant - Microneedle

Lecture 29 - Spinal Cord Structure, and Circuits

Lecture 30 - Surgical Steps in Spinal Surgeries

Lecture 31 - 3D Printing - Part III

Lecture 32 - 3D Printing - Demonstration

Lecture 33 - Wet Etching Demonstration

Lecture 34 - Neural Implants for Parkinson's Disease

Lecture 35 - Spinal micro neuro Surgery

Lecture 36 - Anesthesia in Rodents

Lecture 37 - Physiological Monitoring in Rodents

Lecture 38 - Lithography Demonstration

Lecture 39 - Electronic System Development for Neural Engineering - I

Lecture 40 - Anesthesia Administration Equipments and Vital Monitoring

Lecture 41 - Standard Safety Practices

Lecture 42 - Euthanasia

Lecture 43 - Euthanaisa in Rodents

Lecture 44 - Electronic System Development for Neural Engineering - II

Lecture 45 - Rodent Brain and Spinal Cord Harvest

Lecture 46 - Rodent Behavioural Setups

Lecture 47 - Study Plan for Behavioural Setups: Stroke Model

Lecture 48 - PCB Design Demonstration for Neural Systems

Lecture 49 - Electronic Systems for Brain Stimulation - I

Lecture 50 - Behavioural Taks in Rodent Models - I

Lecture 51 - Behavioural Taks in Rodent Models - II

Lecture 52 - Behavioural Setup for Rodents: Parkinsonism Model - I

Lecture 53 - Behavioural Setup for Rodents: Parkinsonism Model - II

Lecture 54 - Electronic Systems for Brain Stimulation - II

Lecture 55 - Course Concluding Remarks