STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 - 2016)

BIOCHEMISTRY

CODE: 15BY/PC/BC14 **CREDITS: 4**
L T P : 4 1 0
TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To acquire a fundamental knowledge of biochemistry
- To enable students to apply biochemistry in the processes of Biotechnology and clinical studies

Unit 1

Introduction to Biochemistry (5 hrs.)

1.1 The Importance of Biochemistry in Understanding the Processes of the Body
1.2 Components of the Cell and Cell Fractionation – Markers for each Organelle
1.3 Relationship between Cell Biology and Biochemistry

Unit 2

Chemical and Biological Foundation of Biochemistry (15 hrs.)

2.1 Water- Role of water, Maintenance of Body Water
2.2 Maintenance of pH – Role of Hemoglobin, Respiratory Control, Role of Kidney, Acidosis, Alkalosis
2.2 Structures of the Major Biochemical Components of the Body, Homeostasis, Proteins, Carbohydrates, Lipids, and Nucleic Acids

Unit 3

Enzymes (15 hrs.)

3.1 Enzyme Nomenclature, Classification, Cofactor, Active Site, Specificity and Factors Affecting Enzyme Action
3.2 Enzyme Regulation- Allosteric, Feedback, Product Inhibition
3.3 Application of Enzymes- Enzymes in Clinical Diagnosis and Pharmaceutical Industry

Unit 4

Cellular Metabolism (15 hrs.)

4.1 Concepts of Metabolism- Fuel Oxidation and the Role of ATP, the Respiratory Chain and Oxidative Phosphorylation
4.2 Glycolysis, Gluconeogenesis, Pentose Phosphate Pathway, Metabolism of Glycogen, Citric Acid Cycle, Metabolism of Ethanol
4.3 Oxidation of Fatty Acids, Biosynthesis Fatty Acids and Triglycerides, Degradation of Amino Acids – Transamination, Oxidative Deamination and Urea Cycle

Unit 5

Integrated Metabolism (15 hrs.)

5.1 Tissue Metabolism – Liver and Muscle
5.2 Metabolic Adaptations in the Fed State, Starvation State
5.3 Signal Transduction- Response to Hormonal Message, Role of Tyrosine Kinases

TEXT BOOKS

Albert, L. Lehninger et al**.** *Biochemistry.* U.K: Worth, 2007.

Thomas. E. Creighton. *Proteins.* New Work: W. H. Freeman, 2005.

BOOKS FOR REFERENCE

Champe, Pamela C, Richard A. Harvey and Denise R. Ferrier. *Lippincott's Illustrated Reviews: Biochemistry.* India: J.P. Brothers, 2005.

Garrett, H. Reginald and Grisham, M. Charles. *Biochemistry.* U.S.A.: Thomson – Brooks/Cole, 2005.

Jeremy, M. Berg. *Biochemistry.* New York: W.H. Freeman, 2001.

Lubert, Stryer. *Biochemistr*y. New York: H. Freeman, 2005.

Segal, I. H. *Enzyme Kinetics*. New York: John Wiley, 1975.

Voet, D. and Voet, G. *Biochemistry.* New York: John Wiley, 2000.

JOURNALS

Journal of Biochemistry
Indian Journal of Clinical Biochemistry
Biochemistry

WEB RESOURCES

www.themedicalbiochemistrypage.org
www.biochemistry.org

PATTERN OF EVALUATION

Continuous Assessment Test:
Total Marks: 50 **Duration: 90 mins.**

Section A – 10 x 1 = 10 Marks (All questions to be answered)
Section B – 2 x 10 = 20 Marks (2 out of 4 to be answered)
Section C – 1 x 20 = 20 Marks (1 out of 2 to be answered)

Third component:
List of Evaluation modes:
Assignment
Open book test
Case study
Clinical implications of metabolic pathways
Diagnostic applications of biochemicals
Role of Biomarkers

End Semester Examination:

Total Marks: 100 **Duration: 3 hours**

Section A – 20 x 1 = 20 Marks (All questions to be answered)
Section B – 4 x 10 = 40 Marks (4 out of 7 to be answered)
Section C – 2 x 20 = 40 Marks (2 out of 4 to be answered)

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M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 - 2016)

MOLECULAR BIOLOGY

CODE: 15BY/PC/MB14 **CREDITS : 4**
L T P : 4 1 0
TOTAL TEACHING HOURS: 65

OBJECTIVE OF THE COURSE

- To understand the structure and functional aspects of the cell at molecular level

Unit 1

Introduction to Cell and Molecular Biology (11 hrs.)

1.1 The Dynamic Cell, Structure and Functions of Plasma Membrane – Passive and Active transport
1.2 Cell Motility – Microfilaments, Intermediate Filaments and Microtubules
1.3 Mechanisms of Cell Communication, Extracellular Matrix and Cell – Cell Interactions

Unit 2

Molecular Constituents, RNA Transcription and Processing (11 hrs.)

2.1 Nucleic Acids, Genetic Code
2.2 Synthesis of Macromolecules, DNA Structure, Replication, Damage and Repair
2.3 RNA – Types, Transcription and Processing
2.4 Protein Synthesis

Unit 3

Molecular Structure of Genes and Chromosomes (13 hrs.)

3.1 Molecular Definition of a Gene
3.2 Organisation of Prokaryotic Genome
3.3 Organisation of Eukaryotic Genomes – Coding and Non-Coding Sequences
3.4 Mobile DNA

Unit 4

Transcriptional and Translational Regulation (16 hrs.)

4.1 Transcriptional Regulation in Eukaryotes – Steroid Hormone Receptors, Heat Shock Genes, Homeotic Genes
4.2 DNA Methylation and Histone Modification, Protein Processing, Folding, Sorting and Transport, Post Transcriptional Regulation
4.3 Transcriptional Regulation in Prokaryotes – Regulation by Repressors and by Activators, Regulation by Attenuation, Translational Regulation in Bacteria

Unit 5

Hybridization Techniques, Cell Cycle and Apoptosis (14 hrs.)

5.1 DNA Isolation, Gel Electrophoresis, Blotting and Hybridization Techniques- Northern, Southern, Western, South Western and North Western, Probe Construction – Radioactive and Non- radioactive Labeling Methods

5.2 Cell Cycle and Genes Regulating Cell Cycle

5.3 Apoptosis- Regulators- Intrinsic and Extrinsic Pathways

TEXT BOOKS

Cooper, G.M. and Hausman, R.E. *The Cell – A Molecular Approach***.** U.S.A.: Sinauer Associates. 2013.

Weaver. *Molecular Biology***.** India: Tata McGraw Hill. 2007.

Wolfe, Stephen L. *Molecular and Cellular Biology***.** U.S.A.: Wadsworth, 1999.

BOOKS FOR REFERENCE

Lewin, Benjamin. *Genes XI.* U.S.A.: Jones and Bartlett, 2012.

Karp, Gerald. *Cell and Molecular Biology – Concepts and Experiments***.** U.S.A.: John Wiley, 2010.

Becker, Wayne M. et al. *The World of the cell.* India: Pearson Education. 2009.

Watson, James D. et al. *Molecular Biology of the Gene*. U.S.A.: CSHL, 2008.

Lodish, et al. *Molecular and Cell Biology.* U.S.A.: Scientific American, 2007.

Alberts, Bruce, et al. *Molecular Biology of the Cell***.** U.S.A.: Garland, 2007.

JOURNALS

Journal of Molecular Cell Biology
Molecular Biology International

WEB RESOURCES

www.molbiolcell.org
www.biomedcentral.com/bmcmolbiol.

PATTERN OF EVALUATION

Continuous Assessment Test:
Total Marks: 50 **Duration: 90 mins.**
Section A – 10 x 1 = 10 Marks (All questions to be answered)
Section B – 2 x 10 = 20 Marks (2 out of 4 to be answered)
Section C – 1 x 20 = 20 Marks (1 out of 2 to be answered)

Third component:
List of Evaluation modes:
Assignment
Open book test
Seminar
Quiz

End Semester Examination:
Total Marks: 100 **Duration: 3 hours**

Section A – 20 x 1 = 20 Marks (All questions to be answered)
Section B – 4 x 10 = 40 Marks (4 out of 7 to be answered)
Section C – 2 x 20 = 40 Marks (2 out of 4 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 -2016)
MICROBIOLOGY

CODE: 15BY/PC/MI14 **CREDITS : 4**
L T P: 4 1 0
TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To understand growth and morphology of microbes
- To create an awareness on applied aspects of microbiology
- To have an overview of the recent advances in the field of microbiology

Unit 1

Bacteriology (15 hrs.)

1.1 History and Scope of Microbiology, Classification of Microbes -Bacteria, Fungi, Algae and Protozoa

1.2 Ultrastructure of Bacteria, Morphology and Staining

1.3 Numerical Taxonomy; Chemotaxonomy; Phylogenetic Relationships - Cladogram, Dendrogram, Universal Phylogenetic Trees

Unit 2

Microbial Growth and Control (12 hrs.)

2.1 Microbial Nutrition, Types of Culture Media, Pure Culture Techniques, Preservation of Culture

2.2 Microbial Growth-Growth Curve, Measurement of Growth, Continuous and Batch Culture

2.3 Physical and Chemical Methods of Microbial Control

Unit 3

Virology (14 hrs.)

3.1 Viruses - General Properties of Plant and Animal Virus, Classification of Viruses, Structure, Isolation, Cultivation, Purification

3.2 Viral Multiplication - Lytic and Lysogenic Life Cycle

3.3 Viruses and Disease – HIV, Ebola, H1N1

3.4 Virions and Prions

Unit 4

Food and Industrial Microbiology (11 hrs.)

4.1 Food Microbiology –Dairy Products – Fermented Foods – Baker's Yeast, Sauerkraut-Microbial Flora of Fresh Foods, Prebiotics and Probiotics

4.2 Industrial Microbiology – Industrially Important Microorganisms-in Fuel-Ethanol, Biofertilisers, Biopesticides, Pharmaceuticals- Production of Antibiotics – Streptomycin

4.3 Production of Organic Acids – Citric acid, Production of Enzymes - Amylase, Production of Amino acids – Glutamic Acid, Production of Vitamins – Vitamin B12

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Unit 5

Microbial Diseases (**13 hrs.)**

5.1 Medical Microbiology-Disease Transmission, Patterns and Spread of Infection

5.2 Respiratory Tract Infection-Tuberculosis , Viral Influenza, Fungal Pneumonia and Aspergillosis

5.3 Gastrointestinal Infection-Dysentery, Gastroenteritis

5.4 Urinary Tract Infection – Leptospirosis, Adenovirus Type 2, Fungal Candidiasis

5.5 Sexually Transmitted Diseases – Syphilis, Herpes Simplex Virus

TEXT BOOKS

Ananthanarayan, R and Jayaram Paniker C.K. *Textbook of Microbiology*. Chennai: Orient Longman, 1997.

Krasner, R.I. *The microbial challenge.* Canada: Jones and Bartlett, 2010.

Patel, A.H. *Industrial Microbiology***.** India: MacMillan, 1999.

Shors, Teri. *Understanding viruses.* Canada: Jones and Bartlett, 2009.

Vasanthakumari. R. *Textbook of Microbiology***.** New Delhi: BI, 2007.

BOOKS FOR REFERENCE

Demain, Arnold L. and Davies, Julian E. *Manual of Industrial Microbiology and Biotechnology.* U.S.A.: ASM, 2010.

Dimmock, N.J., Easton, A.J.and Leppard. *Introduction to Modern Virology.* U.S.A.: Blackwell, 2007.

Glazer,A.N.,and Nikaido,H. *Microbial Biotechnology***.** U.K.: Cambridge, 2007.

Inglis, T. J. *Microbiology and Infection: A Clinical Core Text for Integrated Curricula with Self-Assessment.* U.S.A.: Elsevier Health Sciences, 2007.

Pelczar, Michael, J (Jr.),Reid, Roger,D.Chan E.C.S.and H.Kreig**.** *Microbiology***.** New Delhi: Tata McGraw-Hill, 2001.

Prescott,L.M. *Microbiology.* New Delhi: McGraw-Hill, 2011.

Tortora,G.G.J.,Funke,B.R.and Case,C.L. *Microbiology-An Introduction***.** U.S.A.: Benjamin-Cummings, 2009.

JOURNALS

Journal of Applied Microbiology
Journal of Industrial Microbiology

WEB RESOURCES

www.asm.org
www.ncbi.nlm.nih.gov/
www.sgm.org

PATTERN OF EVALUATION

Continuous Assessment Test:

Total Marks: 50 **Duration: 90 mins.**

Section A – 10 x 1 = 10 Marks (All questions to be answered)
Section B – 2 x 10 = 20 Marks (2 out of 4 to be answered)
Section C – 1 x 20 = 20 Marks (1 out of 2 to be answered)

Third Component:

List of Evaluation modes:
Assignment
Seminar
Paper reviews
Quiz

End Semester Examination:

Total Marks: 100 **Duration: 3 hours**

Section A – 20 x 1 = 20 Marks (All questions to be answered)
Section B – 4 x 10 = 40 Marks (4 out of 7 to be answered)
Section C – 2 x 20 = 40 Marks (2 out of 4 to be answered)

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M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 - 2016)

MICROBIOLOGY - PRACTICAL

CODE: 115BY/PC/P112 **CREDITS: 2**
L T P: 0 0 3
TOTAL HOURS: 39

1. Culture Media Preparation, Aseptic Techniques (3hrs.)
2. Pure Culture Techniques (3hrs.)
3. Isolation and Culturing of Bacteria, Fungi and Algae (3hrs.)
4. Bacterial Growth Curve (6hrs.)
5. Staining - (6hrs.)
    a) Simple Staining
    b) Fungal Staining
    c) Differential Staining
    d) Spore Staining

6. Biochemical Tests- (6 hrs.)
    a) Carbohydrate Fermentation
    b) TSI Agar Test
    c) IMViC Test
    d) Urease
    e) Catalase
    f) Oxidase
    g) Phenylalanine Deaminase Test
    h) Amylase
    i) Casein Hydrolysis
    j) Gelatin Liquefaction
    k) Coagulase test

7. Kirby- Bauer Antibiotic Sensitivity Test (3hrs.)
8. Resazurin Test to Check the Quality of Milk (3hrs.)
9. Motility by Hanging Drop Method (3hrs.)
10. Mold study- Slide Culture Methods- Yeast Characteristics (3hrs.)

PATTERN OF EVALUATION

Continuous Assessment Test:
Total Marks: 50 **Duration: 6 hours**

1. Major experiment to be conducted (14 Marks)
   10 Marks for principle, procedure and conduct. 4 Marks for result

2. Minor experiment to be conducted (10 Marks)
   5 Marks for principle and procedure, 5 marks for conduct and result

3. 4 Spotters each carrying 4 marks (16 Marks)

4. Viva voce (5 Marks)

5. Record (5 Marks)

End Semester Examination
Total Marks: 50 **Duration: 6 hours**

1. Major experiment to be conducted (14 Marks)
   10 Marks for principle, procedure and conduct. 4 Marks for result

2. Minor experiment to be conducted (10 Marks)
   5 Marks for principle and procedure, 5 marks for conduct and result

3. 4 Spotters each carrying 4 marks (16 Marks)

4. Viva voce (5 Marks)

5. Record (5 Marks)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE: BIOTECHNOLOGY
SYLLABUS
(Effective from the academic year 2015 - 2016)

BIOCHEMISTRY AND MOLECULAR BIOLOGY- PRACTICAL

CODE: 15BY/PC/P213 **CREDITS : 3**
L T P : 0 0 5
TOTAL HOURS : 65

BIOCHEMISTRY

1. Preparation of Buffers (5hrs.)
2. Estimation of DNA by Diphenyl Amine Method (5hrs.)
3. Estimation of RNA by Orcinol Method (5hrs.)
4. Anti-oxidant Assay (5hrs.)
5. Isolation and Estimation of Protein by Lowry and Bradford's Method (5hrs.)
6. Separation and Visualization of Proteins by SDS – PAGE (5hrs.)

MOLECULAR BIOLOGY

1. Isolation of Bacterial DNA (5hrs.)
2. RAPD and RFLP Analysis (5hrs.)
3. Southern Hybridization (5hrs.)
4. Isolation of Total RNA (5hrs.)
5. Northern Blotting (5hrs.)
6. Mitosis and Meiosis using Plant Tissue (5hrs.)
7. PCR Amplification (5hrs.)

PATTERN OF EVALUATION

Continuous Assessment Test:
Total Marks: 50 **Duration: 6 hours**

BIOCHEMISTRY

1. Major experiment to be conducted (10 Marks)
   5 Marks for procedure and 5 Marks for conduct and result

2. Minor experiment (5 Marks)
   Marks allotted for principle and procedure

MOLECULAR BIOLOGY

3. Major experiment to be conducted (10 Marks)
   5 Marks for procedure and 5 Marks for conduct and result.

4. Minor experiment (5Marks)
   Marks allotted for principle and procedure

5. 5 Spotters each carrying 2 marks (10 Marks)

6. Record (5 Marks)

7. Viva voce (5 Marks)

End Semester Examination
Total Marks: 50 **Duration: 6 hours**

BIOCHEMISTRY

1. Major experiment to be conducted (10 Marks)
   5 Marks for procedure and 5 Marks for conduct and result

2. Minor experiment (5 Marks)
   Marks allotted for principle and procedure

MOLECULAR BIOLOGY

3. Major experiment to be conducted (10 Marks)
   5 Marks for procedure and 5 Marks for conduct and result

4. Minor experiment (5Marks)
   Marks allotted for principle and procedure

5. 5 Spotters each carrying 2 marks (10 Marks)

6. Record (5 Marks)

7. Viva voce (5 Marks)

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M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 -2016)

RECOMBINANT DNA TECHNOLOGY

CODE: 15BY/PC/RD24 **CREDITS : 4**
L T P : 4 1 0
TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To create an awareness on the principles and applications of recombinant DNA technology
- To understand the application molecular biotechnology

Unit 1

Introduction and Enzymes in Recombinant DNA Technology (13 hrs.)

1.1 Introduction to Genetic Engineering and Recombinant DNA Technology
1.2 Restriction Modification Systems - Types and Nomenclature and Restriction Enzymes TYPE I, II, III
1.3 DNA Ligase- Properties and Specificity
1.4 Other Enzymes Used in Recombinant DNA Technology - S1 Nuclease, BAL 31 Nuclease
1.5 DNA Polymerase, Polynucleotide Kinase, Phosphatase, Reverse Transcriptase - Activity and Mode of Action

Unit 2

Plasmids and Vectors (14 hrs.)

2.1 Plasmids- Properties, Incompatibility, Isolation and Purification Techniques
2.2 Plasmid Vectors and their Properties, Copy Number, pBR 322, pUC, pGEM3Z – its Construction and Derivatives, Single Stranded Plasmids
2.3 Bacteriophage lambda (λ) as a Vector- Essential Features, Organization of Genome, General Structure, Rationale for Vector Construction Cosmids, Phasmids, Fosmids, Phagemids
2.4 Filamentous Phage Vectors, L Zap, L Blue Print Vectors, Shuttle Vectors
2.5 Expression Vectors, Promoter Probe Vectors, Vectors for Library Construction, Linkers, Adaptors, Homopolymer Tailing

Unit 3

Expression Vectors (12 hrs.)

3.1 Expression Vectors - Expression of Foreign DNA in Bacteria- Fusion Protein and in *Pichia sp*. Expression System
3.2 YACs, BACs, PACs, MACs and HACs
3.3 Shotgun Cloning - Genomic Library and cDNA Library Construction- Marker Genes Recombinant Selection and Screening

Unit 4

Sequencing and Molecular Mapping (13 hrs.)

4.1 DNA Sequencing and Polymerase Chain Reaction- its Principle, Types and Applications, Site Directed Mutagenesis

4.2 Molecular Markers and its Applications - RFLP, RAPD, AFLP, VNTR, STS, SSCP, SSR, CAPS, SCAR

4.3 Molecular Mapping of Genome - Genetic and Physical Maps, Chromosome Walking

Unit 5

Applications in Industrial and Healthcare (13 hrs.)

5.1 Modern Biotechnology – Products Using Gene Cloning – Monoclonal Antibodies, Insulin, Growth Hormones, Vaccines

5.2 Gene Therapy for Inherited Disorders and Neoplastic Disorders

5.3 Genetically Modified Organisms in Industry – *Pseudomonas* sp., *Bacillus thuringiensis*

TEXT BOOKS

Brown, Terence, A. *Gene Cloning and DNA Analysis: An Introduction.* U.S.A.: Blackwell, 2010.

Glick Bernard R. and Pasternak Jack J. *Molecular Biotechnology: Principles and Applications of Recombinant DNA***.** U.S.A.: ASM Press, 2009.

Primrose, S. B. *Principles of Gene Manipulation: An Introduction to Genetic Engineering.* U.S.A.: Blackwell, 2009.

BOOKS FOR REFERENCE

Dale, Jeremy W., Schantz Malcolm. *From Genes to Genomes: Concepts and Applications of DNA Technology.* U.S.A.: Wiley, 2007.

Innis, Michael A. Gelfand, David H. and Sninsky John J. *PCR Strategies.* U.S.A.: Academic, 1995.

Green, Michael and Sambrook, Joseph. *Molecular Cloning: A Laboratory Manual.* U.S.A.: CSHL, 2012.

Watson James D., et.al. *Recombinant DNA, Genes and Genomes.* Palgrave : Macmillan, 2007.

JOURNALS

Journal of Molecular Biology
Journal of Cloning and Transgenesis

WEB RESOURCES

www.rpi.edu/dept/chem-emg/biotech-environ/.../rdna.html
www.web.mit.edu/hst.160/www/quiz/recombinant DNA andcloning.html

PATTERN OF EVALUATION

Continuous Assessment Test:

Total Marks: 50 **Duration: 90 mins.**

Section A – 10 x 1 = 10 Marks (All questions to be answered)
Section B – 2 x 10 = 20 Marks (2 out of 4 to be answered)
Section C – 1 x 20 = 20 Marks (1 out of 2 to be answered)

Third Component:
List of Evaluation modes:
Assignment
Seminar
Paper reviews
Quiz

End Semester Examination:
Total Marks: 100 **Duration: 3 hours**

Section A – 20 x 1 = 20 Marks (All questions to be answered)
Section B – 4 x 10 = 40 Marks (4 out of 7 to be answered)
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STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 - 2016)

ANIMAL AND PLANT BIOTECHNOLOGY

CODE: 15BY/PC/AP24 **CREDITS: 4**
L T P: 4 1 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To provide an insight into the techniques and applications of plant and animal cell culture
- To understand concepts of artificial and transgenic animal technology
- To evaluate the risks and benefits of Plant and Animal Biotechnology

Unit 1

Animal Cell Culture **(15 hrs.)**

1.1 Animal Tissue culture - Historical Background, Aseptic Techniques, Culture Vessels and Substrates
1.2 Defined Media and Supplements- Serum Free Media- Preparation and Sterilization
1.3 Primary Cell Culture- Subculture and Cell Line- Quantitation –Contamination
1.4 Cryopreservation-Cytotoxicity

Unit 2

Cloning and Transgenic Animals **(10 hrs.)**

2.1 *In vitro* Fertilization and ART, Embryo Transfer, Pregnancy and Prenatal Diagnosis
2.2 Cloning by Species
2.3 Transgenic Animals - Production and Application of Transgenic Livestock, Transgenic Animals as Model for Human Diseases
2.4 Biotechnology in Animal Production - Manipulation of Growth, Probiotics as Growth Promoters, Manipulation of Lactation, Wool Production in Sheep

Unit 3

Plant Tissue Culture **(15 hrs.)**

3.1 Plant Tissue Culture - Principles and Methodology, Protoplast Technology and Somatic Embryogenesis
3.2 Somaclonal Variation, Synthetic Seeds, Production of Secondary Metabolites
3.3 Production of Haploid Plants, Germplasm Conservation

Unit 4

Gene Transformation Technology and Applications in Plants **(10 hrs.)**

4.1 Selectable and Scoreable Markers, Reporter Genes and Promoters Used in Plant Vectors
4.2 Techniques for Plant Transformation – *Agrobacterium tumefaciens* – Mediated Gene Transfer, Direct Gene Transfer Methods, Chloroplast Transformation
4.3 GM Strategies for Insect Resistance – Environmental Impact of BT Crops
4.4 Transgenics for Abiotic Stress Tolerance and Cytoplasmic Male Sterility

Unit 5

Applications of Plant Genetic Engineering (15 hrs.)

5.1 Molecular Farming- Carbohydrates and Proteins
5.2 Plants as Bioreactors- Antibodies, Foreign Proteins in Plants and Edible Vaccines
5.3 Hybrid Seed Production
5.4 QTL, Marker Assisted Selection
5.5 Applications of Tissue Culture in Agriculture and Horticulture

TEXT BOOKS

Chawla, H.S. *Introduction to Plant Biotechnology***.** India: Oxford, 2009.

Freshney, Ian R. *Culture of Animal Cells: A Manual of Basic Technique***.** U.S.A.: Wiley-Liss, 2010.

Purohit, S.S. *Agricultural Biotechnology*. India: Agrobios, 2007.

Slater, A., Scott, N and Fowler M. *Plant biotechnology.* U.S.A.: Oxford, 2003.

BOOKS FOR REFERENCE

Biswas. *Agricultural Biotechnology***.** New Delhi: Dominant, 2005.

Hammond, J. McGarvey, P and Yusibov V. *Plant Biotechnology***,** U.S.A.: Springer, 2000.

Holland, Alan and Johnson, Andrew. *Animal Biotechnology and Ethics***.** U.S.A.: Springer, 1998.

Houdebine, Louis-Marie. *Transgenic Animals: Generation and Use***.** U.S.A.: CRC, 1997.

Pörtner, Ralf. *Animal Cell Biotechnology: Methods and Protocols***.** U.S.A.: Humana, 2007.

Stacey, Glyn and Davis, John. *Medicines from Animal Cell Culture.* U.S.A.: John Wiley, 2007.

Twyman, Richard M. *Gene Transfer to Animal Cells***.** U.S.A.: Garland Science, 2005.

JOURNALS

Journal of Animal science and Biotechnology
International Journal of animal Biotechnology
Journal of Plant Molecular Biology and Biotechnology
Plant Biotechnology Reports

WEB RESOURCES

www.jasbsci.com/
www.niab.org.in/
www.pb.ethz.ch/
www.nrcpb.org/

PATTERN OF EVALUATION

Continuous Assessment Test:

Total Marks: 50 **Duration: 90 mins.**

Section A – 10 x 1 = 10 Marks (All questions to be answered)
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Section C – 1 x 20 = 20 Marks (1 out of 2 to be answered)

Third component:
List of Evaluation modes:
Assignment
Quiz
Seminar
Debate

End Semester Examination:
Total Marks: 100 **Duration: 3 hours**

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M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 - 2016)

IMMUNOLOGY

CODE: 15BY/PC/IM34 **CREDITS: 4**
L T P: 4 1 0
TOTAL TEACHING HOURS : 65

OBJECTIVE OF THE COURSE

- To study the basic concepts of immunology and its use in human welfare

Unit 1

Introduction to Immune System **(13 hrs.)**

1.1 Basic Concepts in Immunology, Self, Non-self-recognition - Innate and Adaptive Immunity
1.2 Cells and Organs of the Immune System
1.3 Antigens- Classification and Characteristic Features
1.4 Immunoglobulin - Classes -Primary Structure- -Biological Activities
1.5 Antigen-Antibody Reactions

Unit 2

B and T Cell Responses **(15 hrs.)**

2.1 Complement system, Function- Components-Activation-Regulation-Biological Consequences
2.2 Major Histocompatibility Complex, General Organization-MHC Molecules and Genes-Regulation-Antigen Processing and Presenting Pathway
2.3 T Cell-Receptors, Maturation-Activation and Differentiation
2.4 B Cell- Receptors, Maturation-Activation and Differentiation

Unit 3

Immune Effector Mechanism **(16 hrs.)**

3.1 Cytokines, Properties-Receptors-Antagonists-Cytokine Related Diseases
3.2 Hypersensitivity Reactions- Gell and Coomb Classification-Type I, II, III, IV
3.3 Leukocyte Activation and Migration
3.4 Cell Mediated Cytotoxicity
3.5 Immune Responses in Tissues

Unit 4

Immune System in Health and Diseases (10 hrs.)

4.1 Immune System in Health and Diseases- Immune Response to Viral, Bacterial, Fungal and Parasitic Infection

4.2 Autoimmunity- Organ Specific-Systemic-Treatment of Autoimmune Diseases

4.3 Primary Immunodeficiency- B cell and T cell Deficiency

4.4 AIDS and Secondary Immunodeficiencies

Unit 5

Immune System in Health and Diseases (11 hrs.)

5.1 Transplantation Immunology- Basis of Graft Rejection-General and Specific Immunosuppressive Therapy-Immune Tolerance to Allograft-Clinical Transplantation

5.2 Tumor Immunology- Oncogenes and Cancer Induction-Tumors and Tumor Antigens-Immune Response to Tumors-Cancer Immunotherapy

5.3 Vaccines- DNA Vaccines- RNA Vaccines

TEXT BOOKS

Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt. *Roitt's Essential Immunology.* U.S.A.: Wiley-Blackwell, 2011.

Thomas J. Kindt, Barbara A. Osborne and Richard A. Goldsby. *Immunology.* U.S.A.: W. H. Freeman, 2006.

BOOKS FOR REFERENCE

Parslow, T.G., Sites, D, P and Terr., A.T. *Medical Immunology*. U.S.A.: McGraw-Hill, 2001.

Tizard. L R. *Immunology: An Introduction*. New York: Saunders, 1995.

JOURNALS

The Journal of Immunology
American Journal of Immunology
BMC Immunology

WEB RESOURCES

www.library.csusm.edu/course guides/biology
www.immunologylink.com
http://www.wiley.com/college/bio/karp12791/weblinks.html

PATTERN OF EVALUATION

Continuous Assessment Test:
Total Marks: 50 **Duration: 90 mins.**

Section A – 10 x 1 = 10 Marks (All questions to be answered)
Section B – 2 x 10 = 20 Marks (2 out of 4 to be answered)
Section C – 1 x 20 = 20 Marks (1 out of 2 to be answered)

Third Component:
List of Evaluation modes:
Assignment
Open book test
Seminar
Group Discussion

End Semester Examination:
Total Marks: 100 **Duration: 3 hours**

Section A – 20 x 1 = 20 Marks (All questions to be answered)
Section B – 4 x 10 = 40 Marks (4 out of 7 to be answered)
Section C – 2 x 20 = 40 Marks (2 out of 4 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 - 2016)

ENZYME AND BIOPROCESS TECHNOLOGY

CODE: 15BY/PC/EB34 **CREDITS: 4**
L T P: 4 1 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To acquire fundamental knowledge of enzymes and its implications on industrial processes
- To create an awareness on important industrial bio-products and the applications of enzymes in various fields

Unit 1

Introduction to Enzymes **(10 hrs.)**

1.1 Bioenergetics-Concepts, Factors affecting rate of Chemical Reactions, Kinetics of Enzyme Catalysed and Uncatalysed Chemical Reactions

1.2 Classification of Enzymes, Mechanisms of enzyme action, Concept of Active Site and Energetics of Enzyme Substrate Complex Formation, Specificity of Enzyme Action, Principles of Catalysis – Collision Theory, Transition State Theory, Role of Entropy in Catalysis

Unit 2

Enzyme Kinetics **(15 hrs.)**

2.1 Kinetics of Single Substrate and Multi-Substrate Enzyme Catalysed Reaction- Estimation of Michaelis-Menten Parameters

2.2 Enzyme Inhibition – Reversible and Irreversible Inhibition and Kinetics

2.3 Enzyme Immobilization Methods- Characterization and Properties of Immobilized Biocatalysts, Applications of Immobilized Enzymes

Unit 3

Fundamentals of Bioprocess Engineering **(13 hrs.)**

3.1 Media Design and Inoculum Development, Media Optimization,

3.2 Sterilization Methods–Medium Sterilization, Batch Sterilization, Continuous Sterilization, Filter sterilization

3.3 Basic Configuration of fermenter and ancillaries, Control systems in a fermenter

3.4 Microbial Growth Kinetics- Modes of operation- Batch, Fed-batch and Continuous

Unit 4

Microbial Growth Kinetics **(12 hrs.)**

4.1Quantification of Microbial Growth and Product Formation, Yield Coefficients, Oxygen Consumption and Heat Evolution in Aerobic Cultures, Thermodynamic Efficiency of Growth

4.2 Gas – Liquid Mass Transfer – Oxygen Transfer Rate and Coefficient

4.3 Types of Bioreactors, CSTR- Plug Flow Reactor- Fluidized Bed- Packed Bed Reactor. Solid State Fermentation. Aerobic and Anaerobic Systems

Unit 5

Downstream processing (15 hrs.)

5.1 Techniques Used in Bioproduct Analysis, Cell Distribution Methods for Intracellular Products, Removal of Insolubles, Biomass (and Particulate Debris)

5.2 Separation Techniques, Flocculation, Sedimentation, Centrifugation and Filtration- Solvent Extraction- Aqueous Two-Phase Separation

5.3 Precipitation- Product Isolation and Purification Techniques- Chromatography (Ion-Exchange, Affinity and Molecular Sieving)

5.4 Membrane Separation-Microfiltration- Ultrafiltration - Reverse Osmosis- Product Formulation and Finishing, Crystallization, Gel Permeation Chromatography, Dialysis, Drying and Lyophilization

TEXT BOOKS

Asenjo, Juan A. *Bioreactor Systems Design*. India: CRC, 1995.

Bailey, J.E. and Ollis, D. *Biochemical Engineering Fundamentals*. New York: McGraw – Hill, 2002.

Bryce and Mansi. *Fermentation Microbiology & Biotechnology*. India: Kluwer Academic, 2011.

Doran, Pauline M. *Bioprocess engineering principles*. London: Academic, 1995.

Palmer, Trevor. *Enzymes : Biochemistry, Biotechnology and Clinical Chemistry***.** U.S.A.: Horwood, 2004.

Stanbury and Whitaker. *Principles of Fermentation Technology***.** U.S.A.: Pergamon, 1984.

BOOKS FOR REFERENCE

Butterworth. *Technological Applications of Biocatalysts*. U.S.A.: BIOTOL, 1995.

Coulson. *Chemical Engineering*. U.S.A.: Pergamon, 1984.

Schuler, Michael L. *Bioprocess Engineering*. U.S.A.: Prentice, 1992.

Straathof, A.J. *Applied Biocatalysis*. New York: Tailor and Francis, 2000.

Wanng, D.I.C. and Cooney, C.L. *Fermentation and Enzyme Technology*. U.S.A.: John Wiley, 1994.

JOURNALS

Biotechnology and Bioprocess Engineering
Bioresources and Bioprocessing
Enzyme and Microbial technology
Enzyme Technology and Molecular Biology

WEB RESOURCES

www.bioprocessintl.com/
www.ibclifesciences.com/BPI/overview.xml
www.techenzyme.com/
www.abenzymes.com/
www.wildfermentation.com/
John Schollar and Benedikte Watmore, Practical Fermentation-a technical guide
web.mit.edu/professional/short.../fermentation_technology.html

PATTERN OF EVALUATION

Continuous Assessment Test:
Total Marks: 50 **Duration: 90 mins.**

Section A – 10 x 1 = 10 Marks (All questions to be answered)
Section B – 2 x 10 = 20 Marks (2 out of 4 to be answered)
Section C – 1 x 20 = 20 Marks (1 out of 2 to be answered)

Third Component:

List of Evaluation modes:
Assignment
Open book test
Seminar
Quiz

End Semester Examination.
Total Marks: 100 **Duration: 3 hours**

Section A – 20 x 1 = 20 Marks (All questions to be answered)
Section B – 4 x 10 = 40 Marks (4 out of 7 to be answered)
Section C – 2 x 20 = 40 Marks (2 out of 4 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE: BIOTECHNOLOGY
SYLLABUS
(Effective from the academic year 2015 -2016)

RECOMBINANT DNA TECHNOLOGY - PRACTICAL

CODE: 15BY/PC/P322 **CREDITS : 2**
L T P : 0 0 3
TOTAL HOURS: 39

1. Restriction Digestion – Agarose Gel Electrophoresis (6 hrs.)
2. Cloning and Ligation (6 hrs.)
3. Isolation of Plasmid DNA (3 hrs.)
4. Preparation of Competent cell (3 hrs.)
5. Bacterial Transformation (6 hrs.)
6. Identification of Recombinants – Antibiotic markers, Blue-white screening (3 hrs.)
7. GFP Cloning (6 hrs.)
8. DNA Sequencing – Demonstration (6 hrs.)

PATTERN OF EVALUATION
Continuous Assessment Test:
Total Marks: 50 **Duration: 6 hours**

1. Major experiment to be conducted (15 Marks)
   10 Marks for principle, procedure and conduct. 5 Marks for result

2. Minor experiment to be conducted (10 Marks)
   5 Marks for principle and procedure, 5 marks for conduct and result

3. 5 Spotters each carrying 3 marks (15 Marks)

4. Viva voce (5 Marks)

5. Record (5 Marks)

End Semester Examination
Total Marks: 50 **Duration: 6 hours**

1. Major experiment to be conducted (15 Marks)
   10 Marks for principle, procedure and conduct. 5 Marks for result
2. Minor experiment to be conducted (10 Marks)
   5 Marks for principle and procedure, 5 marks for conduct and result
3. 5 Spotters each carrying 3 marks (15 Marks)
4. Viva voce (5 Marks)
5. Record (5 Marks)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 - 2016)

ANIMAL AND PLANT BIOTECHNOLOGY – PRACTICAL

CODE: 15BY/PC/P423 **CREDITS : 3**
L T P : 0 0 5
TOTAL HOURS : 65

ANIMAL BIOTECHNOLOGY

1.	Isolation of Genomic DNA from Animal Cells	(5 hrs.)
2.	Preparation and Sterilization of Animal Cell Culture Media	(2 hrs.)
3.	Development of Monolayer	(3 hrs.)
4.	Subculturing / Passaging	(2 hrs.)
5.	Quantitation of Animals Cells Using Hemocytometer	(3 hrs.)
6.	Cell Viability Test	(2 hrs.)
7.	MTT Assay	(3 hrs.)
8.	Chick Embryo Fibroblast	(2 hrs.)
9.	Karyotyping (Demonstration)	(3 hrs.)

PLANT BIOTECHNOLOGY

1 Basic techniques in plant tissue culture (10 hrs.)
- Preparation of Medium, Surface Sterilization
- Callus Induction, Organogenesis
- Embryo Culture

2	Protoplast Isolation by Enzymatic Method and Protoplast Fusion	(5 hrs.)
3	*Agrobacterium* culture, Reporter Gene (GUS) Assay	(5 hrs.)
4	Production of Synthetic Seeds	(5 hrs.)
5	Isolation of Plant Genomic DNA	(5 hrs.)
6	Isolation of Chloroplast	(5 hrs.)
7	Detection of Antimicrobial Secondary Metabolites Produced by Plant Tissues	(5 hrs.)

PATTERN OF EVALUATION

Continuous Assessment Test:
Total Marks: 50 **Duration: 6 hours**
Animal Biotechnology
1. Major experiment to be conducted (10 Marks)
   5 Marks for procedure and 5 Marks for conduct and result

2. Minor experiment (5 Marks)
   Marks allotted for principle and procedure

Plant Biotechnology
3. Major experiment to be conducted (10 Marks)
   5 Marks for procedure and 5 Marks for conduct and result

4. Minor experiment (5 Marks)
   Marks allotted for principle and procedure

5. 5 Spotters each carrying 2 marks (10 Marks)

6. Record (5 Marks)

7. Viva voce (5 Marks)

End Semester Examination
Total Marks: 50 **Duration: 6 hours**

Animal Biotechnology
1. Major experiment to be conducted (10 Marks)
   5 Marks for procedure and 5 Marks for conduct and result

2. Minor experiment (5 Marks)
   Marks allotted for principle and procedure

Plant Biotechnology
3. Major experiment to be conducted (10 Marks)
   5 Marks for procedure and 5 Marks for conduct and result

4. Minor experiment (5 Marks)
   Marks allotted for principle and procedure

5. 5 Spotters each carrying 2 marks (10 Marks)

6. Record (5 Marks)

7. Viva voce (5 Marks)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 -2016)

FOOD AND PHARMACEUTICAL BIOTECHNOLOGY

CODE: 15BY/PC/FP44 **CREDITS : 4**
L T P : 4 1 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To acquire knowledge on the recent advances in food and pharmaceutical biotechnology
- To enable students to apply the principles and techniques in the relevant fields

Unit 1

Introduction to Food Processing (15 hrs.)

1.1 Source of Food - Food of Plant, Animal and Microbial Origin, Different Foods and Groups of Foods as Raw Materials for Processing, Need and Significance of Processing these Foods.

1.2 Milling of Grains and Pulses, Edible Oil Extraction, Pasteurisation of Milk and Yoghurt, Canning and Bottling

1.3 Drying – Traditional and Modern Methods of Drying, Dehydration of Fruits, Vegetables, Milk, Animal Products etc., Preservation by Use of Acid, Sugar and Salt

1.4 Pickling and Curing with Microorganisms and Microbial Fermentation, Frying, Baking, Extrusion Cooking

Unit 2

Food Preservation (12 hrs.)

2.1 Food Preservation- Principles of Food Preservation, Use of Chemical Preservatives, Canning, Freezing and Dehydration, Use of Radiation

2.2 Chemical and Physical Properties of Food Affecting Microbial Growth – pH, Water Activity, Redox Potential, Nutrients, Antimicrobial Compounds

2.3 Role of Microorganisms in Food Spoilage

Unit 3

Food Packaging and Quality Assurances (14 hrs.)

3.1 Basic Packaging Materials, Types of Packaging, Packaging Design, Packaging for Different types of Foods, Retort Pouch Packing, Costs of Packaging and Recycling of Materials

3.2 Food Borne Infections and Intoxications, Infective and Toxic types
Types – *Clostridium sp., Salmonella sp.*, *Shigella sp.*, *Staphylococcus sp.*, *Campylobacter sp.*, *Listeria sp.*

3.3 Mycotoxins in Food with Reference to *Aspergillus* species

3.4 Quality Assurance, Microbiological Quality Standards of Food, Government Regulatory Practices and Policies, FDA, EPA, HACCP, ISI, ISO, Genetically Modified Foods Classification of additives, E-number

3.5 Biosensors in Food

Unit 4

General Pharmacology (11 hrs.)

4.1 Introduction of Pharmacology, Sources of Drugs, Route of Administration, Mechanism of Action of Drugs- Absorption, Distribution, Metabolism and Excretion of Drugs

4.2 Pharmacological Classification of Drugs - Analgesics, Antipyretics, Anti-inflammatory, Antidepressants and CNS Stimulants, Anti-hypertensive Drugs and Anti-hyper lipidemic Drugs. Diuretics and Anti-diuretics, Anti-asthmatic Drugs

Unit 5

Formulation and Delivery (13 hrs.)

5.1 Compressed Tablets-Wet Granulation –Dry Granulation or Slugging-Direct Compression-Tablet Press

5.2 Formulation-Coating-Capsules Sustained Dosage Forms-Parental Solutions-Oral Liquids-Injections-Ointments-Standard of Hygiene and Good Manufacturing Practices

5.3 Transdermal Delivery System, Liposomes and Nanoparticles

5.4 Personalized Medicine

5.5 Pharmacogenomics

TEXT BOOKS

Adams, M. R. Moss, M. O. *Food Microbiology***,** U.S.A.: Royal Society of Chemistry, 2000.

Doyle, M. P., Buchanan, R. L. *Food Microbiology: Fundamentals and Frontiers*. U.S.A. ASM, 2012.

BOOKS FOR REFERENCE

Garbutt, J. *Essentials of Food Microbiology*, U.S.A.: Hodder, 1997.

George, B. J. *Basic Food Microbiology.* U.S.A.: Springer, 1989.

Joshi,V. K., Pandey. *A Biotechnology: Food Fermentation Microbiology, Biochemistry and Technology.* India: Educational, 1999.

Katzung**,** B. G. Masters, S. B., Trevor, A. J. *Basic and Clinical Pharmacology*. U.S.A.: McGraw, 2012.

Prajapati, J. B. *Fundamentals of Dairy Microbiology*. India: Nadiad Akta Prakashan, 1995.

Satoskar, R. S., Bhandarkar, S.D., Rege, N. *Pharmacology and Pharmacotherapeutics*. India: Popular Prakashan, 1973.

Tripathi K D. *Essentials of Medical Pharmacology*. India: Jaypee. 2013.

JOURNALS

Journal of Food Microbiology
Journal of Food and Pharmaceutical sciences

WEB RESOURCES

www. nottingham.ac.uk

PATTERN OF EVALUATION
Continuous Assessment Test:
Total Marks: 50 **Duration: 90 mins**

Section A – 10 x 1 = 10 Marks (All questions to be answered)
Section B – 2 x 10 = 20 Marks (2 out of 4 to be answered)
Section C – 1 x 20 = 20 Marks (1 out of 2 to be answered)

Third Component:
List of Evaluation modes:
Assignment
Seminar
Paper reviews
Quiz

End Semester Examination:
Total Marks: 100 **Duration: 3 hours**

Section A – 20 x 1 = 20 Marks (All questions to be answered)
Section B – 4 x 10 = 40 Marks (4 out of 7 to be answered)
Section C – 2 x 20 = 40 Marks (2 out of 4 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 - 2016)

STEM CELL BIOLOGY AND TISSUE ENGINEERING

CODE: 15BY/PC/ST44 **CREDITS: 4**
L T P: 4 1 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To provide an understanding of the basic concepts of Stem Cell Biology and Tissue Engineering
- To create an awareness on the applications in the field of regenerative medicine

Unit 1

Introduction to Stem Cells **(12 hrs.)**

1.1 Stem Cells - Definition, Characterization, Pluripotency, Self-renewal and Differentiation
1.2 Pluripotent Stem Cells from Vertebrate Embryos
1.3 Stem Cell Niches - Niche Specification within Mammalian Tissues
1.4 Adult Stem Cell from Amniotic Fluid- Cord Blood and Tooth Primordial

Unit 2

Basic Mechanism of Stem Cells **(15 hrs.)**

2.1 Basic Biology, Mechanism of Stem Cells, Molecular Basis of Pluripotency- Influence of the IL6 Family of Cytokines
2.2 Extrinsic Determinants and Intrinsic Determinants of Pluripotency
2.3 Epigenetic Configuration of Pluripotent Cells
2.4 Mechanism of Stem Cell Renewal

Unit 3

Applications of Stem Cells **(18 hrs.)**

3.1 Stem Cell Gene Therapy, Cancer Stem Cells
3.2 Neural Stem Cells for Central Nervous System Repair-Spinal Cord Injury
3.3 Use of Embryonic Stem Cells to Treat Heart Disease
3.4 Insulin-Producing Cells Derived from Embryonic Stem Cells
3.5 Stem Cells for Burns and Skin Ulcers
3.6 Orthopedic Applications of Stem Cells

Unit 4

Introduction to Tissue Engineering (10 hrs.)

4.1 Tissue Engineering- Basic Biology of Tissue Engineering- the Basis of Growth and Differentiation, Morphogenesis and Tissue Engineering
4.2 *In vitro* Control of Tissue Development
4.3 Growth Factors, Tissue Engineering Bioreactors
4.4 Tissue Assembly in Microgravity
4.5 Biomaterials in Tissue Engineering

Unit 5

Applications of Tissue Engineering (10 hrs.)

5.1 Bioartificial Organs–Bioartificial Pancreas, Hepat Assist Liver Support System
5.2 Heamatopoietic System- Red Blood Cell Substitutes-Renal Replacement Devices
5.3 Brain Implants-Neural Stem Cells
5.4 Periodontal Applications, Artificial Womb
5.5 Future Perspectives of Tissue Engineering

TEXT BOOKS

Robert P. Lanaza, Robert Langer and Joseph Vacanti. *Principles of Tissue Engineering*. U.S.A.: Academic, 2007.

Robert Lanza. *Essentials of Stem Cell Biology.* U.S.A.: Academic, 2005.

BOOKS FOR REFERENCE

Atala, Anthony. *Principles of Regenerative Medicine***.** U.S.A.: Academic, 2008.

Belval, Brian. *Critical Perspectives on Stem Cell Research***.** U.S.A.: The Rosen, 2006.

Davis. *Cell therapy, Stem Cells and Brain Repair***.** U.S.A.: Humana, 2009.

Fong, Calvin A. *Stem Cell Research Developments***.** U.S.A.: Nova, 2007.

Greer, Erik V. *Neural Stem Cell Research***.** U.S.A.: Nova, 2006.

Lanza, Robert and Klimankaya, Irina. *Essential Stem cell Methods***.** U.S.A.: Academic, 2009.

Micklem.H.S, Loutit John.F. *Tissue grafting and radiation***.** New York: Academic, 2004.

Notarianni, Elena and Evans. Martin J. *Embryonic Stem Cells***.** New York: Oxford, 2006.

Penso.G, Balducci. D. *Tissue cultures in biological research***.** Amsterdam: Elsevier, 2004.

Sylvia, S. Mader. *Human Biology*. U.S.A.: Mc Graw, 2011.

JOURNALS

International Journal of Stem Cell
Journal of Tissue Engineering and Regenerative Medicine
Journal of Biomaterials and Tissue Engineering

WEB RESOURCES

stemcells.nih.gov/
www.nature.com/nature/stemcells/
www.cell.com/cell-stem-cell/
www.nuigalway.ie/anatomy/tissue_engineering.html

PATTERN OF EVALUATION

Continuous Assessment Test:
Total Marks: 50 **Duration: 90 mins.**

Section A – 10 x 1 = 10 Marks (All questions to be answered)
Section B – 2 x 10 = 20 Marks (2 out of 4 to be answered)
Section C – 1 x 20 = 20 Marks (1 out of 2 to be answered)

Third Component:

List of Evaluation modes:
Assignment
Open book test
Seminar
Group Presentation
Biological Models

End Semester Examination:
Total Marks: 100 **Duration: 3 hours**

Section A – 20 x 1 = 20 Marks (All questions to be answered)
Section B – 4 x 10 = 40 Marks (4 out of 7 to be answered)
Section C – 2 x 20 = 40 Marks (2 out of 4 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 - 2016)

DISSERTATION

CODE: 15BY/PC/DI49 **CREDITS : 09**
L T P: 0 0 12

GUIDELINES FOR DISSERTATION

Project should be done individually. Each student will choose a topic of her interest and the student will be assigned to a supervisor.

The project will require practical work with the submission of a project report. It should include wet lab work. The duration of the project work is between 3 and 6 months

The project report should be submitted in the prescribed format containing a minimum of 50 pages. References should not be counted with the main pages. The report should be enhanced with photographs.

Each candidate has to give three periodical reviews to the internal guide on the scheduled dates prescribed by the department.

Each candidate can prepare 4 hard copies of the thesis. 1 copy for her and 3 copies must be submitted to the department. The project should be submitted on the scheduled date prescribed by the Department. The student should appear for Viva-voce before a panel comprising the External Examiner, the supervisor and the Head of the Department.

Guidelines for Evaluation

The maximum marks for the dissertation is 200 and this is divided into 4 compartments.

a) Style format and neatness in presentation	(50 Marks)
b) Logic and reasoning	(25 Marks)
c) Methodology – analysis and interpretation	(75 Marks)
d) Viva	(50 Marks)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 - 2016)

ENZYME AND BIOPROCESS TECHNOLOGY - PRACTICAL

CODE: 15BY/PC/P533

CREDITS : 3
L T P : 0 0 5
TOTAL HOURS : 65

1. Enzyme Kinetics (5 hrs.)
2. Effect of pH, Temperature on Enzyme Activity (10 hrs.)
3. Thermal Stability on Enzyme Activity (5 hrs.)
4. Enzyme Inhibition Kinetics (5 hrs.)
5. Enzyme Immobilization using Sodium Alginate (5 hrs.)
6. Determination of Thermal Death Point of Bacterial Culture (5 hrs.)
7. Production of Ethanol using *Saccharomyces cerevisiae* (5 hrs.)
8. Sauerkraut Production (5 hrs.)
9. Growth of Bacteria-Estimation of Biomass, Calculation of Specific Growth Rate (5 hrs.)
10. Placket-Burman Design for Media Optimization (15 hrs.)

PATTERN OF EVALUATION
Continuous Assessment Test:
Total Marks: 50 **Duration: 6 hours**

1. Major experiment to be conducted (14 Marks)

   10 Marks for principle, procedure and conduct. 4 Marks for result.

2. Minor experiment to be conducted (10 Marks)

   5 Marks for principle and procedure, 5 marks for conduct and result.

3. 4 Spotters each carrying 4 marks (16 Marks)

4. Viva voce (5 Marks)

5. Record (5 Marks)

End Semester Examination

Total Marks: 50 **Duration: 6 hours**

1. Major experiment to be conducted (14 Marks)

   10 Marks for principle, procedure and conduct. 4 Marks for result.

2. Minor experiment to be conducted (10 Marks)

   5 Marks for principle and procedure, 5 marks for conduct and result.

3. 4 Spotters each carrying 4 marks (16 Marks)

4. Viva voce (5 Marks)

5. Record (5 Marks)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2015 - 2016)

IMMUNOLOGY - PRACTICAL

CODE: 15BY/PC/P633 **CREDITS: 3**
L T P : 0 0 5
TOTAL HOURS: 65

1. Differential Counting (10 hrs.)
2. Immunodiffusion-Radial, ODD (pattern and titration) (10 hrs.)
3. Immunoelectrophoresis-IEP, cIEP, Rocket Electrophoresis (10 hrs.)
4. Immunodiagnostics- Widal Test, Latex Agglutination Test (CRP) (5 hrs.)
5. Isolation of Lymphocytes (5 hrs.)
6. Isolation of Rosette cells (5 hrs.)
7. Purification of IgG (5 hrs.)
8. ELISA (DOT) (5 hrs.)
9. Western Blotting (10 hrs.)

PATTERN OF EVALUATION
Continuous Assessment Test:

Total Marks: 50 **Duration: 6 hours**

1. Major experiment to be conducted (14 Marks)
   10 Marks for principle, procedure and conduct. 4 Marks for result

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   5 Marks for principle and procedure, 5 marks for conduct and result

3. 4 Spotters each carrying 4 marks (16 Marks)

4. Viva voce (5 Marks)

5. Record (5 Marks)

End Semester Examination

Total Marks: 50 **Duration: 6 hours**

1. Major experiment to be conducted (14 Marks)
   10 Marks for principle, procedure and conduct. 4 Marks for result

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3. 4 Spotters each carrying 4 marks (16 Marks)

4. Viva voce (5 Marks)

5. Record (5 Marks)