M.Phil / Ph.D– BIOCHEMISTRY  
(Effective from the academic year 2018 - 2019 and onwards)

PREAMBLE

- The degree of Master of Philosophy [M.Phil] /Doctor of Philosophy (Ph.D) is awarded to a candidate who has submitted a thesis on the basis of original and independent research in any biochemistry field of research.
- This makes a contribution to the advancement of knowledge, which can be useful to the society.
<table>
<thead>
<tr>
<th>Course code</th>
<th>Name of the course</th>
<th>Instruction hours / week</th>
<th>credits</th>
<th>Maximum Marks (100)</th>
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<tbody>
<tr>
<td>18RBC101</td>
<td>Research and Pedagogy</td>
<td>4</td>
<td>4</td>
<td>100</td>
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<tr>
<td>18RBC201</td>
<td>Advanced paper in Biochemistry</td>
<td>4</td>
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<tr>
<td>18RBC301A</td>
<td>Enzyme and Enzyme technology</td>
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<td>18RBC301B</td>
<td>Cancer Biology and immunology</td>
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<td>18RBC301C</td>
<td>Medicinal Plants and Plant therapeutics</td>
<td>4</td>
<td>4</td>
<td>100</td>
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<tr>
<td>18RBC301D</td>
<td>Clinical Biochemistry and Toxicology</td>
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<td>18RBC301E</td>
<td>Plant Molecular Biotechnology</td>
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<td>18RBC301F</td>
<td>Animal Tissue Culture</td>
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<td><strong>Program Total</strong></td>
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<td><strong>12</strong></td>
<td><strong>12</strong></td>
<td><strong>300</strong></td>
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</table>
UNIT I: Research Problem

UNIT II: Sampling methods

UNIT III: Data Processing

UNIT IV: Scientific writing and presentation

UNIT- V: Pedagogical methods in higher education
Objectives and role of higher education- Important characteristics of an effective lecture- Quality teaching and learning- lecture preparation- characteristics of instructional design- Methods of teaching and learning: Large group- Technique – lecture, seminar, symposium, team teaching, project, small group technique- simulation, role playing demonstration, Brain storing, Case discussion, and assignment, methods of evaluation- self evaluation, student evaluation, diagnostic testing and remedial teaching- question banking- electronic media in education:- ‘e’ learning researches- web based learning.

SUGGESTED READING


UNIT I: Biochemical Techniques

UNIT II: Microscopy and PCR Techniques

UNIT III: Bioinformatics Tools

UNIT IV: Genomics and Proteomics Human Genome project

UNIT V: Culture Techniques
Plant Tissue Culture: Tissue culture media, composition and preparation, primary culture, callus and suspension cultures, somoclonal variation, micro propagation, organogenesis, Somatic embryogenesis, artificial seeds, Transfer and establishment of whole plants in soil, Haploidy: Protoplast fusion and somatic hybridization.

Animal Tissue Culture: Media - Natural media, balanced salt solution and simple media, serum and protein free chemically defined media. Primary cell culture,(chick, mouse and human biopsy)and methods of desegregations of tissues; continuous or established cell culture, tissue culture, organ culture; three dimensional culture, feeder layer, cell separation; cell synchronization; cryopreservation and revival.
SUGGESTED READING


M.Phil/Ph.D Biochemistry 2018-2019

18RBC301A ENZYMES AND ENZYME TECHNOLOGY 4H-4C

Instruction hours/week: L: 4  T: 0  P: 0  Marks: 100

End Semester Exam: 3 Hours

UNIT I: Protein and enzymes

UNIT II: Isolation and purification of enzymes
Sources of enzymes for industry, extraction of enzymes for scientific and industrial purposes. Downstream processing of enzymes, uses of soluble enzymes. Study of enzymes in aqueous biphasic systems. Factors affecting the enzyme activity -Substrate concentration, Enzyme concentration, pH, temperature etc.,

UNIT III: Enzyme immobilization and their applications

UNIT IV: Clinical analysis of enzymes
Application of ELISA and EMIT in clinical analysis. Different types of Biosensors- potentiometric, amperometric, piezo - electric and immuno biosensors. Electro analytical applications of enzymes, Methods of coenzyme regeneration. Biochips and Biocomputers.

UNIT V: Enzymes in Biotechnology
Enzyme catalysis in organic solvents, Restriction endonucleases, DNA ligases, DNA polymerase and their uses in Biotechnology. Site directed mutagenesis, artificial enzymes, ribozymes and Abzymes and their uses.

SUGGESTED READING

UNIT I: Biology of cancer


UNIT II: Apoptosis

Programmed cell death (Apoptosis)-Intracellular proteolytic cascade, cascade of caspase proteins, adapter proteins, Bcl-2, IAP family proteins, extra cellular control of cell division, tumor necrosis factor and related death signals.

UNIT III: Genetic basis of cancer

Genetic basis of cancer-oncogenes, tumor suppressor genes, aberrations in signaling pathways, oncogenic mutations in growth promoting proteins, Mutations causing loss of growth – inhibiting and cell cycle control, Role of carcinogens and DNA repair in cancer.

UNIT IV: Immunology of cancer

Immunity- Active, passive, humoral and cell mediated immunity. Therapeutic uses of cytokines and cytokine receptors. Test for lymphocyte function. B cell and T cell immuno deficiency disorder. Clinical laboratory methods for the detection of antigens and antibodies test for histocompatibility antigens, neoplasm of the immune system.

UNIT V: Cancer Techniques

Techniques-FISH techniques, Real time PCR, Western blotting, ELISA assay, immunocytochemistry, immunohistochemistry, flow cytometry, fluorescent microscopy and confocal microscopy.

SUGGESTED READING


UNIT I: Medicinal plants

Medicinal plants—bioactive principles in medicinal plants methods of extraction, isolation, separation and screening, pharmacologically active plants-CNS, CVS, Hypoglycemic, Hepatoprotective, anti allergic, anticancer, immunoactive plants, plants protecting against oxidative stress, chemotherapeutic products.

UNIT II: Free radicals

Free radicals—types, sources, importance, production, free radicals induced damages, lipid peroxidation, measurement of free radicals, disease caused by radicals, reactive oxygen species, antioxidant defence system, enzymic and non-enzymic antioxidants, role of antioxidants in prevention of diseases, phytochemicals as antioxidants.

UNIT III: Metabolites of Plant

Alkaloids, flavonoids, terpenoids, phenols—Occurrence, distribution & functions, Production of secondary metabolite in plants, stages of secondary metabolite production, uses of tissue culture techniques, elicitation, biotransformation—production of pharmaceutical compounds.

UNIT IV: Plant cell culture

Principles—callus, meristem and organ culture, culture methods, culture media & preparations, plant regeneration, protoplast technology, micropropogation in plants, somatic embryogenesis, somoclonal selection.

UNIT V: Animal cell culture

Animal cell culture: Culture media, Serum and protein free defined media and their application. Functions of different constituents of culture medium. Role of carbon dioxide, growth factors, glutamine in cell culture. Cell lines, primary culture and culture maintenance.

Experimental animals and Animal handling - Sacrification, collection of sample. Ethical issues for animal handling.

SUGGESTED READING


UNIT I: Clinical Enzymology
Clinical significance of Phosphatases, transmainases, 5’nucleotidase, Gamma –glutamyl transferase, Lactate Dehydrogenase, Creatine Phospho kinase.
Diagnostic enzymes in hepatobiliary disease, Atherosclerosis, Myocardial infarction, renal dysfunction. Cancer markers for oral, prostate, colorectal breast and GI tract cancer, oncofetal cancer markers.

UNIT II: Free radicals

UNIT III: Antioxidants
Enzymic antioxidants- Chemistry, mechanism, antioxidant effect of SOD, catalase, Glulathione Peroxidase.
Non Enzymic antioxidants- source, chemistry, toxicity, biochemical functions, bioavailability, bioassays, Antioxidant effects of Vit A, Vit C, Vit E, glutathione and selenium.
Trace elements - Introduction, sources, biochemical functions of zinc, copper and magnesium and iron.

UNIT IV: Medicinal plants
Medicinal plants-bioactive principles in medicinal plants methods of extraction, isolation, separation and screening ,Pharmacologically active plants-CNS,CVS, Hypoglycemic, Hepatoprotective ,anti allergic ,anticancer, immunoactive plants, plants protecting against oxidative stress, chemotherapeutic products.

UNIT V: Toxicity
Effects of physiochemical and biological factors on heavy metal toxicity, toxic mechanism-Carcinogenesis, teratogenesis and immunotoxicity. Bioassays for heavy metal toxicity, pathological, histopathological examinations for heavy metal toxicity.

SUGGESTED READING
M.Phil/Ph.D Biochemistry

I8RBC305E PLANT MOLECULAR BIOTECHNOLOGY 2018-2019

4H-4C

Instruction hours/week: L: 4 T: 0 P: 0

Marks: 100

End Semester Exam: 3 Hours

UNIT I: Plant genome


UNIT II: Cloning strategies

Tools for cutting and joining of DNA; gene transfer techniques; Methods of selection and screening of recombinant DNA. Construction of genomic libraries and cDNA libraries - probe construction and labelling (radio and non-radio). Molecular mechanism of anti-sense technology - inhibition of splicing, disruption of RNA structure & capping - application of anti-sensing technology.

UNIT III: Gene regulation

Inducible enzymes, regulatory mutations, repressor, operon, promotor, catabolic repression, repressible enzyme systems, control by attenuation, positive control, gene regulation in eukaryotes, transcriptional regulation, post transcriptional regulation, hormones & gene expression; viruses & gene expression, genetic control of pattern formation in plant development.

UNIT IV: Plant transformation technology


UNIT V: Plant manipulation and its applications


SUGGESTED READING


UNIT I: Introduction to animal cell culture
Introduction, importance, history of cell culture development, different tissue culture techniques including primary and secondary culture, continuous cell lines, suspension culture, organ culture, advantages and limitations medical/pharmaceutical products of animal cell culture-genetic engineering of animal cells and their applications. Risks in a tissue culture laboratory and safety - biohazards.

UNIT II: types of cell culture
Different types of cell culture media, growth supplements, serum free media, balanced salt solution, other cell culture reagents, culture of different tissues and its application. Facilities for animal cell culture-infrastructure, equipment, culture vessels. Biology and characterization of cultured cells-cell adhesion, proliferation, differentiation, morphology of cells and identification.

UNIT III: Types of Techniques
Primary cell culture techniques - mechanical disaggregation, enzymatic disaggregation, separation of viable and non-viable cells. Mass culture of cells - manipulation of cell line selection - types of cell lines -maintenance of cell lines - immobilization of cells and its application - synchronization of cell cultures and cell division - production of secondary metabolites - biotransformation - Induction of cell line mutants and mutations - cryopreservation – germplasm conservation and establishment of gene banks.

UNIT IV: Animal cell culture scale up
Animal cell culture scale up: Scale up in suspension - stirrer culture, continuous flow culture, air-lift fermentor culture; Scale up in monolayer - Roller bottle culture, multi surface culture, multi array disks, spirals and tubes - monitoring of cell growth. Organ culture - whole embryo culture - specialized culture techniques - measurement of cell death.

UNIT V: Tissue engineering
Tissue engineering: Design and engineering of tissues - tissue modeling. Embryonic stem cell engineering - ES cell culture to produce differential cells - Human embryonic stem cell research. Transgenic animals-transgenic animals in xenotransplantation.

SUGGESTED READING

