STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 86

M.Sc. DEGREE : BIOTECHNOLOGY

COURSES OF STUDY

(Effective from the academic year 2009 - 2010)

CREDIT BASED 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									
BY/PC/BC 14	Biochemistry	4	4	1	0	3	50	50	100
BY/PC/MI 14	Microbiology	4	4	1	0	3	50	50	100
BY/PC/CM 14	Cell and Molecular Biology	4	4	1	0	3	50	50	100
BY/PC/P1 18	Biochemistry, Microbiology and Cell and Molecular Biology - Practicals	8	0	0	10*	12	50	50	100
BY/PE/EB13	Environmental Biotechnology	3	3	1	0	3	50	50	100
BY/PE/AB13	Applications of Biotechnology	3	3	1	0	3	50	50	100
	Semester - II								
BY/PC/VG 24	Cloning Vectors and Genetic Engineering	4	4	1	0	3	50	50	100
BY/PC/AP 24	Animal and Plant Biotechnology	4	4	1	0	3	50	50	100
BY/PC/P2 28	Cloning Vectors and Genetic Engineering, Animal and Plant Biotechnology - Practicals	8	0	0	10*	12	50	50	100
BY/PE/ST 23	Stem Cell Technology	3	3	1	0	3	50	50	100
BY/PE/GP 23	Genomics and Proteomics	3	3	1	0	3	50	50	100
	Semester - III								
BY/PC/BE 34	Bioprocess and Enzyme Technology	4	4	1	0	3	50	50	100
BY/PC/IM 34	Immunotechnology	4	4	1	0	3	50	50	100
BY/PC/P3 38	Bioprocess Technology, Enzyme Technology and Immunotechnology - Practicals	8	0	0	10*	12	50	50	100
BY/PE/BB 33	Biophysics and Biostatistics	3	3	1	0	3	50	50	100
BY/PN/SI32	Summer Internship	2	0	0	2	-	-	-	100
Semester - IV									
BY/PC/IN 44	Instrumentation	4	4	1	0	3	50	50	100
BY/PC/DI 48	Dissertation	8	-	-	36	-	DI - 150		200
BY/PE/MD 43	Medical Biotechnology	3	3	1	0	3	50	50	100
BY/PE/RB 43	Research Methodology and Bioethics	3	3	1	0	3	50	50	100

* Practical exams will be conducted in two sessions of 6 hours each

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M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2009 - 2010)

BIOCHEMISTRY

CODE :BY/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 **(5 hrs)**

Introduction to Biochemistry.
The importance of biochemistry in understanding the processes of the body.
Components of the cell and cell fractionation – markers for each organelle.
Relationship between cell biology and biochemistry.

Unit 2 **(15 hrs)**

Chemical and Biological Foundation of Biochemistry.
Water : Role of water, maintenance of body water. Maintenance of pH – Role of Hemoglobin, Respiratory control, Role of Kidney, Acidosis, Alkalosis.
Structures of the major biochemical components of the body – Carbohydrates, lipids, proteins and nucleic acids.
Proteins : Structure – Function relationship.
Digestion and absorption of Carbohydrates, Lipids and Proteins.

Unit 3 **(15 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 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 **(15 hrs)**

Tissue metabolism and Signal transduction.
Metabolic adaptations in the fed state, starvation state.
Metabolism in specific tissues – Liver, Muscle.
Signal transduction : Response to hormonal message, Role of Tyrosine Kinases.

BOOKS FOR REFERENCE

Berg, Jeremy M. **Biochemistry,** 5th ed., W.H.Freeman, New York 2001.

Brandon and Tooze. **Introduction to protein structure,** Garland Publishing, New York 2001.

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

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

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

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

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

Voet, D. and Voet, G., **Biochemistry**, 2nd ed., John Wiley and Sons, New York 1994.

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M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2009 - 2010)

MICROBIOLOGY

CODE :BY/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 provide information on microbiology related to growth and morphology of microbes
- To provide an insight on applied aspects of microbiology

Unit 1 **(15 hrs)**

History and scope of microbiology- Ultrastructure of Bacteria. Fungi, Algae, Protozoa and Viruses. Classification of microbes - Phylogenetic classification-Identification- Morphology and staining, biochemical characters, Serology, Phage Typing, Fatty acid profile, Flow cytometry, DNA base composition, DNA fingerprinting, Ribosomal RNA analysis, PCR, Nucleic acid hybridization.

Unit 2 **(10 hrs)**

Pure culture techniques. 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.

Unit 3 **(15 hrs)**

Industrial uses of microbes-SCP, Cheese, 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 **(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-TB, Pneumonia. Gastrointestinal-dysentery, ulcer. Urinary and reproductive-Candidasis, Leptospirosis.

Unit 5 **(10 hrs)**

Viruses - General properties of plant and animal virus, classification, structure, isolation, cultivation, purification, transmission and multiplication. Viruses and disease –HIV and Cancer. . Virions and Prions.

BOOKS FOR REFERENCE

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

Crueger, W and Crueger, A **Biotechnology: A Textbook of Industrial Microbiology**, Panima Publishing Corporation. 2005

Demain, Arnold L., and Davies, Julian E **Manual of Industrial Microbiology and Biotechnology**, 2nd ed., ASM Press 2004.

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

Glazer,A.N.,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 Edition), Elsevier Health Sciences Publisher, 2007

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

Pelczar, Michael,J(Jr.),Reid, Roger,D.Chan E.C.S.and H.Kreig **Microbiology,**(5th Edition) Tata McGraw-Hill Publishing Co.Ltd, New Delhi 1993.

Prescott,L.M **Microbiology**, McGraw-Hill Publications 2005.

Tortora,G.G.J., ,Funke,B.R.and Case,C.L. **Microbiology-An Introduction,** Dorsling Kindersley Publishers 2006.

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

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2009 - 2010)

CELL AND MOLECULAR BIOLOGY

CODE :BY/PC/CM14 **CREDITS : 4**
L T P : 4 1 0
TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To understand the fundamentals of structure, function and dynamics of the cell and their applications.

Unit 1 **(10 hrs)**

The dynamic cell, plasma membrane, subcellular organization, structure and function of organelles in prokaryotic and eukaryotic cells. Cell motility - microfilaments and microtubules. Cell – cell interactions.

Unit 2 **(12 hrs)**

Nucleic acids, the genetic code and synthesis of macromolecules : DNA structure, replication and repair. RNA – types, transcription and processing. Protein synthesis.

Unit 3 **(12 hrs)**

Molecular structure of genes and chromosomes : Molecular definition of a gene. Organisation of eukaryotic genomes – coding and non-coding sequences. Organization of prokaryotic genome. Mobile DNA. Biology of bacteriophage λ : lytic growth and lysogeny.

Unit 4 **(18 hrs)**

Transcriptional and translation regulation : Transcriptional regulation in eukaryotes – regulatory proteins, steroid hormone receptors, heat shock genes, homeotic genes, DNA methylation, histone modification, specialized mechanism regulating rRNA genes. Post transcriptional regulation. Transcriptional regulation in prokaryotes – regulation by repressors, by activators, regulatory protein acting as both repressor and activator, regulation by attenuation. Translational regulation in bacteria.

Unit 5 **(13 hrs)**

Cell cycle and cell cycle regulation : Genes regulating cell cycle. Signal transduction. Programmed cell death. Oncogenes and tumor suppressor genes.

BOOKS FOR REFERENCE

Alberts, Bruce, et. al., **Molecular Biology of the Cell**, Garland Publishers, USA 1994.

Cooper, G.M. and Hausman, R.E., **The Cell – A Molecular Approach**, ASM Press, USA 2004.

Darnell, James, Harvey Lodish and David Baltimore, **Molecular and Cell Biology**, Scientific American Books, Distributed by W.H. Freeman and Co.NY, USA 1998.

Karp, Gerald, **Cell and Molecular Biology – Concepts and Experiments**, John Wiley and Sons 1996.

Lewin, Benjamin, **Genes VIII,** Pearson Prentice Hall 2004.

Watson, James D., Baker, Tania A., Bell, Stephen A., Gann, Alexander Levine, Michael, Losick Richard and Cummings, Benjamin **Molecular Biology of the Gene**, 6th edition, CSHL Press 2004.

Weaver, **Molecular Biology**, Tata McGraw Hill 2002.

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

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M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2009 - 2010)

BIOCHEMISTRY, MICROBIOLOGY AND CELL AND MOLECULAR BIOLOGY – PRACTICALS

CODE :BY/PC/P117 **CREDITS : 7**

L T P : 0 0 1 0

TOTAL TEACHING HOURS : 130

Biochemistry

1. Colorimetric Determination of amino acids (from plant source).
2. Determination of total soluble sugars by ferricyanide (plant/animal tissue) – Volumetric procedure.
3. Determination of starch in plant tissues.
4. Qualitative test for lipids – Solubility test, emulsification, saponification, Liebermann-Burchard test for cholestrol, Sudan Black B test, test for unsaturated lipids.
5. Gel filtration – Separation of proteins.
6. Thin layer chromatography – Separation of amino acids.
7. SDS – PAGE – Separation of proteins.

Microbiology

1. Isolation and culturing of bacteria, fungi and algae.
2. Bacterial growth curve.
3. Staining –
    a) Fungal Staining
    b) Differential staining
    d) Spore 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

5. Kirby- Bauer Antibiotic Sensitivity Test.
6. Resazurin test to check the quality of milk.
7. Determination of potability of water.

Cell and Molecular Biology

1. Extraction and estimation of genomic DNA (Plant or Animal).
2. Restriction enzyme – Agarose gel electrophoresis.
3. RAPD or RFLP analysis.
4. Southern hybridization and the use of non-radioactive probes.
5. Isolation of plasmid DNA
6. Isolation of total RNA.
7. mRNA isolation.
8. Northern blotting.
9. Mitosis and meiosis using plant tissue.
10. PCR amplification.

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M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2009 - 2010)

ENVIRONMENTAL BIOTECHNOLOGY

CODE: BY/PE/EB13 **CREDITS: 3**
L T P: 3 1 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. 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.

Unit 3 **(10 hrs)**

Waste Management - Solid waste-hazardous, non-hazardous, medical waste. Paper and Distillery. Composting, vermi-composting - Wastewater treatment - Biological process for domestic and industrial treatment-Activated sludge, Biological filters.

Unit 4 **(10 hrs)**

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

Unit 5 **(12 hrs)**

Bioremediation-In situ and ex-situ – Bioaugmentation - Degradation of xenobiotics in environment - Degradative plasmids- GEMs and environmental safety-, Biomining-Metal leaching, Extraction of metals –Copper and Gold.

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.** Atlantic Publishers and Distributors Ltd., New Delhi 2008.

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

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

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

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

Paget,G.E, **Methods in Toxicology,**Blackwell Scientific Publications,Oxford 1970.

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

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

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

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M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2009 - 2010)

APPLICATIONS OF BIOTECHNOLOGY

CODE :BY/PE/AB13 **CREDITS : 3**
L T P : 3 1 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.

Unit 1 **(10 hrs)**
Introduction to cloning – enzymes and techniques used in gene cloning.

Unit 2 **(11 hrs)**
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 **(10 hrs)**
Tissue culture: Culture techniques. Applications in Horticulture, Floriculture and Pharmaceutical industry.

Unit 4 **(11 hrs)**
Biofertilizers. Biofuels: Ethanol production and Biogas. Biodiesel. Petroplants and algal hydrocarbons.

Unit 5 **(10 hrs)**
Fundamentals of Fermentation technology: Scale up and down stream processing. Dairy – Cheese, Bakery – Bread, Beverages – Wine and Beer, Enzyme – Amylase and Vitamin B12.

BOOKS FOR REFERENCE

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

Purohit, S.S and Mathur S.K., **Biotechnology – Fundamentals and Applications**, (3rd edn)., Agrobios, India 2000.

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

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

Watson James D., et.al., **Recombinant DNA** (2nd Edition), Scientific American Books, USA 1992.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2009 – 2010)

CLONING VECTORS AND GENETIC ENGINEERING

CODE: BY/PC/VG24 **CREDITS: 4**

L T P: 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To provide 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; 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 **(13 hrs)**

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

Unit 3 **(13 hrs)**

Specialized vectors and its applications- Expression vectors; Expression of foreign DNA in Bacteria- fusion protein; Shuttle Vectors; YACs, BACs, PACs, MACs and HACs.

Shotgun cloning; Methods of direct transformation- Heat shock, PEG mediated microinjection, particle bombardment, Electroporation, Lipofection; Genomic library and cDNA library construction; Marker genes; Recombinant selection and screening.

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, SSR, CAPS, SCAR. Chromosome walking.

Unit 5 **(13 hrs)**

Principle and application of gene silencing- Antisense RNA technology; DNA foot printing; Gene tagging; Gene cloning and DNA analysis in medicine (Insulin, Human Growth Hormone, factor VIII, Vaccines).

BOOKS FOR REFERENCE

Brown, Terence A, **Gene Cloning and DNA Analysis: An Introduction** (5th Edition), Blackwell Publishers 2006.

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

Glick Bernard R. and Pasternak Jack J., **Molecular Biotechnology: Principles and Applications of Recombinant DNA** by (3rd Edition), ASM Press 2003.

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

Primrose, S. B., et.al., **Principles of Gene Manipulation: An Introduction to Genetic Engineering (6th Edition)**, Blackwell Publishers 2001.

Rodriguez Raymond L., Denhardt David T., **Vectors : A Survey of Molecular Cloning Vectors and Their Uses**, Butterworths Publisher 1987.

Sambrook, Joseph. , Russell, David W., **Molecular Cloning: A Laboratory Manual** (3rd Edition), CSHL Press, 2001.

Watson James D., et.al., **Recombinant DNA** (2nd Edition), Scientific American Books, USA 1992.

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M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2009 - 2010)

ANIMAL AND PLANT BIOTECHNOLOGY

CODE: BY/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)**

Gene transfer methods into animal cells; DNA mediated transformation; 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. Production of regulatory proteins, blood products, vaccines and hormones in transgenic animals.

Unit 3 **(13 hrs)**

Plant tissue culture: principles and methodology. Protoplast technology and somatic embryogenesis. Somaclonal variation, synthetic seeds. Production of haploid plants. Applications of tissue culture in Agriculture and Horticulture. Marker assisted selection and breeding.

Unit 4 **(12 hrs)**

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

Unit 5 **(10 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, Lipids and Vitamins
Molecular farming : Carbohydrates and proteins
Plants as bioreactors : Antibodies, foreign proteins in plants and edible vaccine.

BOOKS FOR REFERENCE

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

Bösze Zsuzsanna **Bioactive Components of Milk,** Springer, 2007.

Chawla, H.S. **Introduction to Plant Biotechnology**, 2nd edition, Oxford and IBH Pub 2002.

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

Purohit, S.S.,**Agricultural Biotechnology**, Agrobios, India 2003.

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

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

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 Edition), Royal Society of Chemistry 2000.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
M.Sc. DEGREE : BIOTECHNOLOGY
SYLLABUS
(Effective from the academic year 2009 - 2010)

CLONING VECTORS AND GENETIC ENGINEERING, ANIMAL BIOTECHNOLOGY AND PLANT BIOTECHNOLOGY – PRACTICALS

CODE :BY/PC/P226 **CREDITS : 6**
L T P : 0 0 9
TOTAL TEACHING HOURS : 117

Cloning vectors and Genetic Engineering

1. Bacterial transformation
2. Cloning and ligation
3. GFP cloning
4. *In situ* PCR based site directed mutagenesis
5. *In vitro* transcription
6. DNA sequencing (demo)

Animal Biotechnology

1. Preparation of culture media
2. Filter sterilization
3. Preparation of single cell suspension from spleen and thymus
    a) Warm trypsinization
    b) Cold trypsinization
    c) Mechanical disaggregation
4. Cell counting and cell viability
5. Primary explant culture
6. Isolation of DNA from spleen/thymus/cheek cells

Plant Biotechnology

1. Basic techniques in plant tissue culture
    - Preparation of medium, surface sterilization
    - Callus induction, organogenesis
    - Meristem culture

2. Protoplast isolation by enzymatic method and Protoplast fusion
3. *Agrobacterium* culture, reporter gene (GUS) assay
4. Isolation of plant mitochondria

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M.Sc. DEGREE: BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2009 - 2010)

STEM CELL TECHNOLOGY

CODE: BY/PE/ST23 **CREDITS : 3**
L T P : 3 1 0
TOTAL TEACHING HOURS: 52

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 **(15hrs)**

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 **(10 hrs)**

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

Unit 3 **(15hrs)**

History about the development of Stem Cell Research- Factors and mechanisms involved in Stem Cell Renewal and Pluripotency- Types of Stem Cells. 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 **(5 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.

Unit 5 **(7 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 REFERENCE

Atala, Anthony **Principles of Regenerative Medicine,** Academic Press, USA 2008

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

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

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

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

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2009 - 2010)

GENOMICS AND PROTEOMICS

CODE :BY/PE/GP23 **CREDITS : 3**
L T P : 3 1 0
TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE

- To introduce and understand the basics of genomics, proteomics and its applications

Unit 1 **(10 hrs)**
Genomic and cDNA sequences and output management from different biological output sources gene prediction rules and software. *E. coli*, yeast, *Drosophila*, *Arabidopsis* and Human Genome Projects. Population studies.

Unit 2 **(10 hrs)**
Genome organization. Analysis of genomic and proteomic information with respect to biological systems – Genome Applications- Pathway regulatory networks.

Unit 3 **(10 hrs)**
Gene Expression, Microarrays and recent developments in expression analysis. Applications of Microarrays in Drug Toxicity Testing, Metabolic pathways.

Unit 4 **(11 hrs)**
Sequence Analysis (Proteins & Nucleic acids) Sequence Alignment methods- Proteomics, Proteins Analysis-Structural Comparisons- 2D gel, Mass spec, Protein and Antibody arrays.

Unit 5 **(11 hrs)**
Protein Databases-Comparison of Protein Sequences and Database searching-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.

BOOKS FOR REFERENCE

Brown, T.A, **Genomes,** First edition, John Wiley and Sons Ltd, New York. 1999

Grandi, G., **Genomics, Proteomics and Vaccines**, John Wiley and sons. 2004

Maleolm and Goodship, J **Genotype to phenotype,** Second edition. Bios Scientific Publishers Ltd. 2001.

Primrose, B **Principle of genome analysis**. Second edition. Blackwell Science 1998.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2009 - 2010)

BIOPROCESS TECHNOLOGY AND ENZYME TECHNOLOGY

CODE :BY/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 – Aerobic and anaerobic systems. Enzyme kinetics: Kinetics and mechanisms of enzyme catalyzed reaction - Steady state kinetics - Inhibition and multisubstrate enzyme kinetics - Pre steady state and relaxation kinetics - King and Altman procedure.

Unit 2 **(10 hrs)**

Types of bioreactors –Batch- Fed Batch- Continuous Stirred tank- Plug flow reactor- Fluidized bed- packed bed reactor. 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.

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 – enzyme mimicking.

BOOKS FOR REFERENCE

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

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

Cornish-Bowden, A., **Analysis of Enzyme Kinetic Data**, Oxford Univ. Press, London 1996.

Coulson **Chemical Engineering** , Pergamon Press 1984.

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

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

Moo-Young M., **Comprehensive Biotechnology** Pergamon Press 1985.

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

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

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

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2009 - 2010)

IMMUNOTECHNOLOGY

CODE :BY/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 - antigen isolation, purification and characterization of various antigens and haptens from pathogens by biophysical, biochemical methods (gel filtration, affinity chromatography, electrophoresis)

Unit 2 **(10 hrs)**

Immunoglobulin - primary structure-classes-biological activities.

Purification of Antibodies: Precipitation and column chromatographic techniques. Quantitation of immunoglobulin: RID, DID and Nephlometry. Monoclonal Antibodies: Hybridoma technology-Diagnostic and therapeutic applications of monoclonal Antibodies.

Unit 3 **(13 hrs)**

Antigen-Antibody reactions-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.

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 **(16 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 using RIA, IRMA and ELISA. Autoimmune disorders

Unit 5 **(13 hrs)**

Basic concepts of active and passive immunization. Vaccines: Principles and types-Live Attenuated-Subunit-Conjugate-Toxins and Toxoids-Recombinant DNA Vaccines. Identification of T and B epitopes for vaccine development.

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.

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

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

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

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

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

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

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M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2009 - 2010)

BIOPROCESS TECHNOLOGY, ENZYME TECHNOLOGY AND IMMUNOTECHNOLOGY - PRACTICALS

CODE :BY/PC/P338 **CREDITS : 8**

L T P : 0 0 10

TOTAL HOURS : 130

Bioprocess Technology and Enzyme Technology

1. Bioethanol production
2. Microbial production of Pencillin
3. Isolation of Pectinase/Cellulase from *Aspergillus/ Trichoderma*.
4. Microbial production of citric acid/lactic acid from *Aspergillus niger*.
5. Cell immobilization using alginate.
6. Estimation of clinically significant enzymes-SGOT, SGPT.
7. Salivary amylase production.
8. Effect of pH, temperature and substrate concentration on amylase activity.
9. Sauerkrat production.

Immunotechnology

1. Characterization of WBC
2. Separation of T and B cells
3. Immunodiffusion-Radial, ODD
4. Immunoelectrophoresis-IEP cIEP Rocket electrophoresis
5. Immunodiagnostics (using commercial kits)- Widal test
6. Western Blotting- (Demonstration)
7. Purification of IgG using column – (Demonstration)
8. ELISA (Demonstration)

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M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2009 - 2010)

BIOPHYSICS AND BIOSTATISTICS

CODE :BY/PC/BB33 **CREDITS : 3**
L T P : 3 1 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 provide an introduction to the basic biophysical processes governing cellular function
- To provide information on the collection, analysis and interpretation of biological data

Unit 1 **(15 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 ^{1}H 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 **(12 Hrs)**

Protein Biology

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

Membrane Biophysics: Structure and dynamics of biological membranes, Donnan Equilibrium permeability of membrane- Diffusion, Facilitated transport, active transport Nernst Equation Membrane potential-generation of concentration gradients across membranes-proton-flux. Macromolecular Interactions**:** Supramolecules.

Unit 3 **(6 Hrs)**

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

Unit 4 **(8 Hrs)**

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 **(11 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**–Garland Publishing New York 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**, Kitab Mahal, Allahabad, India 1972.

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

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

Negi .K.S. **Biostatistics**, AITBS Publishers, India 2002.

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

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

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

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M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2009 - 2010)

INSTRUMENTATION

CODE :BY/PE/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)**

Calorimetry: 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**; Jones and Bartlett Publishers, Boston, USA 1992.

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

Morris and Morris **Separation methods in Biochemistry** Pitman London 1960.

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

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

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

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M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS

(Effective from the academic year 2009 - 2010)

RESEARCH METHODOLOGY AND BIOETHICS

CODE :BY/PE/RI43 **CREDITS : 3**

L T P : 3 1 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 –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) and patents, TRIPS
Case studies on patents (Basmati, Turmeric and Neem).

Unit 4 **(10 hrs)**

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.

Unit 5 **(12 hrs)**

Biosafety, containment facilities for Genetic Engineering experiments, good laboratory practices (GLP).

BOOKS FOR REFERENCE

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

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

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

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

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M.Sc. DEGREE : BIOTECHNOLOGY
SYLLABUS
(Effective from the academic year 2009 - 2010)
MEDICAL BIOTECHNOLOGY

CODE :BY/PE/MD43 **CREDITS : 3**
L T P : 3 1 0
TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE
To provide basic information on the importance of biotechnology in the field of medicine and health care.

Unit 1 **(12 hrs)**
Drug discovery and Development : Introduction, overview of the phases of drug discovery and development: discovery, pre-clinical and clinical development; differences between small molecule drugs and biologicals.

Unit 2 **(10 hrs)**
Drug Discovery: disease models, 2. Drug Discovery: Disease models; Target identification and validation; Principles of drug design; Screening techniques; synthesis of new drugs; Molecular modeling in drug discovery - virtual screening and Molecular Docking.; Antisense DNA technology for drug designing. Lead identification; Lead optimization - design, make, test cycle.

Unit 3 **(10 hrs)**
Preclinical Development: Pharmacology; Pharmacokinetics; PK-PD modelling; Safety Pharmacology; Toxicology

Unit 4 **(10 hrs)**
Drug Development and registration: Drug delivery; formulation; Personalized medicene-Pharmacogenomics; different phases of clinical trials; ICMR guidelines for clinical trials; Regulatory authorities - FDA, EMEA and others; Drug registration; IPR issues

Unit 5 **(10 hrs)**
Biomedicenes: i). Nucleic acid therapies - gene therapy (vectors, viral and non-viral, SiRNA), oligonucleotides; ii) Protein, peptide and peptidomimetic therapeutics - insulin, growth harmones, coagulation factors, interferons and interleukins; mABs in cancer, immunoregulation, transplantation, pulmonary disease, infections and endocrine disorders; vaccines for protection against foreign agents and treatment of cancer and autoimmune disorders; protein diagnostics; iii) Tissue Engineering and stem cell therapy.

BOOKS FOR REFERENCE

Daan, J.A, Crommeling and Sinclair R.D., **Pharmaceutical Biotechnology**, 3rd edition, Taylor and Francis 2007.

Kayser, O. and Muller, R.H. **Pharmaceutical Biotechnology, Drug discovery and Clinical Applications**, Wiley-VCH, Weinheim 2004.

Sargel, L., **Applied Biopharmaceutics and pharmacokinetics,** Prentice-Hall International, London 1999.

Sasson, A. **Medical Biotechnology: Achievements, Prospects and Perceptions.** United Nations University Press 2005.

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M.Sc. DEGREE : BIOTECHNOLOGY

SYLLABUS
(Effective from the academic year 2009 - 2010)

DISSERTATION

CODE :BY/PC/DI48 **CREDITS : 08**

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.

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.

Assignment of Marks:

Project report : 150 marks
Viva-voce : 50 marks.