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NPTEL : Proteomics: Principles and Techniques (Biotechnology)

Co-ordinators : Prof. Sanjeeva Srivastava

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Co-ordinators : Prof. Mainak Das

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NPTEL : Bio electricity (Biotechnology)

Co-ordinators : Prof. Mainak Das

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Lecture 1 - Fundamentals of central dogma, Part 1

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Lecture 3 - Fundamentals of central dogma, Part 3

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Lecture 5 - Pedigree Analysis

Lecture 6 - Complications in Mendelian Pedigree Patterns

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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)

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Lecture 2 - The Genomics Era

Lecture 3 - Epigenetics

Lecture 4 - Forward Genetics vs Reverse Genetics

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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)

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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

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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

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Lecture 21 - Factors Determining the Conversion Process - II

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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

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Lecture 4 - Positive feedback loop in homeostasis

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Lecture 12 - Skeletal muscle formation

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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

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Lecture 30 - Long term depression

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Lecture 34 - Spinal cord injury

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Lecture 42 - Eye lens and cataract

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Lecture 45 - Mechanism of photo processing by rods

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- 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/polycarbonate surface - I
- Lecture 15 - Interaction of cell and glass/polycarbonate 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 - Drug 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
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- Lecture 30 - Cell separation and in vitro myelination cell culture mode - V
- Lecture 31 - Fluorescent assisted cell sorting

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Lecture 6 - Shape of a tree: Form and Taper

Lecture 7 - Metzgers theory

Lecture 8 - Form factor and form quotients

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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

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Lecture 21 - Canopy attributes - Part I

Lecture 22 - Canopy attributes - Part II

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Lecture 6 - Testing the Hypothesis

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Lecture 8 - Writing an Abstract

Lecture 9 - Title for a Research Paper

Lecture 10 - Title and Keywords

Lecture 11 - Mileposts for the Article Writing

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Lecture 13 - Writing the Results Section

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Lecture 18 - Finalizing the Manuscript and Ethics in Research

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

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Lecture 14 - Photosynthesis - IV

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Lecture 12 - Habitat degradation, loss, fragmentation and displacement

Lecture 13 - Reserve selection and design

Lecture 14 - Habitat management and improvement

Lecture 15 - Some terminologies

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Lecture 19 - Mechanical capture

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[Lecture 33 - Other aspects: cryopreservation, seed banks, etc.](#)

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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

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Lecture 11 - Detailed Physical Techniques - I

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Lecture 18 - Iron pyrite and seed pre-treatment

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

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

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- 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 - Biogeography: 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

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Lecture 3 - Value of forests

Lecture 4 - What is Silviculture ?

Lecture 5 - Plant Growth Factors

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Lecture 8 - Major Soil Types

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Lecture 10 - Tree Form

Lecture 11 - Measurement of Tree attributes - I

Lecture 12 - Measurement of Tree attributes - II

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Lecture 16 - Kinds of Threats

Lecture 17 - Forest Fire

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Lecture 26 - Growing Stock and Increment

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Lecture 2 - Making Decisions - II and Interactions - I

Lecture 3 - Interactions-II and Working of the Economy

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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

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- 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
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- Lecture 23 - Ex-situ and in-situ conservation
- Lecture 24 - Benefits from conservation
- Lecture 25 - Population and population growth - I
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- Lecture 28 - Resources and Conservation
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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

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Lecture 18 - Phase Plane Analysis - III

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Lecture 21 - Random variables and random process

Lecture 22 - Spike train statistics and response measure

Lecture 23 - Receptive fields and models of receptive fields

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Lecture 2 - Physiology of voltage gated channels

Lecture 3 - Physiology of voltage gated channels

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Lecture 9 - ECG-Normal, Technical aspects

Lecture 10 - ECG Interpretation

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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

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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

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Lecture 8 - Metabolic engineering strategies in plants

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

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Lecture 15 - Isoquinoline alkaloids - Biosynthesis and tissue localization

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

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

Lecture 18 - Benzyloisoquinoline alkaloids - Metabolic pathway engineering

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

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- 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
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- Lecture 38 - Biosynthesis of monoterpenoids
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- Lecture 45 - Menthol story: Biosynthesis and pathway manipulation - I
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- 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
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- Lecture 62 - Molecular Pharming: Transplastomic plants
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Lecture 18 - Liquid-Liquid Extraction

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Lecture 9 - Open Systems

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Lecture 15 - ANOVA

Lecture 16 - Anova

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Lecture 16 - Solution to PP 4.1

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Lecture 18 - Cell view: stoichiometry; degree of reductance

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- Lecture 5 - Properties - Mechanical and Physico-chemical
- Lecture 6 - Mechanical properties
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- Lecture 8 - Resorbability, biodegradation
- Lecture 9 - Resorbability, biodegradation (Continued...)
- Lecture 10 - Biofilm
- Lecture 11 - Biofilm (Continued...)
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- Lecture 14 - Material characterization - Analytical instruments
- Lecture 15 - Analytical instruments
- Lecture 16 - Analytical instruments (Continued...)
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- Lecture 18 - Biological responses, compatibility, cytotoxicity
- Lecture 19 - Biological Responses
- Lecture 20 - Cell-biomaterial interaction
- Lecture 21 - Animal trials (in vivo)
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- Lecture 23 - Metals-types, classifications, applications
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NPTEL : NOC:Demystifying the Brain (Biotechnology)

Co-ordinators : Dr. V Srinivasa Chakravarthy

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- Lecture 2 - Understanding Brain's Shape - Segment 1 - Brain size and intelligence
- Lecture 3 - Understanding Brain's Shape - Segment 2 - Save Wire Principle
- Lecture 4 - Understanding Brain'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
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- Lecture 13 - Emotions in the Brain - Segment 1
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Lecture 17 - Introduction to Network Biology

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- Lecture 32 - Reconstruction of Protein Networks
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- Lecture 2 - Process Parameters and Variables
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- Lecture 19 - Combustion Reactions: An Introduction
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NPTEL : Introduction to Synthetic Biology (Biotechnology)

Co-ordinators : Prof. Karthik Raman

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DIGIMAT - The No.1 Autonomous Learning Platform for Creative Learning

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

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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 Pptern genrators

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 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 \(ELISA\)](#)

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

- 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

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

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 Koelling's Experiment, Kamin'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 : Thorndike's view, Tolman's views, Skinner Box

Lecture 12 - Introduction of Reinforcement Learning - II : Classification, Thorndike's view, Tolman'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

- 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

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 Deposition: Basics

Lecture 17 - Chemical Vapor Deposition: Precursor Transport

Lecture 18 - Chemical Vapor Deposition: Types of CVD Equipment

Lecture 19 - Chemical Vapor Deposition: Nucleation and Growth

Lecture 20 - Chemical Vapor Deposition: Other Details

Lecture 21 - Atomic Layer Deposition

Lecture 22 - Atomic Layer Deposition (Continued...)

Lecture 23 - Physical Vapor Deposition: Basics

Lecture 24 - Physical Vapor Deposition: Evaporation

Lecture 25 - Physical Vapor Deposition: Sputtering

Lecture 26 - Metallization: Contact resistance

Lecture 27 - Metallization: Electromigration and Epilogue

Lecture 28 - Pattern Transfer Basics

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 Etching Recipes
- Lecture 45 - Wet Etching 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 - Fluorescence Spectrometer - 1
- Lecture 57 - Fluorescence Spectrometer - 2
- Lecture 58 - Ti:Sapphire Laser and Two Photon Fluorescence

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](#)

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 - Euthanasia 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 Tasks in Rodent Models - I
- Lecture 51 - Behavioural Tasks 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