## BHARATHIAR UNIVERSITY (CBSC PATTERN)

### B. Sc. CLINICAL LAB TECHNOLOGY DEGREE COURSE

#### SCHEME OF EXAMINATION - CBCS PATTERN

For the students admitted during the academic year 2011 – 2012 batch and onwards

<table>
<thead>
<tr>
<th>Part</th>
<th>Study Components</th>
<th>Course title</th>
<th>Ins. hrs/week</th>
<th>Examinations</th>
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@ No University Examinations. Only Continuous Internal Assessment (CIA)

# No Continuous Internal Assessment (CIA). Only University Examinations.

List of Elective papers (Colleges can choose any one of the papers as electives)

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<thead>
<tr>
<th>Elective - I</th>
<th>A</th>
<th>Drug Biochemistry</th>
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<td>B</td>
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<td>C</td>
<td>Plant &amp; Animal Biotechnology</td>
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<td>Elective - II</td>
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<td>Bioinstrumentation-Principles and applications</td>
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<td>B</td>
<td>Nanomaterials and Nanomedicine</td>
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<td>Genetic Engineering And Bioprocess Technology</td>
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<td>Elective - III</td>
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<td>Clinical laboratory &amp; its interpretations</td>
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<td>Nanobiotechnology</td>
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<td>Plant Therapeutics</td>
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Note:

1. The syllabus for the above papers (except Biochemistry Practical I, II and Elective Papers I - B, C; II - B, C; III – B, C) be the same as prescribed for the academic year 2008-09.
2. The syllabus for the Biochemistry Practical I, II and Elective Papers I - B, C; II - B, C; III – B, C are furnished below:
SEMESTER I & II
BIOCHEMISTRY PRACTICAL I

Determination of the following Biochemical Constituents:
Blood Urea
Blood Urea Nitrogen
Serum Albumin
Serum Creatinine
Serum Calcium
Serum Iron
Serum Phosphorus
Total Serum Proteins
Triglycerides
Bilirubin
Cholesterol
HDL Cholesterol
LDL Cholesterol
Serum Uric acid
VLDL Cholesterol

The following Biochemical parameters in Urine:
Protein
Calcium
Creatinine
Phosphorus
Urea
Bence Jones Protein
SEMESTER III & IV.
BIOCHEMISTRY PRACTICAL II

Determination of the following Enzymes
Acid phosphatases
Alkaline phosphatases
Alpha- Amylase
CPK
CPK MB
I. DM
Cholinesterase
SGOT
SGPT
Gamma GT

Determination of Immunoglobulins
IgA
IgE
IgG
IgM
Serum Immunoglobulins

Determination of the following
Glucose Tolerance Test
Electrophoresis of plasma proteins.
Liver Function Test
Paper Chromatography – Urine
Prothrombin Time
Renal Calculi analysis
Renal Function Test
Urea Clearance Test

SEMESTER – V ELECTIVE I - B

INTRODUCTION TO BIOMATERIALS

Unit – I


Unit – II

Unit – III

Unit – IV

Unit – V

Total number of periods 45

TEXT / REFERENCE BOOKS

SEMESTER – VI ELECTIVE II - B

NANOMATERIALS AND NANOMEDICINE

Unit I
Structure property relationship of Biological materials: tissues, bones and teeth, collagen rich tissues, elastic tissues, nanostructured collagen mimics in tissue Engineering.
Biopolymers: Preparation of nanobiomaterials – Polymeric scaffolds collagen, Elastins: Mucopolysaccharides, proteoglycans, cellulose and derivatives; Dextrans; Alginates; Pectins; Chitin.

Unit II
Cardiovascular implants: Role of nanoparticles and nanodevices in blood clotting; Blood rheology; Blood vessels; Geometry of blood circulation; Vascular implants; Cardiac pacemakers; blood substitutes; Biomembranes.
Unit III
Polymeric implant materials: Polyolefin; polyamides (nylon); Acrylic polymers (bone cement) and hydregels; Fluorocarbon polymers; Natural and synthetic rubbers, silicone rubbers; High strength thermoplastics; deterioration of polymers.
Biomaterials for Ophthalmology: Contact lenses; Optical implants for glaucoma; adhesives; artificial tears; Protection gears.

Unit IV

Unit V

Total number of Periods 45

Reference:
3. Nanofabrication towards biomedical applications Willey – VCHVerlag GmbH &Co, KGaA.

SEMESTER – VI ELECTIVE III - B
NANOBIOTECHNOLOGY

Unit I
Interdiciplinary areas of Biotech and Nanoscience. It is a field that concerns the utilization of biological systems. Cells, Cellular components. Nucleic acids and proteins refinement and application of instruments – to generate and manipulate nanostructured materials to basic and applied studies.

Unit II
Interphase systems pertaining to biocompatible inorganic devices for medical implants – microfluidic systems – microelectronic silicon substrates.

Unit III
Unit IV
DNA based nanostructures - Topographic and Electrostatic properties of DNA and proteins – Hybrid conjugates of gold nanoparticles – DNA oligomers – use of DNA molecules in nanomechancics and computing.

Unit V
Semiconductor (metal) nanoparticles and nucleic acid and protein based recognition groups – application in optical detection methods – Nanoparticles as carrier for genetic material.

Total number of periods 45

References:

SEMESTER – V ELECTIVE I - C

SUBJECT TITLE : PLANT & ANIMAL BIOTECHNOLOGY

SUBJECT DESCRIPTION:
This course presents the plant and animal tissue culture methods, explains the mechanism of gene transfer, Methods of selection, Production of novel proteins and their applications.

GOALS:
To enable the students to have a sound knowledge on the methods of tissue culture and large scale production of recombinant proteins.

OBJECTIVES:
On successful completion of the course the students should have:

- Understood the components of culture media and various tissue culture techniques.
- Learnt about the technique of genetic engineering in plants and animals.
- Learnt about the synthesis and applications of recombinant proteins from cell cultures.

CONTENTS:
UNIT – I:
Plant tissue culture: - Media composition, nutrients & growth regulators, MS medium & B5 medium. Callus & suspension culture. Initiation & differentiation of PTC.
Micropropagation:- Methods, Production of haploid plants, phytochemicals from plant tissue culture.
UNIT – II:
Protoplast technology:- Isolation, fusion of protoplasts, Electroporation, Biolistics, Regeneration of plants from protoplasts.
Gene Transfer in plants:- Ti plasmid vectors, mechanism of T-DNA transfer, Vir genes.
Transgenic plants:- Herbicide, Virus, Pest resistance plants, Male infertility, Genetic engineering of plant oils.

UNIT - III:
Mammalian cell culture:- Establishment of cell in culture: Requirements for invitro growth; importance of serum.
Cell-lines; cell transformation – properties of transformed cells, cell separation, Mass cultivation of cells: suspension culture; immobilized cultivation.

UNIT - IV:
Genetic Engineering of Animal cells: - Mammalian cell culture in protein production.
Gene transfer into mammalian cells, Selectable markers pSV plasmids; retroviral vectors; Expression vectors; reporter genes.

UNIT – V:
Animal Biotechnology:- Artificial insemination and embryo transfer, Invitro fertilization (IVF): embryo cloning. Human embryo research, transgenic mice, Gene therapy; the Human Genome Project.
Recombinant proteins from cell cultures: - Interferons, Viral vaccines, Hybridoma technology-Monoclonal antibodies- production and applications.

REFERENCES:
2. BIOTOL series, Invitro cultivation of animal cells- Butler worth Heineman, 1993
5. Freshney; Animal cell culture; IRL press.

SEMESTER – VI ELECTIVE II - C
GENETIC ENGINEERING AND BIOPROCESS TECHNOLOGY

UNIT I
Basis of gene cloning; Restriction endonucleases – types, features; ligations; linkers and adaptors.
Vectors: Plasmid vectors – basic features – pBR 322; Bacterio phage vectors; cosmids; Artificial chromosomes.
Cloning hosts.
Preparation of plasmid DNA from bacteria.
UNIT II

Genomic library and cDNA library.
Hybridization probes; Southern, Northern and Western blotting techniques.

UNIT III
DNA sequencing:- Outline of Sanger’s method.
Genetic fingerprinting – applications.

In vitro mutagenesis:- Oligonucleotide directed mutagenesis. Protein Engineering.
PCR – Technique and application; Antisense RNA, RNAi.

UNIT IV
Expression vectors of E. coli:- Constituents; examples of promoters – expression cassettes – problems caused in expression of eukaryotic genes; fusion proteins – Application of gene technology. Recombinant insulin; Recombinant growth hormones.
Cloning HBV surface antigen in yeast. Insect cells as host system.
Safety aspects and hazards of genetic engineering.

UNIT V
Gene transfer in plants: Ti plasmid vectors; mechanism of T-DNA transfer, virulence genes.
Electroporation, biolistics and protoplast fusion.
Application: Transgenic plants – herbicide resistance, male infertility, virus resistance, pest resistance.

References:
SEMESTER – VI ELECTIVE III- C
PLANT THERAPEUTICS

UNIT I
Medicinal plants-bioactive principles in medicinal plants: methods of extraction, isolation, separation and screening, pharmacologically active plants – CNS, CVS, Hypoglycemic.

UNIT II
Hepatoprotective, nephroprotective, anti allergic, anticancer, antibacterial, antiviral and antimalarial, anti-inflammatory, immunoactive properties of the medicinal plants, plants protecting against oxidative stress, chemotherapeutic products.

UNIT III
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 IV
Primary metabolites, Alkaloids, flavanoids, terpenoids, phenolics, steroids, Vitamins, minerals – Occurrence, distribution & functions.

UNIT V
Production of secondary metabolite in plants, stages of secondary metabolite production, uses of tissue culture techniques, elicitation, biotransformation- production of pharmaceutical compounds

REFERENCES:
4. Singh, M.P and Panda, H 2005, Medicinal Herbs with their formulations, Daya Publishing House, Delhi