CC11 CELL AND MOLECULAR BIOLOGY (BOT-A-CC-5-11-TH, BOT-A-CC-5-11-P)

Lead Teacher: DR. SUJITA DATTA GHOSH

DR. SUJITA DATTA GHOSH

THEORETICAL **No of Classes Allotted – Two (2)/Week**

3. Cell cycle and its regulation:

3.1. Kinetochore and spindle apparatus-structural organization and functions, 3.2.Microtubulesstructure, organization and function, 3.3. Mechanism of cell cycle control in Yeast (checkpoints and role of MPF)

MOLECULAR BIOLOGY

1. DNA Replication, Transcription and Translation (Prokaryotes & Eukaryotes):

1.1. Central Dogma, 1.2. Semiconservative DNA replication – mechanism, enzymes involved in DNA replication- DNA polymerase, DNA gyrase, Helicase, Ligase, primase and other accessory proteins, 1.3. Eukaryotic replication with special reference to replication licensing factor, assembly of new nucleosome, replication at the end chromosome telomere, telomerase concept, 1.4. Fidelity of DNA replication- prokaryote: nucleotide selection, proof reading, mismatch repair; eukaryote: through selection of error prone DNA polymerase, 1.5.Transcription, 1.6 RNA processing, 1.7. Aminoacylation of tRNA, 1.8. Translation.

2. Gene Regulation: 2.1 Concept of Lac-operon, 2.2. Positive and negative control.

3. Genetic Code: 3.1 Properties-evidences & exceptions, 3.2. Decipherence of codon (Binding technique).

DR. ARGHYA KUMAR HAIT

1. Origin and Evolution of Cells: **No of Classes Allotted – One (1)/Week**

1.1. Evolution of nucleic acid (from PNA to DNA), Concept of RNA world, Ribozymes, First cell, 1.2. Origin of eukaryotic cell (endosymbiotic theory), 1.3. Small RNA- riboswitch, RNA interference, si RNA, mi RNA- brief idea, 1.4.Organellar DNA (cp- and mt- DNA).

PROF. SAYELA GUHA

THEORETICAL **No of Classes Allotted One (1)**

2. Nucleus and Chromosome:

2.1. Nuclear envelope, Nuclear lamina and Nuclear pore complex, 2.2. Nucleolus-ultrastructure and ribosome biogenesis, 2.3. Chromatin ultrastructure and DNA packaging in eukaryotic chromosome, 2.4. Centromere: types, structure and function. Apoptosis (Brief idea).

4. Recombinant DNA Technology:

4.1. Restriction endonuclease, - types and roles, 4.2. Vector (plasmid pBR 322), 4.3. Marker gene, 4.4. Steps of cloning technique, 4.5. PCR and its application, 4.6. Genomic DNA and cDNA library.

5. Development and causes of Cancer (in general and brief), tumor suppressor gene and oncogene.

PRACTICAL **DR. SUJITA DATTA GHOSH and PROF. SAYELA GUHA**

CELL BIOLOGY **No of Practical Classes Allotted – Two (2)/Week**

1. Study of plant cell structure with the help of epidermal peal mount of Onion/*Rhoeo*/*Crinum*
2. Measurement of cell size by the technique of micrometry.
3. Counting cells per unit volume with the help of haemocytometer (Yeast/pollengrains)
4. Cytochemical staining of DNA- Pyronine-methyl green staining.
5. Estimation of DNA content through DPA staining.
6. Estimation of RNA through orcinol method.
7. Study of nucleolus through hematoxylin/ orcin staining and determination of nucleolar frequency.
8. Preparation of models/ charts: rolling circle, theta replication, semi-discontinuous replication, prokaryotic RNA polymerase and eukaryotic RNA polymerase II, assembly of spliceosome mechinary, splicing mechanism in group I and group II introns, ribozyme and alternative splicing.

CC12 BIOCHEMISTRY (BOT-A-CC-5-12-TH, BOT-A-CC-5-12-P)

Lead Teacher : DR. ARKAJO MAJUMDAR

DR. ARKAJO MAJUMDAR

THEORETICAL **No of Classes Allotted – Two (2)/Week**

1. Biochemical Foundations:
1.1. Covalent and non-covalent bonds; hydrogen bond; Van der Waal's forces; 1.2. Structure and properties of water; 1.3. pH and buffer (inorganic and organic); 1.4. Handerson-Hasselbalch equation; 1.5. Isoelectric point.

3. Energy flow and enzymology:
3.1. Bioenergetics-Thermodynamic principles; free energy; energy rich bonds- phosphoryl group transfer and ATP; redox potentials and Biological redox reactions,

4. Cell membrane:
4.1. Membrane chemistry, 4.2. Membrane transport (uniport, symport, antiport), mechanism of ion uptake.

5. Phosphorylation: ATP Synthesis- Chemiosmotic model, Oxidative and Photophosphorylation-Mechanism and differences.

DR. NANDINI CHAKRABARTY

THEORETICAL **No of Classes Allotted – Two (2)/Week**

2. Molecules of life:
2.1. Nucleic Acids – structure of nucleosides & nucleotides ; oligo- and poly nucleotides , B & Z form of DNA, RNA- different forms; nucleotide derivatives (ATP, NADP), 2.2. Proteins – structure and classification of amino acids; primary, secondary, tertiary and quaternary

structure of proteins; 2.3. Carbohydrates - structure of mono-, di- and polysaccharide; stereoisomers, enantiomers and epimers; 2.4. Lipids - structure of simple lipid and compound lipid (phospholipids and glycolipids), fatty acids- saturated and unsaturated.
Enzymes – classification and nomenclature (IUBMB); Co-factors and co-enzymes; isozymes, 3.3. Mechanism of enzyme action; enzyme inhibition; 3.4. Enzyme kinetics (Michaelis- Menten equation) and simple problems.

PRACTICAL **DR. ARKAJO MAJUMDAR and DR. NANDINI CHAKRABARTY**

No of Classes Allotted – Two (2)/Week

PLANT BIOCHEMISTRY

Qualitative:

1. Detection of organic acids: citric, tartaric, oxalic and malic from laboratory samples.
2. Detection of carbohydrate and protein from plant samples.
3. Detection of the nature of carbohydrate – glucose, fructose , sucrose and starch from laboratory samples.
4. Detection of Ca, Mg, Fe, S from plant ash sample.

Quantitative:

1. Preparation of solutions and buffers.
2. Estimation of amino-nitrogen by formol titration method (glycine) .
3. Estimation of glucose by Benedicts quantitative reagent.
4. Estimation of titratable acidity from lemon.
5. Estimation of catalase activity in plant samples and effect of substrate, enzyme concentration and pH on enzyme activity.
6. Estimation of urease activity in plant samples.
7. Colorimetric estimation of protein by Folin phenol reagent.

DSE A BIOSTATISTICS (BOT-A-DSE-A-5-1-TH, BOT-A-DSE-A-5-1-P)

Lead Teacher : PROF. SAYELA GUHA

DR. SUJITA GHOSH

THEORETICAL **No of Classes Allotted – One (1)/Week**

3. Central tendency– Arithmetic Mean, Mode and Median; Measurement of dispersion– Coefficient of variation, Standard Deviation, Standard error of Mean.
4. Test of significance: chi- square test for goodness of fit.
6. Measurement of gene frequency: Hardy-Weinberg equilibrium- conditions applied for its implications (simple problems to calculate genotypic and allelic frequencies).

PROF. SAYELA GUHA	
THEORETICAL	**No of Classes Allotted – One (1)/Week**
1. Biostatistics: Definition, statistical methods, basic principles, variables- measurements, functions, limitations and uses of statistics. **2. Biometry:** Data, Sample, Population, Random sampling, Frequency distribution- definition only. **5. Probability-** multiplicative and additive rules of probability: application and importance	
PRACTICAL	**DR. SUJITA GHOSH and PROF. SAYELA GUHA** **No of Classes Allotted – Two (2)/Week**
BIOSTATISTICS **1.** Univariate analysis of statistical data: Statistical tables, mean, mode, median, standard deviation and standard error (using seedling population / leaflet size). **2.** Calculation of correlation coefficient values and finding out the probability. **3.** Determination of goodness of fit in Mendellian and modified mono-and dihybrid ratios (3:1, 1:1, 9:3:3:1, 1:1:1:1, 9:7, 13:3, 15:1) by Chi-square analysis and comment on the nature of inheritance. **4.** Calculation of 'F' value and finding out the probability value for the F value **5.** Basic idea of computer programme for statistical analysis of correlation coefficient,'t' test, standard error, standard deviation.	

DSE B PLANT BIOTECHNOLOGY (BOT-A-DSE-B-5-5-TH, BOT-A-DSE-B-5-5-P)

Lead Teacher : DR. RUPAK KUMAR SENGUPTA

DR. RUPAK KUMAR SENGUPTA	
THEORETICAL	**No of Classes Allotted – Two (2)/Week**
1. Plant tissue culture –Introduction: 1.1. Basic concept and milestones, 1.2. Cellular totipotency, 1.3. Tissue culture media, 1.4. Aseptic manipulation, 1.5. Cyto-differentiation and dedifferentiation. **2. Callus culture:** 2.1. Callus induction, maintenance and application, 2.2. Suspension culture-introductory idea. **3. Plant regeneration:** 3.1. Organogenesis (direct and indirect), 3.2. Somatic embryogenesis, 3.3. Significance of organogenesis and somatic embryogenesis, 3.4. Artificial seed. **4. Haploid Culture:** 4.1. Anther and Pollen culture methods, 4.2. Applications. **5. Protoplast Culture:** 5.1. Protoplast isolation and culture, 5.2. Protoplast fusion (somatic hybridization), 5.3. Significance.	

PROF. SUTAPA GUPTA

THEORETICAL **No of Classes Allotted – One (1)/Week**

6. Plant Genetic Engineering:

6.1. Brief concept of different gene transfer methods, special emphasis on *Agrobacterium* mediated gene transfer, Role of Reporter gene, 6.2. Achievements in crop biotechnology, environment and industry (suitable example)- pest resistant plants (BT cotton), herbicide resistance, disease and stress tolerance, transgenic crop with improved quality (flavr tomato, golden rice), role of transgenic in population degradation (super-bug), leaching of minerals, production of industrial enzymes, oil, edible vaccine.

PRACTICAL **DR. RUPAK KUMAR SENGUPTA and PROF. SUTAPA GUPTA**

No of Practical Classes Allotted – One (1)/Week

1. Familiarization of basic equipments in plant tissue culture
2. Study through photographs/ charts/ models of anther culture, somatic embyogenesis, endosperm and embryo culture, micropropagation.
3. Preparation of basal media. Sterilization techniques.
4. Demonstration of any tissue culture technique during visit in a plant tissue culture lab.
5. Preparation of Field Report on a visit to a tissue culture lab.

TRACKING ACADEMIC PROGRESSION THROUGH INTERNAL ASSESSMENT/EVALUATION

1. **METHOD : CLASS TEST – First during MID TERM and the second before the END TERM by each teacher concerned.**
2. **MENTOR – MENTEE APPROACH**
3. **Presentation by the students in the Departmental STUDENTS SEMINAR.**