

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 86

M.Sc. DEGREE : BIOTECHNOLOGY

COURSES OF STUDY

(Effective from the academic year 2011 - 2012)

CHOICE BASED CREDIT SYSTEM

Subject Code	Title of Course	Credits	Teaching/ Practical Hours			Exam Hours	Continuous Assessment	End Semester	Maximum Marks
			Lecture Hours	Tutorial Hours	Practical Hours				
Semester - I									
11BY/PC/BC14	Biochemistry	4	4	1	0	3	50	50	100
11BY/PC/MI14	Microbiology	4	4	1	0	3	50	50	100
11BY/PC/CM14	Cell and Molecular Biology	4	4	1	0	3	50	50	100
11BY/PC/P112	Biochemistry and Microbiology - Practicals	2	0	0	3	6	50	50	100
11BY/PC/P213	Cell and Molecular Biology - Practicals	3	0	0	5	6	50	50	100
11BY/PE/RB14	Research Methodology and Bioethics	4	4	0	0	3	50	50	100
11BY/PA/CW12	Child Welfare	2	2	0	0	-	50	-	100
Semester - II									
11BY/PC/VG 24	Cloning Vectors and Genetic Engineering	4	4	1	0	3	50	50	100
11BY/PC/AP 24	Animal and Plant Biotechnology	4	4	1	0	3	50	50	100
11BY/PC/P322	Cloning Vectors and Genetic Engineering - Practicals	2	0	0	3	6	50	50	100
11BY/PC/P423	Animal and Plant Biotechnology - Practicals	3	0	0	5	6	50	50	100
11BY/PE/BB24	Biophysics and Biostatistics	4	4	0	0	3	50	50	100
11BY/PK/SS22	Soft Skills	2	2	0	0	-	50	-	100
Semester - III									
11BY/PC/BE34	Bioprocess and Enzyme Technology	4	4	1	0	3	50	50	100
11BY/PC/IM34	Immunotechnology	4	4	1	0	3	50	50	100
11BY/PC/P533	Bioprocess and Enzyme Technology - Practicals	3	0	0	5	6	50	50	100
11BY/PC/P633	Immunotechnology - Practical	3	0	0	5	6	50	50	100
11BY/PN/SI32	Summer Internship	2	-	-	-	-	50	-	100
Semester - IV									
11BY/PC/IN44	Instrumentation	4	4	1	0	3	50	50	100
11BY/PC/ST44	Stem Cell Technology	4	4	1	0	3	50	50	100
11BY/PC/DI48	Dissertation	8	-	-	12	-	-	50	100
11BY/PE/GP44	Genomics and Proteomics	4	4	0	0	3	50	50	100
Offered to Other Departments									
11BY/PE/AB24	Applications of Biotechnology	4	4	0	0	3	50	50	100
11BY/PE/EB34	Environmental Biotechnology	4	4	0	0	3	50	50	100
Independent Study Courses									
11BY/PI/GB24	Genetics and Plant Breeding	4	-	-	-	3	-	50	100
11BY/PI/TE24	Tissue Engineering	4	-	-	-	3	-	50	100

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

BIOCHEMISTRY

CODE: 11BY/PC/BC14

CREDITS : 4

L T P : 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To introduce students to the details of human biochemistry.
- To help students learn to apply biochemistry in the process of clinical problem solving.

Unit 1

(14 hrs)

Introduction to Biochemistry.
Components of the cell and cell fractionation – markers for each organelle.
Structures of the major biochemical components of the body – Carbohydrates, lipids, proteins nucleic acids and coenzymes. Water : Role of water, maintenance of body water.
Maintenance of pH – Role of Hemoglobin, Respiratory control, Role of Kidney, Acidosis, Alkalosis.
Digestion and absorption of Carbohydrates, Lipids and Proteins.

Unit 2

(12 hrs)

Biomolecules. Classification, structure and property of porphyrins. Plant and animal pigments.
Hormones - growth, pancreatic and sex hormones - Prostaglandins, leukotrienes, thromboxanes. Vitamins.

Unit 3

(14 hrs)

Fundamental aspects of Enzymology and Clinical applications.
Enzyme nomenclature, Classification, Cofactor, Active site, Specificity and factors affecting enzyme action.
Enzyme regulation : Allosteric, feedback, product inhibition.
Enzymes and enzyme based assays used in clinical diagnosis.

Unit 4

(15 hrs)

Cellular metabolism.
Fuel Oxidation and generation of ATP.
Cellular Bioenergetics : The role of ATP, Biological oxidation, the respiratory chain and Oxidative phosphorylation.
Glycolysis, Gluconeogenesis, Pentose Phosphate pathway, Metabolism of Glycogen, Citric acid cycle, metabolism of Ethanol.
Oxidation of fatty acids, Biosynthesis of Cholesterol, Fatty acids and Triglycerides.
Degradation of amino acids – transamination, oxidative deamination and Urea cycle.
Integration of metabolism.

Unit 5

(10 hrs)

Tissue metabolism.

Metabolic adaptations in the fed state, starvation state.

Metabolism in specific tissues – Liver, Muscle. Drug metabolism – xenobiotics.

BOOKS FOR STUDY

Hames, David and Hooper, Nigel. Biochemistry. 3rd ed. New York : Taylor and Francis, 2008.

Jain, J.L. Fundamentals of Biochemistry. 4th ed. New Delhi : S.Chand and Company, 2007.

Lehninger, Albert L., et al. Biochemistry. 5th ed. New York : Worth Publishing, 2007.

Murray, R.K., Granner, D.K and Rodwell, V.W. Harper's Illustrated Biochemistry, 7th ed. McGraw Hill, 2006.

Stryer, L. Biochemistry. 5th ed. New York : W.H.Freeman, 1995.

Voet, D. and Voet, G. Biochemistry. 3rd ed. New York : John Wiley and Sons, 2008.

BOOKS FOR REFERENCE

Berg, Jeremy M. Biochemistry. 5th revised ed. New York : W.H.Freeman, 2002.

Brandon and Tooze. Introduction to protein structure. 2nd ed. New York : Garland Publishing, 2001.

Conn, E.E. and Stumpf. Biochemistry. 4th ed. New York : Wiley Eastern, 1976.

Devlin, Thomas M. Textbook of Biochemistry with clinical correlations. 6th ed. New York : John Wiley and Sons, 2006.

Garrett, H. Reginald and Charles M.Grisham. Biochemistry. 3rd ed. USA : Thomson Brooks /Cole. 2007.

**QUESTION PAPER PATTERN FOR
BIOCHEMISTRY – 11BY/PC/BC14**

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a, b, c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

CELL AND MOLECULAR BIOLOGY

CODE: 11BY/PC/CM14

CREDITS : 4

L T P : 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To make the student understand the architecture of the cell.
- To understand the fundamentals of functional aspects of the cell at molecular level.

- Unit 1 (11 hrs)**
The dynamic cell, plasma membrane, subcellular organization, structure and function of organelles in prokaryotic and eukaryotic cells. Cell motility – microfilaments, intermediate filaments and microtubules. Mechanisms of cell communication. Cell – cell interactions.
- Unit 2 (11 hrs)**
Nucleic acids, the genetic code and synthesis of macromolecules : DNA structure, replication, damage and repair. RNA – types, transcription and processing. Protein synthesis.
- Unit 3 (13 hrs)**
Molecular structure of genes and chromosomes : Molecular definition of a gene. Organization of prokaryotic genome. Organisation of eukaryotic genomes – coding and non-coding sequences. Mobile DNA. Organelle DNA.
- Unit 4 (18 hrs)**
Transcriptional and translation regulation : Transcriptional regulation in eukaryotes – steroid hormone receptors, heat shock genes, homeotic genes, DNA methylation and histone modification. Protein processing, folding, sorting and transport. Post transcriptional regulation. Transcriptional regulation in prokaryotes – regulation by repressors and by activators, regulation by attenuation. Translational regulation in bacteria.
- Unit 5 (12 hrs)**
Cell cycle and genes regulating cell cycle. Apoptosis : Intrinsic and extrinsic pathways. Cancer : Oncogenes and tumor suppressor genes. Molecular approaches to cancer treatment.

BOOKS FOR STUDY

Cooper, G.M. and Hausman, R.E. The Cell – A Molecular Approach, 5th ed. USA : ASM Press, 2009.

Weaver. Molecular Biology, 5th ed. Tata McGraw Hill, 2007.

Wolfe, Stephen L. Molecular and Cellular Biology, USA : Wadsworth, Inc. 1999.

BOOKS FOR REFERENCE

Alberts, Bruce, et. al. Molecular Biology of the Cell. 5th ed. USA : Garland Publishers, 2007.

Becker, Wayne M. et al. The World of the cell. 7th ed. Pearson Education, 2009.

Darnell, James, Harvey Lodish and David Baltimore. Molecular and Cell Biology, 6th ed. NY, USA. Scientific American Books, Distributed by W.H. Freeman and Co. NY, 2007.

Karp, Gerald, Cell and Molecular Biology – Concepts and Experiments, 6th ed. John Wiley and Sons, 2010.

Lewin, Benjamin, Genes X. Jones and Bartlett Publishers, 2011.

Watson, James D., Baker, Tania A., Bell, Stephen A., Gann, Alexander Levine, Michael, Losick Richard and Cummings, Benjamin. Molecular Biology of the Gene, 6th ed. CSHL Press, 2008.

**QUESTION PAPER PATTERN FOR
CELL AND MOLECULAR BIOLOGY– 11BY/PC/CM14**

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

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M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

MICROBIOLOGY

CODE: 11BY/PC/MI14

CREDITS : 4

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To provide information on the recent advances in the field of microbiology
- To elucidate upon microbiology related to growth and morphology of microbes
- To give an insight on applied aspects of microbiology

Unit 1 (12 hrs)

History and scope of microbiology. Classification of microbes - Phylogenetic classification-Identification- Morphology and staining, Ultrastructure of Bacteria, Fungi, Algae and Protozoa Biochemical characters, Serology, Fatty acid profile. Modern developments in microbiology.

Unit 2 (13 hrs)

Microbial nutrition, culture media, physical and chemical methods of microbial control. Microbial growth-growth curve, measurement of growth, continuous and batch culture, Factors affecting growth. Preservation of culture. Pure culture techniques. Microbial diversity and taxonomy - Ribotyping, Ribosomal RNA analysis.

Unit 3 (15 hrs)

Food microbiology –Dairy products – microbial flora of fresh foods, spoilage and preservation.

Industrial uses of microbes – Fuel -Ethanol, pharmaceuticals-antibiotic, Biofertilisers, Biopesticides, Biopolymers, Biosurfactants. Production of Antibiotics – Streptomycin, Production of Organic Acids – Citric acid; Production of Enzymes - Amylase; Production of Amino acids – Glutamic Acid; Production of Vitamins – Vitamin B12.

Unit 4 (10 hrs)

Biology of bacteriophage λ : lytic growth and lysogeny - Phage Typing. Viruses - General properties of plant and animal virus, classification, structure, isolation, cultivation, purification, transmission and multiplication. Viruses and disease – HIV. Virions and Prions.

Unit 5**(15 hrs)**

Medical microbiology-disease transmission, patterns and spread of infection, Microscopic, molecular and biochemical methods of identification. Symptoms pathogenesis and control of diseases. Respiratory tract infection-TB, viral Influenza, fungal Pneumonia. Gastrointestinal infection-dysentery, gastroenteritis, Aspergillosis. Urinary tract infection – Leptospirosis, adenovirus type 2, fungal candidiasis. Sexually transmitted diseases – syphilis, Herpes simplex virus, Candidiasis.

BOOKS FOR STUDY

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

Krasner, R.I. The microbial challenge. 2nd ed. Canada : Jones and Bartlett Publishers, 2010.

Patel, A.H. Industrial Microbiology. MacMillan Publishers, 1999.

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

Vasanthakumari. R. Textbook of Microbiology. New Delhi : BI Publications Pvt. Ltd., 2007.

BOOKS FOR REFERENCE

Demain, Arnold L., and Davies, Julian E. Manual of Industrial Microbiology and Biotechnology. 3rd ed. ASM Press, 2010.

Dimmock, N.J., Easton, A.J.and Leppard. Introduction to Modern Virology. 6th ed. Blackwell Publishing, 2007

Glazer,A.N.,and Nikaido,H. Microbial Biotechnology. Cambridge University Press, 2007.

Inglis, T. J. J. Microbiology and Infection: A Clinical Core Text for Integrated Curricula with Self-Assessment. 3rd ed. Elsevier Health Sciences Publisher, 2007.

Pelczar, Michael,J (Jr.),Reid, Roger,D.Chan E.C.S.and H.Kreig. Microbiology. 5th ed. New Delhi : Tata McGraw-Hill Publishing Co.Ltd, 2001.

Prescott,L.M. Microbiology. McGraw-Hill Publications, 2011.

Tortora,G.G.J.,Funke,B.R.and Case,C.L. Microbiology-An Introduction. 10th ed. Benjamin-Cummings Pub. Co., 2009

**QUESTION PAPER PATTERN FOR
MICROBIOLOGY – 11BY/PC/MI14**

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a, b, c) not exceeding 500 words each.

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M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

BIOCHEMISTRY AND MICROBIOLOGY – PRACTICALS

CODE : 11BY/PC/P112

CREDITS: 2

L T P : 0 0 3

TOTAL TEACHING HOURS : 39

Biochemistry

1. Colorimetric Determination of glucose and amino acids (from plant source).
2. Determination of starch in plant tissues.
3. Estimation of protein by Lowry and Bradford's method.
4. Protein purification – ammonium sulphate, acetone, TCA precipitation.
5. Qualitative test for lipids – Solubility test, emulsification, saponification, Liebermann-Burchard test for cholesterol, Sudan Black B test, test for unsaturated lipids.
6. Thin layer chromatography – Separation of amino acids.
7. Gel filtration – Separation of proteins (Demonstration).
8. SDS – PAGE – Separation of proteins (Demonstration).

Microbiology

1. Isolation and culturing of bacteria, fungi and algae.
2. Bacterial growth curve.
3. Staining –
 - a) Fungal Staining
 - b) Differential staining
 - c) Spore staining
 - d) Acid fast staining
4. Biochemical tests-
 - 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

5. Kirby- Bauer Antibiotic Sensitivity Test.
6. Resazurin test to check the quality of milk.
7. Motility by hanging drop method.

**QUESTION PAPER PATTERN FOR
BIOCHEMISTRY AND MICROBIOLOGY PRACTICALS – 11BY/PC/P112**

	EXAM
HOURS: 6	
BIOCHEMISTRY AND MICROBIOLOGY PRACTICALS	(50 MARKS)
Biochemistry	
1. Major experiment to be conducted 5 Marks for procedure and 5 Marks for conduct and result.	(10 Marks)
2. Minor experiment Marks allotted for principle and procedure	(6 Marks)
Microbiology	
3. Major experiment to be conducted 5 Marks for procedure and 5 Marks for conduct and result.	(10 Marks)
4. Minor experiment Marks allotted for principle, procedure, conduct and result.	(7 Marks)
5. 4 Spotters each carrying 3 marks.	(12 Marks)
6. Viva voce	(5 Marks)

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M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

CELL AND MOLECULAR BIOLOGY – PRACTICALS

CODE: 11BY/PC/P213

CREDITS : 3

L T P : 0 0 5

TOTAL TEACHING HOURS: 65

Cell and Molecular Biology

1. **Extraction and estimation of bacterial DNA.**
2. **RAPD and RFLP analysis.**
3. **Southern hybridization and the use of non-radioactive probes.**
4. **Isolation of total RNA.**
5. **Northern blotting.**
6. **Mitosis and meiosis using plant tissue.**
7. **PCR amplification.**
8. **Isolation of plant mitochondria and chloroplast.**

**QUESTION PAPER PATTERN FOR
CELL AND MOLECULAR BIOLOGY PRACTICALS – 11BY/PC/P213**

	EXAM HOURS: 6
CELL AND MOLECULAR BIOLOGY PRACTICALS	(50 MARKS)
1. Major experiment to be conducted 10 Marks for principle, procedure and conduct. 4 Marks for result.	(14 Marks)
2. Minor experiment to be conducted 5 Marks for principle and procedure, 5 marks for conduct and result.	(10 Marks)
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 2011 - 2012)

RESEARCH METHODOLOGY AND BIOETHICS

CODE: 11BY/PE/RB14

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE

- To describe and express the role and importance of research on basic and applied sciences
- To propose a research proposal in the field of Biotechnology

Unit 1 (10 hrs)

Principles and practice of research: Literature review, action plan and pilot study
Undertaking a research project: Data collection, Classification and presentation of data.

Unit 2 (10 hrs)

Presentation of project: writing reports; organization of manuscript, writing a thesis, scientific writing, proposal writing, reference-cross-referencing- Presentation of the results- software packages for data analysis-Proof reading- grant application.

Unit 3 (10 hrs)

Bioethics- Introduction. Intellectual Property Rights (IPR) – types and patents, patent application and licensing, TRIPS. Case studies on patents (Basmati, Turmeric and Neem).

Unit 4 (12hrs)

Regulations on field experiments and release of GMO's (Genetically Modified Organisms), labeling of GM (Genetically Modified) Foods. Impact of gene cloning. Legal, Social and Ethical Issues in Human Genetics-Issues related to Organ transplantation-Use of humans in research (Belmont Report)-Use of animals in research-Clinical trials I, II, III. Ethical and social consideration of stem cell research.

Unit 5 (10 hrs)

Biosafety – Cartagena Protocol, different levels of biosafety. Containment types, facilities for Genetic Engineering experiments, good laboratory practices (GLP). Basic Laboratory and Maximum Containment Laboratory.

BOOKS FOR STUDY

Raman, A. A. Handbook on Research Processes. Chennai : S. Viswanathan Pvt. Ltd., 2003.

Gurumani, N. Research Methodology for Biological Sciences. Chennai : MJP, 2006.

Gurumani, N. Scientific thesis writing and Paper Presentation, Chennai : MJP, 2010.

BOOKS FOR REFERENCE

Beauchamp, T.L., and Childress, J.F. Principles of Biomedical Ethics. 4th ed. Oxford University Press, 1994.

Pence, G.E. Classic Cases in Medical Ethics. 4th ed. McGraw-Hill Inc., 2004.

QUESTION PAPER PATTERN FOR RESEARCH METHODOLOGY AND BIOETHICS – 11BY/PE/RB14

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

GENETICS AND PLANT BREEDING

CODE :11BY/PI/GB24

CREDITS: 4

OBJECTIVES OF THE COURSE

- To introduce and understand the basics of genetics and plant breeding.
- To help the student understand the applications of plant breeding.

Unit 1

Basic genetics: Mendel's laws and experiments, genetic ratios, sex chromosomes and sex linked inheritance and chromosome mapping-crossing over, three point test cross, tetrad analysis-complementation analysis. Multiple alleles – Human blood group, rabbit fur color, *Drosophila* eye color. Quantitative inheritance – Nelson-Ehle and East experiments. Cytoplasmic inheritance.

Unit 2

Chromosomal aberrations – Structural and numerical. Polyploidy- Autopolyploid, allopolyploid-application. Types of mutants – Isolation and characterization of mutants, revertants and reversion, genetic analysis of mutants, genetic mapping. Gene interaction -Epistasis.

Unit 3

Microbial genetics : Bacterial transformation, genetic recombination – Rec mutants, RecA protein. Transduction – generalized and specialized. Conjugation. Genetic systems of yeast and *Neurospora*.

Unit 4

Molecular markers- morphological, biochemical and molecular markers, Application of DNA-markers in plant breeding. Plant Breeders rights.

Unit 5

MAS – Construction of genetic map using molecular markers RFLP maps, RAPD markers- mapping population – RIL, BSA and NIL, gene pyramiding, QTL mapping-major and minor gene – genotype x environment interaction – software employed in QTL mapping.

BOOKS FOR REFERENCE

Chahal, G.S. and S.S. Gosal. Principles and procedures of plant breeding. Narosa Publishing Company, 2006.

Griffths, A.J.F. Miller, J.F., Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. An Introduction to genetic analysis. 7th ed. New York : 2000.

Lewin, B. Genes VII. 7th ed. New York : Oxford University Press, 2000.

Maloy. Stanley R, Cronan, J.E and Friefelder, D. Microbial Genetics. 2nd ed. Narosa Publishing Company, 2006.

Russel, P.J. Genetics- A Molecular approach, 2006.

Strickberger, M.W. Genetics. Macmillan Publishing Company, 1986.

Tamarin, R.H. Principles of genetics. Tata-McGrawHill, 2002.

QUESTION PAPER PATTERN FOR GENETICS AND PLANT BREEDING – 11BY/IE/GB24

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

TISSUE ENGINEERING

CODE : 11BY/PI/TE24

CREDITS : 4

OBJECTIVES OF THE COURSE

- To introduce and understand the basic concepts of tissue engineering and its applications.
- To show the importance of regenerative medicine.

Unit 1

Basic biology to tissue engineering: Definition - The basis of growth and differentiation - morphogenesis and tissue engineering – Structure and organization of tissues – epithelial, connective – Basic developmental Biology – Transport property of tissues – Cell-Matrix and Cell-Cell Interactions.

Unit 2

In vitro control of tissue development-Growth factors - Tissue engineering bioreactors - Tissue assembly in microgravity - In vitro synthesis of Tissue and organs – Use of tissue engineering in therapeutics.

Unit 3

Organotypic and histotypic models of engineered tissues - Biomaterials in tissue engineering-Approaches to transplanting engineered cells and tissues – Engineering challenges in immunoisolation device development – Fetal tissue engineering.

Unit 4

Scaffolds and Tissue engineering - Bioartificial pancreas – Hepatassist liver support system – Hematopoietic system : Red Blood cell substitutes - Renal replacement devices – Musculoskeletal system : Structural tissue engineering.

Unit 5

Bone regeneration through cellular engineering – Brain implants – Periodontal applications - Regeneration of dentin – Skin : Wound healing and repair – Artificial womb.

BOOKS FOR REFERENCE

Lanza, Robert P, Langer Robert and Vacanti Joseph, Principles of Tissue Engineering. 2nd ed. Academic Press, 2000.

Palsson B., Hubbell J.A., Plonsey R. and Bronzino J.D. Tissue Engineering (Principles and applications in Engineering). C.R.C. Press, 2003.

Palsson, B.O. and Bhatia S.N. Tissue Engineering. C.R.C. Press, 2003.

Saltzman, M.W. Tissue Engineering – Principles for the Design of replacement of Organs and Tissue. Oxford University Press, 2004.

**QUESTION PAPER PATTERN FOR
TISSUE ENGINEERING – 11BY/IE/TE24**

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

ANIMAL AND PLANT BIOTECHNOLOGY

CODE: 11BY/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 cell culture
- To understand concepts of artificial and transgenic animal technology
- To evaluate the risks and benefits of animal biotechnology

Unit 1

(14 hrs)

Animal Tissue culture - historical background; Aseptic techniques, Culture vessels and substrates- defined media and supplements- serum free media- preparation and sterilization; Biology of cultured cell lines- Primary cell culture- Subculture and cell line- characteristics of cell and cell strains – Cytotoxicity – Application of Animal Cell culture in Biomedical research.

Unit 2

(16 hrs)

Direct Gene transfer methods into animal cells-Heat shock, PEG mediated microinjection, electroporation, lipofection; Viral transformation; IVF; Embryo transfer, Prenatal diagnosis, Germ Cell storage; Nuclear transfer with male germ cells- development of viable mammalian embryos. Cloning by species (e.g.; Fish, Cattle, Goat) Gene therapy; Biotechnology application of HIV diagnostics and therapy. Tissue typing, Transgenic animals and their potential applications– Mouse, Fish, poultry and other mammals; Gene Knockout and mice models for Human genetic disorders.

Unit 3

(13 hrs)

Plant tissue culture: principles and methodology. Protoplast technology and somatic embryogenesis. Somaclonal variation, synthetic seeds, production of secondary metabolites. Production of haploid plants. Cryopreservation and germplasm conservation. Applications of tissue culture in Agriculture and Horticulture. Hybrid seed production.

Unit 4

(10 hrs)

Selectable and scoreable markers, reporter genes and promoters used in plant vectors. Techniques for plant transformation – *Agrobacterium* – mediated gene transfer. Direct gene transfer methods. Chloroplast transformation.

Unit 5**(12 hrs)**

Strategies for engineering herbicide resistant crops and its impact on environment.
GM strategies for insect resistance – Environmental impact of Bt crops. Modification of plant nutritional content; Amino acids and Vitamins.
Transgenics for abiotic stress tolerance and cytoplasmic male sterility.
Molecular farming : Carbohydrates and proteins
Plants as bioreactors : Antibodies, foreign proteins in plants and edible vaccines.

BOOKS FOR STUDY

Chawla, H.S. Introduction to Plant Biotechnology. 3rd ed. Oxford and IBH Pub, 2009.

Freshney, Ian R. Culture of Animal Cells: A Manual of Basic Technique. 6th ed. Wiley-Liss, 2010.

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

Slater, A., Scott, N and Fowler, M. Plant biotechnology. Oxford Univ. Press, 2003.

BOOKS FOR REFERENCE

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

Hammond, J. McGarvey, P and Yusibov V. Plant Biotechnology. Springer Verlag, 2000.

Holland, Alan. and Johnson, Andrew. Animal Biotechnology and Ethics. Springer, 1998.

Houdebine, Louis-Marie. Transgenic Animals: Generation and Use. CRC Press, 1997.

Pörtner, Ralf., Animal Cell Biotechnology: Methods and Protocols. Humana Press, 2007.

Renaville R., Burny A. Biotechnology in Animal Husbandry. Springer, 2001.

Stacey, Glyn. and Davis, John. Medicines from Animal Cell Culture. John Wiley and Sons, 2007.

Twyman, Richard M. Gene Transfer to Animal Cells. Garland Science/BIOS Scientific Publishers, 2005.

Walker, John M., Rapley Ralph. Molecular Biology and Biotechnology. 4th ed. Royal Society of Chemistry, 2000.

**QUESTION PAPER PATTERN FOR
ANIMAL AND PLANT BIOTECHNOLOGY – 11BY/PC/AP24**

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

CLONING VECTORS AND GENETIC ENGINEERING – PRACTICALS

CODE :11BY/PC/P322

CREDITS: 2

L T P : 0 0 3

TOTAL TEACHING HOURS: 39

Cloning vectors and Genetic Engineering

1. **Restriction enzyme – Agarose gel electrophoresis.**
2. Cloning and ligation
3. **Isolation of plasmid DNA**
4. Bacterial transformation
5. GFP cloning
6. *In situ* PCR based site directed mutagenesis
7. *In vitro* transcription
8. Isolation of bacteriophages

**QUESTION PAPER PATTERN FOR
CLONING VECTORS AND GENETIC ENGINEERING PRACTICALS
– 11BY/PC/P322**

EXAM HOURS : 6

CLONING VECTORS AND GENETIC ENGINEERING PRACTICALS (50 MARKS)

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 2011 - 2012)

ANIMAL AND PLANT BIOTECHNOLOGY – PRACTICALS

CODE :11BY/PC/P423

CREDITS: 3

L T P: 0 0 5

TOTAL TEACHING HOURS: 65

Animal Biotechnology

1. Preparation of culture media
2. Filter sterilization
3. Preparation of single cell suspension from spleen and cell counting using Trypan blue
 - a) Warm trypsinization
 - b) Cold trypsinization
 - c) Mechanical disaggregation
4. Cell viability and cell toxicity – MTT assay
5. Isolation of DNA from spleen
6. Isolation of DNA from blood
7. Isolation and culture of splenocytes
8. Primary explant culture (Demonstration)
9. Isolation and culture of cells from chick embryo (Demonstration)

Plant Biotechnology

1. Basic techniques in plant tissue culture
 - Preparation of medium, surface sterilization
 - Callus induction, organogenesis
 - Embryo culture
2. Protoplast isolation by enzymatic method and Protoplast fusion
3. *Agrobacterium* culture, reporter gene (GUS) assay
4. Production of synthetic seeds
5. Isolation of plant genomic DNA.
6. Detection of antifungal secondary metabolites produced by plant tissue

**QUESTION PAPER PATTERN FOR
ANIMAL AND PLANT BIOTECHNOLOGY PRACTICALS
– 11BY/PC/P423**

EXAM HOURS : 6

ANIMAL AND PLANT BIOTECHNOLOGY PRACTICALS (50 MARKS)

Animal Biotechnology

1. Major experiment to be conducted (10 Marks)
5 Marks for procedure and 5 Marks for conduct and result.
2. Minor experiment (6 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 (7 Marks)
Marks allotted for principle, procedure, conduct and result.
5. 4 Spotters each carrying 3 marks. (12 Marks)
6. Viva voce (5 Marks)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 – 2012)

CLONING VECTORS AND GENETIC ENGINEERING

CODE: 11BY/PC/VG24

CREDITS: 4

L T P: 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To give an insight into the principles and applications of molecular biology
- To provide conceptual and technical knowledge for understanding the applications of molecular biotechnology

Unit 1

(13 hrs)

Introduction to Genetic Engineering: Enzymes used in Gene cloning; restriction enzymes – RM system, types and nomenclature; Linkers; Adaptors; Homopolymer tailing; Techniques used in Gene Cloning: DNA isolation, Gel Electrophoresis, Blotting and Hybridization techniques- Northern, Southern, Western, South Western and North Western; Probe Construction – Radioactive and Non- radioactive labeling methods.

Unit 2

(12 hrs)

Cloning Vectors- Plasmids-pBR322, pUC, pGEM3Z, etc; Bacteriophage vectors- lambda and M13 phage; Cosmids, Fosmids, Phagemids; Yeast Cloning Vectors; Viral based vectors; Drosophila genetic element based vectors.

Unit 3

(14 hrs)

Specialized vectors and its applications- Expression vectors; Expression of foreign DNA in Bacteria- fusion protein and in Pichia expression system; Shuttle Vectors; YACs, BACs, PACs, MACs and HACs. Shotgun cloning; Genomic library and cDNA library construction; Marker genes; Recombinant selection and screening. Cloning in yeast : Yeast two and three hybrid system.

Unit 4

(13 hrs)

DNA Sequencing and Polymerase chain reaction- its principle, types and applications; Site Directed Mutagenesis; Molecular markers and its applications: RFLP, RAPD, AFLP, VNTR, STS, SSCP, SSR, CAPS, SCAR. Chromosome walking.

Unit 5

(13 hrs)

Principle and applications - Primer extension, S1 mapping, Rnase protection assay; Antisense RNA technology; RNAi, DNA foot printing; Gene tagging; SAGE and microarrays.

Gene cloning and DNA analysis in medicine (Insulin, Human Growth Hormone, factor VIII, Vaccines).

BOOKS FOR STUDY

Brown, Terence, A., Gene Cloning and DNA Analysis: An Introduction. 6th ed. Blackwell Publishers, 2010.

Glick Bernard R. and Pasternak Jack J. Molecular Biotechnology: Principles and Applications of Recombinant DNA. 4th Ed. ASM Press, 2009.

Primrose, S. B. et.al. Principles of Gene Manipulation: An Introduction to Genetic Engineering. 8th Ed., Blackwell Publishers 2009.

BOOKS FOR REFERENCE

Dale, Jeremy W., Schantz Malcolm von. From Genes to Genomes: Concepts and Applications of DNA Technology. 2nd ed. Wiley-Interscience, 2007.

Innis, Michael A. Gelfand, David H. and Sninsky John J. PCR Strategies. (Edition) Academic Press, 1995.

Sambrook, Joseph., Russell, David W. Molecular Cloning: A Laboratory Manual. 3rd ed. CSHL Press, 2001.

Watson James D., et.al. Recombinant DNA. 3rd ed. Palgrave Macmillan, 2007.

**QUESTION PAPER PATTERN FOR
CLONING VECTORS AND GENETIC ENGINEERING – 11BY/PC/VG24**

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

**Post Elective Course offered by the Department of Biotechnology for
M.A. / M.Sc./ M.Com. Degree Programmes**

SYLLABUS

(Effective from the academic year 2011 - 2012)

APPLICATIONS OF BIOTECHNOLOGY

CODE :11BY/PE/AB24

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE

- To provide basic information on the importance of biotechnology in the field of tissue culture and its importance in health care, energy and environment.
- To help the student see how Biotechnology can be used in everyday life.

Unit 1 (10 hrs)

Tissue culture: Overview. Synthetic seeds. Applications in Agriculture (herbal products), Horticulture (micropropagation), Floriculture (ornamental plants) and Pharmaceutical (medical compounds) industry.

Unit 2 (11 hrs)

Introduction to cloning. Production of Transgenic animals – Mouse, Fish, poultry and other mammals. Cloning in animals : micromanipulation and microinjection. Transgenic plants for crop improvement : Herbicide and Insect resistance. Plantibodies and Edible vaccines.

Unit 3 (11 hrs)

Bioactive compounds, bioproducts. Biofertilizers and Vermicomposting. Importance of VAM fungi. Mushroom cultivation. Food value of edible mushrooms. Biofuels: Ethanol production and Biogas. Biodiesel. Petroplants and algal hydrocarbons.

Unit 4 (10 hrs)

Fundamentals of Fermentation technology: Scale up and down stream processing. Applications of enzymes in the Food Industry - Cheese, Bread, Wine, Beer and Meat. Enzyme and antibiotic production – Cellulase and Penicillin.

Unit 5 (10 hrs)

Production of Vaccines. Molecular diagnostics (DNA fingerprinting, biosensors, screening tests for genetic diseases). Genetic counseling. Overview of drug discovery. Applications of nanostructures.

BOOKS FOR REFERENCE

Glick, B.R., and Pasternak, J.J. Molecular Biotechnology – Principles and Applications of Recombinant DNA. New Delhi : Panima Publishing Corporation, 1994.

Purohit, S.S and Mathur S.K. Biotechnology – Fundamentals and Applications. 3rd ed. India : Agrobios, 2000.

Purohit, S.S. Agricultural Biotechnology. India : Agro Botanica, 2000.

Prescott and Dunn, Industrial Microbiology. USA : The AVI Publishing Co., Inc., 1987.

Watson James D., et.al. Recombinant DNA. 2nd ed. USA : Scientific American Books, 1992.

QUESTION PAPER PATTERN FOR APPLICATIONS OF BIOTECHNOLOGY – 11BY/PE/AB24

SECTION A (20 MARKS)

Objective type of questions

20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.

All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.

Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

BIOPHYSICS AND BIostatISTICS

CODE :11BY/PE/BB24

CREDITS : 4

L T P : 4 0 0

TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE

- To provide the students a firm background for understanding the physical principles and theories underlying biological processes.
- To give an introduction to the basic biophysical processes governing cellular function.
- To disseminate information on the collection, analysis and interpretation of biological data.

Unit 1 (12 Hrs)

Introduction to Molecular Biophysics

Structure, conformation and Structural polymorphism of biomolecules-proteins carbohydrates and nucleic acids- Methods of structural elucidation of biological macromolecules- ^{13}C and ^1H NMR- x-ray diffraction- spectroscopy-CD- ORD-MALDI-TOF

Bioenergetic Principles: Concept of energy- Thermodynamic Principles –Free energy- Enthalpy-Entropy-Role of High Energy Phosphates- Energy transduction.

Unit 2 (10 Hrs)

Protein Biology

Protein sequencing-Protein-protein and protein-ligand interactions-Protein folding- Glycoprotein and Lipoprotein

Membrane Biophysics: Structure and dynamics of biological membranes, signal transduction across membranes, Donnan Equilibrium permeability of membrane- Diffusion, Facilitated transport, active transport, Nernst Equation, Membrane potential- Biomechanics and Neurobiophysics. Macromolecular Interactions: Supramolecules.

Unit 3 (10 Hrs)

Statistics: Applications in Biology-collection-classification –tabulation of statistical Data-Diagrammatic representation-Central tendency – Measures of dispersion - Correlation and Regression Analysis-Concepts and simple problems only.

Unit 4 (10 Hrs)

Probability: Addition and Multiplication theorem of probability - Probability distributions- Binomial, Poisson and Normal distribution – Sampling techniques –Basis of statistical Inference-Sampling distribution-Standard Error- Hypothesis testing –Null Hypothesis-Type I and Type II errors-Concepts and simple problems only.

Unit 5**(10 Hrs)**

Tests of significance for large and small samples based on Normal, t, F distributions with regard to Mean, Variance, proportions and correlation coefficient-Chi-square –test of goodness of fit-Contingency table –Chi square test for independence of two attributes-ANOVA-Concepts and simple problems only.

BOOKS FOR REFERENCE

Branden and Tooze. Introduction to protein Structure. New York : Garland Publishing, 1999.

Creighton, Thomas E. Protein: Structure and Molecular Properties. 2nd ed. WH Freeman and Co., 1996.

Cantor and Schimmel. Biophysical Chemistry. WH Freeman, 1980.

Elhance, D.N. Fundamentals of Statistics. Allahabad, India : Kitab Mahal, 1972.

Gurumani.N. An Introduction to Biostatistics. Chennai : MJP, 2004.

Misra B.N and M.K. Misra. Introductory Practical Biostatistics. India : Naya prakash Publications, 1992.

Negi, .S. Biostatistics. India : AITBS Publishers, 2002.

Pattabhi, V and Gautham, N. Biophysics. Alpha Science International, 2002.

Sokal P.R. Biometry: The Principles and Practice of Statistics in Biological Research. San Francisco, 1969.

Sundar, Rao. An introduction to Biostatistics. Vellore : Prestographik, 1987.

**QUESTION PAPER PATTERN FOR
BIOPHYSICS AND BIostatISTICS – 11BY/PE/BB24**

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

SOFT SKILLS

CODE : 11BY/PK/SS22

CREDITS : 2

L T P : 2 0 0

TOTAL TEACHING HOURS : 26

OBJECTIVES OF THE COURSE

- To empower and create opportunities for self development
- To instill confidence and face challenges.

Unit 1 (6 hrs)

Behavioural Traits

- 1.1 Self Awareness
- 1.2 Communication Skills – Verbal and Non Verbal
- 1.3 Leadership Qualities
- 1.4 Etiquette and mannerisms
- 1.5 Experiential Learning – Based on activities

Unit 2 (5 hrs)

Team Work

- 2.1 Interpersonal Skills
- 2.2 People Management
- 2.3 Creative Thinking
- 2.4 Critical Thinking
- 2.5 Experiential Learning – Based on activities

Unit 3 (5 hrs)

Time Management

- 3.1 Importance of time management
- 3.2 Planning and Prioritizing
- 3.3 Organizing skills
- 3.4 Action Plan
- 3.5 Experiential Learning – Based on activities

Unit 4 (5 hrs)

Conflict Resolution

- 4.1 Reasons for conflict
- 4.2 Consequences of conflict
- 4.3 Managing emotions
- 4.4 Methods of resolving conflicts
- 4.5 Experiential Learning – Based on activities

Unit 5

(5 hrs)

Career Mapping

5.1 Goal setting

5.2 Career Planning

5.3 Resume writing

5.4 Handling Interviews

5.5 Experiential Learning – Based on activities

BOOKS FOR REFERENCE

Khera, Shiv, (2002), **You Can Win**, Macmillan India Ltd., Delhi.

Mishra, Rajiv K., (2004), **Personality Development : Transform Yourself**, Rupa and Co., New Delhi.

Newstrom, John W. and Scannell, Edward E., (1980), **Games Trainers Play: Experiential Learning**, Tata McGraw Hill, New Delhi.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

BIOPROCESS AND ENZYME TECHNOLOGY

CODE :11BY/PC/BE34

CREDITS : 4

L T P : 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To provide an in depth knowledge about enzymes which have a bearing on industrial processes
- To have an additional dimension to the study of production of important industrial bio-products
- To throw light on the applications of enzymes in various fields.

- Unit 1 (12 hrs)**
Fundamentals of bioprocess technology: Media formulation – inoculum development – metabolic engineering – regulation – Optimization of the process - Types of bioreactors – Batch- Fed Batch – Continuous Stirred tank- Plug flow reactor- Fluidized bed- packed bed reactor. Solid state fermentation. Aerobic and anaerobic systems. Enzyme kinetics: Kinetics and mechanisms of enzyme catalyzed reaction.
- Unit 2 (10 hrs)**
Kinetics: Monod growth Kinetics- Batch Mixed growth- Continuous and fed-batch Kinetics of Substrate utilization and product formation- Thermal Death kinetics. Rheological properties. Computer applications in fermentation technology. Steady state kinetics - Inhibition and multisubstrate enzyme kinetics - Pre steady state and relaxation kinetics - King and Altman procedure.
- Unit 3 (13 hrs)**
Introduction to mass energy and momentum transfer: Gas – liquid mass transfer – Oxygen transfer rate and coefficient - Immobilized enzyme systems: Merits and demerits- Different types of carriers- Method of preparation- Characterization and properties of immobilized biocatalysts – Methods and Applications of immobilized enzymes.
- Unit 4 (16 hrs)**
Downstream processing: Techniques used in bioproduct analysis- cell disruption Centrifugation- Filtration and Sedimentation- solvent extraction- Aqueous two-phase separation precipitation- precipitation- product isolation and Purification techniques- chromatography (ion-exchange, affinity and molecular sieving) Membrane separation- Microfiltration- Ultrafiltration - Reverse osmosis

Unit 5**(14 hrs)**

Applications: Commercial applications in food- pharmaceutical and other industries- Enzyme for diagnostic applications- Biosensors- use of enzymes in analysis – types of sensing – Use of unnatural substrates- Artificial enzymes.

BOOKS FOR STUDY

Asenjo, Juan A. Bioreactor Systems Design. CRC, 1995.

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

Doran, Pauline M. Bioprocess engineering principles. London Academic Press, 1995.

Palmer, Trevor. Enzymes : Biochemistry, Biotechnology and Clinical Chemistry. Horwood Publishing , 2004.

Stanbury and Whitaker, Principles of Fermentation Technology. Pergamon Press, 1984.

BOOKS FOR REFERENCE

Butterworth, Technological Applications of Biocatalysts. BIOTOL series,1995.

Coulson. Chemical Engineering. Pergamon Press, 1984.

Schuler, Michael L. Bioprocess Engineering, Prentice Hall, 1992.

Straathof, A.J. Applied Biocatalysis. New York : Taylor and Francis Inc.,2000.

Wanng, D.I.C. and Cooney, C.L., Fermentation and Enzyme Technology. John Wiley and Sons, 1994.

Wiseman, A. and Ellis Harwood. Handbook of Enzyme Biotechnology.2000.

**QUESTION PAPER PATTERN FOR
BIOPROCESS AND ENZYME TECHNOLOGY– 11BY/PC/BE34**

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

IMMUNOTECHNOLOGY

CODE :11BY/PC/IM34

CREDITS: 4

L T P: 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To enable student to have a clear understanding of immunology and its widening horizons.
- To have an additional dimension to the study of immunology and its utility to human welfare.

Unit 1 (13 hrs)

Basic concepts in Immunology: Self/non self recognition - Innate and adaptive immunity -Innate immune system: Organization- functional features and immunological significance Adaptive immune system: Organization - Cells, organs and molecules. Lymphoid organs-Anatomy and functions. Antigens- classification and characteristic features.

Unit 2 (13 hrs)

Immunoglobulin - primary structure-classes-biological activities. Purification of Antibodies: Precipitation and column chromatographic techniques. Quantitation of immunoglobulin: RID, DID and Nephelometry. Antigen-Antibody reactions. Monoclonal Antibodies: Hybridoma technology-Diagnostic and therapeutic applications of monoclonal antibodies. Catalytic antibodies.

Unit 3 (14 hrs)

B Lymphocyte Activation and Antibody production-T cell receptors and Major Histocompatibility Complex molecules : Antigen presenting cells-Antigen processing and presentation-Co-Stimulatory molecules T cell receptor-T cell maturation and activation. Complement system. Mediators of Immune System and immunoregulation: Cytokines- Properties-Receptors- Role of Cytokines in immune response. Immune system in health and diseases: Immune response to viral, bacterial, fungal and parasitic infection; Hypersensitivity reactions

Unit 4 (14 hrs)

Cell sorter, Isolation and characterization of T cell subsets and B cells-Macrophages: Macrophage culture-Assay for Macrophage activation-Isolation of dendritic cells. Mitogen and Antigen induced lymphoproliferation Assay-Cell mediated lympholysis, Mixed lymphocyte reaction-Assessment of DTH and HLA Typing. Autoimmune disorders.

Unit 5**(11 hrs)**

Basic concepts of active and passive immunization. Vaccines: Principles and types-Live Attenuated-Subunit-Conjugate-Toxins and Toxoids-DNA Vaccines- RNA vaccines-mode of delivery, factors affecting immunogenicity of vaccines, modulation of immune responses, self replicating genetic vaccines.

BOOKS FOR STUDY

Goldsby, R, A., Kindt, T.J. and Osborne, B.A. Kuby Immunology, Freeman and Company, 2000.

Roitt, I. Immunology, Black well Scientific Publications, 1996.

BOOKS FOR REFERENCE

Current Protocols in Immunology 3 Volumes, Wiley Publications, 1994.

Gizelli, E and C. R. Lowe (eds.). Biomolecular Sensors. Tailor and Francis Inc., 2002.

Parslow, T.G., Sites, D, P and Terr., A.T. Medical Immunology. 10th ed. McGraw-Hill publishing, 2001.

Ramasamy, P and Hanna. Immunity and Inflammation. R.E.B, University of Madras Publications, Pearl Press Ltd., 2002.

Wier, D.M. Immunological techniques 3 Volumes .Black well scientific Publication, 1992.

Zola, H. Monoclonal antibodies .Bios Scientific Publishers Limited, 2000.

**QUESTION PAPER PATTERN FOR
IMMUNOTECHNOLOGY – 11BY/PC/IM34**

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

BIOPROCESS AND ENZYME TECHNOLOGY - PRACTICALS

CODE : 11BY/PC/P533

CREDITS : 3

L T P : 0 0 5

TOTAL HOURS : 65

Bioprocess and Enzyme Technology

1. Determination of thermal death point of an organism.
2. Production of ethanol using *Saccharomyces cerevisiae*.
3. Isolation of Cellulase from *Aspergillus niger*.
4. Microbial production of citric acid from *Aspergillus niger*.
5. Cell immobilization using alginate.
6. Estimation of a clinically significant enzyme –SGOT.
7. Extraction of amylase and protease from *Aspergillus niger*.
8. Effect of pH, temperature and substrate concentration on amylase activity.
9. Sauerkraut production.

**QUESTION PAPER PATTERN FOR
BIOPROCESS AND ENZYME TECHNOLOGY PRACTICALS – 11BY/PC/P533**

BIOPROCESS TECHNOLOGY AND ENZYME TECHNOLOGY (50 MARKS)

1. Major experiment to be conducted (15 Marks)
10 Marks for procedure and 5 Marks for conduct and result.
2. Minor experiment (10 Marks)
Marks allotted for principle and procedure.
3. 5 Spotters each carrying 4 marks. (20 Marks)
4. Viva voce (5 Marks)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

IMMUNOTECHNOLOGY - PRACTICALS

CODE : 11BY/PC/P633

CREDITS: 3

L T P : 0 0 5

TOTAL HOURS : 65

Immunotechnology

1. Differential counting
2. Separation of T and B cells
3. Immunodiffusion-Radial, ODD
4. Immunoelectrophoresis-IEP, cIEP Rocket electrophoresis
5. Immunodiagnosics (using commercial kits)- Widal test
6. Blood grouping and Rh typing
7. Latex agglutination test
8. Western Blotting- (Demonstration)
9. Purification of IgG using column – (Demonstration)
- 10 ELISA (Demonstration)

**QUESTION PAPER PATTERN FOR
IMMUNOTECHNOLOGY PRACTICALS – 11BY/PC/P633**

IMMUNOTECHNOLOGY PRACTICALS (50 MARKS)

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

**Post Elective Course offered by the Department of Biotechnology for
M.A. / M.Sc./ M.Com. Degree Programmes**

SYLLABUS

(Effective from the academic year 2011 - 2012)

ENVIRONMENTAL BIOTECHNOLOGY

CODE: 11BY/PE/EB34

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES OF THE COURSE

- To provide a fundamental knowledge of the environment
- To create an awareness about environmental issues
- To educate the student about management of environmental issues

Unit 1 (10 hrs)

Introduction: Environmental pollution- Ozone hole- Acid rain- Climate change- Green house effect. Effects of radioactivity on the Environment. Bio-diversity. Environmental management and sustainable development. Environment impact assessment.

Unit 2 (10 hrs)

Microorganisms in relation to energy, Bioenergy from wastes. Biofuel- Production of non conventional fuels-Methane, Hydrogen, Alcohols and Algal hydrocarbons. Potable water - microbiological quality and analysis.

Unit 3 (11 hrs)

Waste Management - Solid waste-hazardous, non-hazardous, medical waste. Restoration of degraded lands - Paper and Distillery. Composting, vermi-composting - Wastewater treatment - Biological process for domestic and industrial treatment. Activated sludge, Biological filters. Denitrification: Physiology of denitrifying bacteria-Tertiary denitrification-One-sludge denitrification.

Unit 4 (10 hrs)

Toxicity- Acute , subacute, chronic carcinogens, mutagens. Biomagnification- Biomonitoring of toxic materials. Bioconversion. Biomonitoring of environmental pollution- Bioindicators- Biosensors.

Unit 5 (11 hrs)

Bioremediation-In situ and ex-situ- Phytoremediation role of seaweeds- Bioaugmentation - Degradation of xenobiotics in environment - Factors causing molecular recalcitrance-Energy metabolism versus cometabolism-Minimum substrate

concentration (Smin). Degradative plasmids- GEMs and environmental safety-,
Biomining-Metal leaching, Extraction of metals –Copper and Gold – Effects of
biomining on the Environment.

BOOKS FOR STUDY

Mohapatra P.K. Textbook of Environmental Biotechnology. New Delhi : I.K.
International Publishing House Pvt.Ltd., 2007.

Rana,S.V.S. Environmental Biotechnology. New Delhi : Rastogi Publishers, 2010.

Subramanian, M.A. Toxicology – Principles and Methods. MJP Publishers, Chennai
2004.

Thankur, I.S. Environmental biotechnology – Basic concepts and applications. IK
International Pvt.Ltd., New Delhi, 2006

BOOKS FOR REFERENCE

Agaothos,S.N. Biotechnology for the Environment- Soil Remediation. Springer
publishers, 2002.

Bhatia S.C. Handbook of Environmental Biotechnology, Vols. I to III. New Delhi :
Atlantic Publishers and Distributors Ltd., 2008.

Gareth, E.M. Environmental Biotechnology : Theory and applications. John Wiley and
Sons, 2003.

Kaushik, Anubha and Kaushik, C.P. Perspectives in Environmental studies. New Delhi :
New Age International Publishers, 2007.

Maier,R.M., Pepper, I.L.and Gerba, C.P. Environmental Microbiology. Academic Press,
2006.

Moo- Young, M. Comprehensive Biotechnology, Vol 1-4. Elsevier India Pvt.Ltd, 2004.

Rajendran, P. and Gunasekaran, P. Microbial remediation. Chennai : MJP Publishers,
2006.

Ritmann,E.B.and Perry,L. Environmental Biotechnology: Principles and
Applications. New York : McGraw-Hill, 2001.

**QUESTION PAPER PATTERN FOR
ENVIRONMENTAL BIOTECHNOLOGY – 11BY/PE/EB34**

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

SUMMER INTERNSHIP

CODE : 11BY/PN/SI32

CREDITS: 2

OBJECTIVES OF THE COURSE

- **To give the students an opportunity to gain experiential learning by observing techniques from any field in Biotechnology.**
- **The students have to observe or get hands – on training in any field in Biotechnology.**
- **Enhance their skills in application – oriented courses.**

The Summer Internship program is for a minimum period of three weeks. The students are expected to have regular attendance in their respective Institute and submit an assignment to the Department reporting the experiments they have observed/conducted. The students are expected to give a seminar presentation in the third semester of the work they have observed/conducted.

Guidelines for Evaluation

The maximum marks for the Summer Internship is 50 and is divided into the following :

- | | |
|-------------------------|------------|
| a) Assignment | (20 Marks) |
| b) Seminar presentation | (15 Marks) |
| c) Attendance | (15 Marks) |

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

DISSERTATION

CODE :BY/PC/DI48

CREDITS : 8

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 2011 - 2012)

INSTRUMENTATION

CODE :11BY/PC/IN44

CREDITS : 4

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To describe and express the role and importance of research on basic and applied sciences
- To propose a research proposal in the field of Biotechnology

Unit 1 (10 hrs)

Acid, base, buffers: Definition and theories proposed for acids and bases, titration curves of amino acids, Henderson Hasselbach equation and its application. Determination of pH by hydrogen electrode and glass electrode.

Unit 2 (10 hrs)

Colorimetry: Principle, Beer and Lamberts, description of the instrument and techniques. Spectrophotometry: Principle and description of the instrument. Separation techniques: Centrifugation - Basic principles of sedimentation, types of centrifuges and rotors. Preparative ultracentrifugation - differential and density gradient.

Unit 3 (15 hrs)

Radiation biology: Stable and radio-isotopes. Measurement of radioactivity in biological samples: Gas ionization (GM counter), Scintillation counter, autoradiography and dosimeter. Radiation units; Safety aspects in handling radioactive isotope; Application of radioactive isotopes in biological studies.

Unit 4 (15 hrs)

Chromatography: General principles and definitions. Methods based on polarity - Partition chromatography, adsorption chromatography, gas liquid chromatography, and reverse phase liquid chromatography. Methods based on partition - Gel filtration and Affinity chromatography. HPLC and FPLC. Ion-exchange chromatography.

Unit 5 (15 hrs)

Electrophoresis - basic principles, PAGE - Native-PAGE, SDS-PAGE, Isoelectric focusing and 2 Dimensional gels. Capillary electrophoresis. Principle and application of Agarose gel electrophoresis, denaturing agarose gel electrophoresis, Pulse-field gel electrophoresis, Mobility shift electrophoresis.

Microscopy : light, phase contrast, Transmission and Scanning electron microscopy and confocal microscopy.

BOOKS FOR REFERENCE

Bozzola, John J. and Russel Lonnie D. Electron Microscopy – Principles and Techniques for Biologist. USA : Jones and Bartlett Publishers, 1992.

Herrit, Willard, Dean and Settle. Instrumental Methods of Analysis. CBS Publishers and Distributors, 1986.

Morris and Morris. Separation methods in Biochemistry. London : Pitman, 1960.

Sambrook, J and Russell, D.W. Molecular Cloning – A Laboratory Manual Vol 1-3. New York : Cold Spring Harbor Laboratory Press, 2001.

Plummer, D.T. An Introduction to Practical Biochemistry. New Delhi : Tata McGraw – Hill Publishing Co., 1985.

Wilson, K and Walker, J. Practical Biochemistry – Principles and Techniques. Cambridge University Press, 2002.

**QUESTION PAPER PATTERN FOR
INSTRUMENTATION – 11BY/PC/IN44**

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

STEM CELL TECHNOLOGY

CODE: 11BY/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 in stem cell biology.
- To study how stem cells are applied in the field of regenerative medicine.

Unit 1

(15 hrs)

Principles of Developmental Biology: Cell Cycle- The Stages of Animal Development- Cell-cell communication in development. Early embryonic development- Fertilization- The early embryonic development of mammals.

Unit 2

(12 hrs)

Later embryonic development- central nervous system – neural crest and the epidermis, mesoderm and endoderm-Sex determination-Metamorphosis, regeneration, and aging. In vitro fertilization- Microinjection. SCNT.

Unit 3

(18 hrs)

History about the development of Stem Cell Research - Properties of stem cells - Factors and mechanisms involved in Stem Cell Renewal and Pluripotency- Types of Stem Cells – Pluripotent stem cells from germ cells; amniotic fluid and placenta, Hematopoietic stem and progenitor cells from cord blood and bone marrow – Problem of differentiation. Basic biology of Stem Cell- its Cell cycle control, Regulation of Hypoxic Genes in Differentiating Stem Cells - Regulation of Gap Junction Protein Genes in Differentiating ES Cells.

Unit 4

(10 hrs)

Applications of Neural Stem Cells: for Brain and Spinal Cord repair. Use of Myogenic Stem Cells in regenerative medicine. Applications of Umbilical cord Stem Cell Therapy. Stem cells and cancer. Embryonic stem cells and gene therapy.

Unit 5

(10 hrs)

Use of Embryonic Stem Cells to Treat Heart Disease, Insulin-Producing Cells Derived from Embryonic Stem Cells: A Potential Treatment for Diabetes- Stem Cells for Burns and Skin Ulcers.

BOOKS FOR STUDY

Atala, Anthony Principles of Regenerative Medicine. USA : Academic Press, 2008.

Davis Cell therapy, stem cells and brain repair. Humana press, 2009.

Lanza, Robert, and Klimankaya, Irina. Essential Stem cell Methods. USA : Academic Press, 2009.

BOOKS FOR REFERENCE

Belval, Brian. Critical Perspectives on Stem Cell Research. USA : The Rosen Publishing Group, 2006.

Fong, Calvin A. Stem Cell Research Developments. USA : Nova Publishers, 2007.

Freshney, Ian R., Stacey, Glyn N and Auerbach, Jonathan M. , Culture of human stem cells. Wiley-Liss, 2007.

Gilbert, Scott F, Singer, Susan R., Tyler, Mary S. and Ronald N. Kozlowski. Developmental Biology. 8th ed. Sinauer Associates Publisher, 2006.

Greer, Erik V. Neural Stem Cell Research. USA : Nova Publishers, 2006.

Notarianni, Elena and Evansm Martin J. Embryonic Stem Cells. New York : Oxford University Press, 2006.

**QUESTION PAPER PATTERN FOR
STEM CELL TECHNOLOGY – 11BY/PC/ST44**

SECTION A (20 MARKS)

Objective type of questions
20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.
All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.
Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2011 - 2012)

GENOMICS AND PROTEOMICS

CODE :11BY/PE/GP44

CREDITS : 4

L T P : 4 0 0

TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE

- To introduce and understand the basics of genomics, proteomics and its applications.
- To help the student understand the fundamentals of bioinformatics.

- Unit 1 (10 hrs)**
Introduction to bioinformatics – Hidden Markov models.
Genomic and cDNA sequences from different biological output sources, gene prediction rules and software : NCBI. *E. coli*, yeast, *Drosophila* and *Arabidopsis* genome projects.
- Unit 2 (11 hrs)**
Genome organization. Analysis of genomic and proteomic information with respect to biological systems –Genome Applications- Pathway regulatory networks, annotation of sequence. Gene Expression, Repetitive elements-Genome wide repeats-Promoter elements-GC% in genomes.
- Unit 3 (11 hrs)**
Sequence Analysis (Nucleic acids & Proteins) – Prediction of splice sites, introns and exons -codon bias - database and analysis. Sequence Alignment methods- Proteomics, Proteins Analysis-Structural Comparisons- 2D gel, Mass spec, Protein and Antibody arrays.
- Unit 4 (10 hrs)**
Sequence databases for nucleotides – Primary nucleotides : GenBank, EMBL, DDBJ. Protein Databases-Comparison of Protein Sequences and Database searching-SWISS – PROT - Methods for Protein Structure Prediction-Conserved Patterns in Protein sequences and structures-
Comparison of Protein 3D structures-Predicting Functions based on DNA and Protein Sequences, protein interaction maps.
- Unit 5 (10 hrs)**
Human genome project-Phylogenetic analysis-Computational approaches in comparative genomics- an aid to gene mapping – in the study of human disease genes. Homology-evolution, homology analysis –gene function.

BOOKS FOR REFERENCE

Brown, T.A. Genomes. 1st ed. New York : John Wiley and Sons Ltd, 1999.

Grandi, G. Genomics, Proteomics and Vaccines, John Wiley and Sons, 2004.

Maleolm and Goodship, J. Genotype to phenotype. 2nd ed. Bios Scientific Publishers Ltd., 2001.

Primrose, B. Principle of genome analysis. 2nd ed. Blackwell Science, 1998.

QUESTION PAPER PATTERN FOR GENOMICS AND PROTEOMICS– 11BY/PE/GP44

SECTION A (20 MARKS)

Objective type of questions

20 Questions with each question carrying 1 mark

Questions to be analytical and definitions only.

All Units to be covered under this section.

SECTION B (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 600 words.

Students will answer 4 questions from a set of 6 questions. Each question carries 10 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section.

Questions may include 2-3 short notes not exceeding 200 words each.

SECTION C (40 MARKS)

Questions should elicit answers that are comprehensive not exceeding 1500 words. Essay type of answers which are descriptive.

Students will answer 2 questions from a set of 4 questions or from 2 questions with internal choice (Example 1 a OR 1 b). Each question carries 20 marks. All questions carry equal marks. Marks should be allotted for diagrams wherever applicable.

Questions to be analytical and all units to be covered under this section. Only 1 question from a particular unit is allowed.

Questions may include 1 set of short notes (a,b,c) not exceeding 500 words each.