



# **KONGU ARTS AND SCIENCE COLLEGE**

**(An Autonomous Institution, Affiliated to Bharathiar University, Coimbatore)**

**ERODE – 638 107**

**B.Sc (Biotechnology)**



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**2017-2018**



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# **SYLLABUS**

Semester	Course Code	Core Paper I Cell Biology	Total Marks:100		Hours Per Week	Credits
			CIA: 25	ESE: 75		
I	17UAQCT101				4	4

### Objectives

- To obtain an adequate knowledge about structure of the cell and their organelles.
- To clearly understand the mechanism and functions of a cell.

### UNIT I

**Cell as a basic unit:** Discovery of the cells, development of cell theory, classification of cell types. Prokaryotic and Eukaryotic cell organization.

**Membrane structure:** Ultra structure of plasma membrane. Membrane models – bilayer (Lipid membrane, Unit membrane and Greater membrane) and micellar model.

### UNIT II

**Membrane function:** Role of active transport, passive transport - diffusion and osmosis in cell membrane function. Cell junctions - occluding, anchoring and communicating junctions. Cell adhesions. Cell-cell signaling (signal receptors, forms of intercellular signaling), ECM.

### UNIT III

**Structural organization and function of intracellular organelles:** Cell wall, mitochondria, golgi complex, ribosomes, lysosomes, microbodies, plastids (chloroplast), vacuoles. Cytoskeleton and its role in motility.

### UNIT IV

**Nucleus:** Ultra structure, chromatin – euchromatin and heterochromatin. Eukaryotic chromosome morphology- Centromere and Telomere, structure of specialized chromosomes (Polytene and Lamp Brush).

**Genetic material:** Experiments to prove DNA as a genetic material, structure of DNA and RNA (mRNA, rRNA, tRNA).



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**UNIT V**

**Cell division and cell cycle:** Cell division in prokaryotes, cell cycle in eukaryotes, mitosis, meiosis and crossing over. Apoptosis and cancer.

**Specialized cells:** Nerve cell and synaptic transmission. sperm cell, muscle cells, cells of vision.

**TEXT BOOK**

Ajoy Paul, Text Book of Cell and Molecular Biology, II Edition, Books and Allied Ltd, Kolkata, 2007.

**REFERENCES**

1. David E Sadava, Cell Biology, I Edition, Panima Publishing Corp, New Delhi, 2004.
2. P.S.Verma and V.K.Agarwal, Cytology, I Edition, S.Chand and Company, New Delhi, 2006.
3. Lodish *et al.*, Molecular Cell Biology, IV Edition, W.H. Freeman & Company, New York, 2001.
4. Gerald Karp, Cell and Molecular Biology, V Edition, John Wiley and Sons, US, 2007.
5. Cooper, The Cell - A Molecular Approach, IV Edition, Sinauer Associates, Inc., Massachusetts, 2007.

**QUESTION PAPER PATTERN**

SECTION - A	SECTION - B	SECTION - C
10 x 1 = 10 Marks (Multiple Choice, Four options) Two questions from each unit	5 x 7 = 35 Marks (Either or choice) Two questions from each unit	3 x 10 = 30 Marks (Answer any three Questions) One Question from each unit



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Semester	Course Code	Allied II Chemistry Paper II	Total Marks:75		Hours Per Week	Credits
			CIA: 20	ESE: 55	4	3
II	17UAQAT203					

### Objectives

- To understand the importance of Coordination Chemistry
- To understand the chemistry of aromatic compounds and their industrial applications.

### UNIT I

**Metallurgy: Terms:** Definition of Mineral, Ore, Mining, Flux, Slag and Poling.

**General methods of extraction of metals:** Ore dressing methods. Reduction methods, Refining methods – Zone refining and Van Arkel Zones refining.

**Furnaces:** Blast and Reverberatory furnaces,

**Extraction of metals:** Extraction process of Uranium

### UNIT II

#### Coordination Chemistry

**Terminology:** Definition of Complex ion, Central ion, Ligand, Coordination bond, Coordination number, Coordination sphere, Chelate complex, Unidentate and Bidentate Ligands. Nomenclature of Mononuclear complexes.

**Isomerism in Coordination compounds:** Stereoisomerism and Optical isomerism.

**Theories:** Werner, Sidgwick Effective Atomic Number and Pauling's Valence bond theory.

**Chelation** - Haemoglobin, Chlorophyll, EDTA – Determination of Hardness of water.

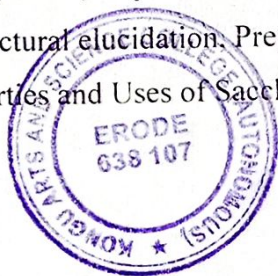
Applications in quantitative and qualitative analysis of Coordination compounds.

### UNIT III

**Aromatic Compounds:** Electrophilic substitution in benzene. Mechanism of Nitration, Halogenation, Alkylation, Acylation and Sulphonation.

Naphthalene - Structural elucidation. Preparation, Properties and uses.

Preparation, Properties and Uses of Saccharin and Aspartame.



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**UNIT IV**

**Energetics:** Thermodynamics- Definition of First law of Thermodynamics. Types of systems- Reversible, Irreversible, Isothermal, Adiabatic and Spontaneous Processes. Enthalpy, Bond energy. Carnot cycle and Carnot theorem. Entropy and its significance. Free energy change.

**UNIT-V**

**Electrochemistry:** Kohlraush's law and its application. Conductometric titration. pH determination. Galvanic cells, EMF Standard electrode potentials, Reference electrodes. Electrochemical series and its applications. Principles of Electroplating.

**Phase Rule:** Definition of terms in Phase rule. Study of a simple Eutectic system: Pb-Ag.

**TEXT BOOKS**

1. B.R. Puri, L.R. Sharma, K.C. Kalia, Principles of Inorganic Chemistry, 28<sup>th</sup> Edition, Vallabh Publication, New Delhi, 2004. (Unit I, II)
2. B.S. Bahl and Arun Bahl, Advanced Organic Chemistry, 1<sup>st</sup> Edition, S. Chand and Company Ltd, New Delhi, 1998. (Unit III)
3. B.R. Puri, L.R. Sharma and Madan S. Pathania, Elements of Physical chemistry, 30<sup>th</sup> Edition, Vishal publication, Jalandhar, 2007. (Unit IV, V)

**REFERENCES**

1. R.D. Madan, Advanced Inorganic Chemistry, 2<sup>nd</sup> Edition. S. Chand and Company, New Delhi, 2005.
2. P.S. Kalsi, Stereo chemistry. Conformation and Mechanism, 4<sup>th</sup> Edition, New Age International Publishers, New Delhi, 2005.
3. R.T. Morrison, and R.N. Boyd, Organic chemistry, 6<sup>th</sup> Edition, Prentice Hall Private Ltd, New Delhi, 1997.
4. D. Van Samuel Glasstone, Thermodynamics – Nostrand Company. Inc., 5<sup>th</sup> Edition, Eastern Wiley Publications, 2002.

**QUESTION PAPER PATTERN**

SECTION - A	SECTION - B	SECTION - C
10 Questions = 10 Marks (Multiple Choice. Four options) Two questions from each unit	5 x 3 = 15 Marks (Either or choice) Two questions from each unit	3 x 10 = 30 Marks (Answer any three Questions) One Question from each unit



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## SEMESTER V

Course : Immunology  
Course Code : 15UAQCT501

Hours per week: 5

Credit : 4

### Objectives:

- To understand the structure, function and role of immune cells
- To acquire knowledge about immune system and their working mechanism

### UNIT I

**Basis of Immunology:** History and scope of immunology. Types of immunity: Innate and Acquired immunity. Hematopoiesis, cells and organs of immune system, humoral and cell-mediated response. Primary and Secondary immune responses. Defense mechanisms - barriers involved in innate immunity (anatomical, physiological and chemical), second line defense (inflammatory response and phagocytosis).

### UNIT II

**Antigen and Antibodies:** Antigen Biology- Classification, antigenicity, immunogenicity, epitopes, haptens, adjuvants. Antibody – Structure, types, properties and their biological functions, polyclonal sera. Structure and classification of MHC, CD molecules and cytokines.

### UNIT III

**Antigen Processing and Presentation:** Pathways and the role of APC's. T-cell Receptor Complex, T-cell activation and differentiation, immunoglobulin gene rearrangement, B-cell maturation, B-cell activation and proliferation. Complement system - Classical pathway, Alternative Pathway, Lectin pathway.

### UNIT IV

**Immune response:** Hypersensitivity – Type I, II, III, IV & V. HLA typing, types of grafts, mechanism of graft rejection, immuno suppression and immunotolerance. Autoimmune diseases (Hashimoto's thyroiditis, Myasthenia gravis, Rheumatoid arthritis, Multiple sclerosis). Vaccines. Production of monoclonal antibodies.



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## UNIT – V

**Tumor Immunology:** Tumor Antigen, Immune response to tumors, Cancer immunotherapy, Immunodeficiency disease (AIDS).

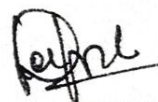
**Immunodiagnosis:** Immunodiffusion, immunoelectrophoresis, agglutination reaction, complement fixation, immunoprecipitation, immunofluorescence, Radio Immuno Assay, ELISA, Western blotting.

## TEXT BOOK

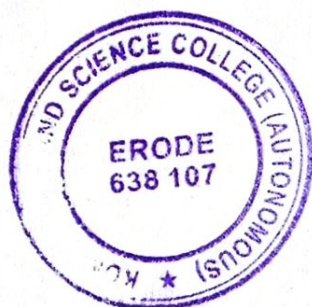
Kuby. J , Immunology – V Edition, W.H.Freeman and Company, 2003.


## REFERENCE BOOKS

1. C.Vaman Rao, Immunology II Edition, Narosa Publishing House, New Delhi, 2006.
2. Ian Todd, Gavin Spickett, Immunology V edition. Blackwell Publishing, 2005.
3. Seemi Farhat Basir. Textbook of Immunology II edition, PHI Learning Private Limited, 2012.



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## SEMESTER V

Course : Recombinant DNA technology

Hours per week: 5

Course Code : 15UAQCT502

Credit: 5

### Objectives:

- To understand various recombinant techniques and new advents in Biotechnology
- To acquire knowledge about the molecular level study of living organism.

### UNIT I

**Enzymes in rDNA:** Basic steps in cloning, Restriction and Modification systems of Bacteria. Restriction enzyme (Endo- and Exo-nucleases) DNaseI, S1nuclease, RNase H. DNA Polymerases, RNA polymerase, *Taq* polymerase, Reverse transcriptase, DNA Ligase, Methylase. End-modifying enzymes - Polynucleotide kinase, Alkaline phosphatase, terminal deoxynucleotidyl transferase. End modification by linkers and adapters.

### UNIT II

**Plasmids** – Types of plasmids, properties of plasmid, plasmid compatibility, copy number control. *E.coli* vectors - pBR322 and their derivatives, pUC vectors and their derivatives, BAC. Inducible promoters, selectable markers, reporter genes, shuttle vectors and expression vectors. Cloning in *Bacillus* and *Streptomyces*.

### UNIT III

**Vectors:** Molecular biology of lambda phage and vectors, M13 biology and vectors, cosmid, phasmid, phagemid. Yeast vectors – YIP, YEP, YRP and YAC. Animal vectors - SV40 and Baculo viral vectors. Plant vectors - Ti plasmid as vector, CaMV and Gemini viral vectors.

### UNIT IV

**Identification of recombinant clones:** Probes - construction and labeling. Introduction of cloned genes into cell- Electroporation, lipofection, Ca-mediated transfer, microinjection. Identification of recombinant DNA. *In vitro* transcription and translation. Hybridization techniques - Southern, Northern and Western blotting, Chromosome walking and jumping. Construction of cDNA and genomic DNA libraries.



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## UNIT V

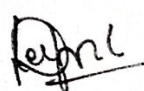
**Molecular techniques:** DNA sequencing – Maxam Gilbert method. Sanger's Dideoxy chain termination method. Automated DNA sequencing method. Microarray. PCR – design and optimization. Types of PCR - Inverse, Nested, RT PCR. Hot Start PCR, applications of PCR. Site-directed mutagenesis. Autoradiography. DNA finger printing. RNAi and Gene silencing. Gene therapy – somatic- and germ line gene therapy, viral and non viral gene delivery systems.

## TEXT BOOKS


1. S.B. Primrose and R.M. Twyman, Principle of Gene Manipulation and Genomics VII edition, Blackwell Publishing, 2006.
2. Ernst L. Winnacker, From Genes to Clones. Panima Publishing Corporation, 2003.

## REFERENCES

1. T.A. Brown. Gene Cloning – An Introduction, III Edition, Stanley Thornes Publishers Limited, 1995.
2. K. Rajagopal, Recombinant DNA Technology and Genetic Engineering. Tata McGraw Hill Education, Pvt. Ltd, 2012.
3. Richard M. Myers *et al.*, Recombinant DNA Genes and Genomes III Edition, W.H. Freeman and Company, 2007.

  
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## SEMESTER V

Course : Plant Biotechnology

Hours per week: 5

Course Code : 15UAQCT503

Credit: 4

**Objectives:**

- To understand the basic concepts in plant development, the growth mechanism and *in vitro* studies.
- To acquire knowledge about techniques used in the betterment of Agriculture.

**UNIT-I**

**Introduction to tissue culture:** Introduction to plant tissue culture, basic lab requirements, conditions of culture room, culture media – types, composition and preparation. Explant selection, sterilization techniques, growth regulators – types, structure and functions of Auxins, Cytokinins, Gibberellins, Abscisic acid and Ethylene. Callus- and suspension cultures-initiation and maintenance of callus and suspension cultures; single cell clones.

**UNIT-II**

**Culture Techniques:** *In vitro* pollination and fertilization, Organogenesis- somatic embryogenesis, embryo culture and applications. Endosperm culture and production of triploids. Micropropagation, axillary bud, shoot-tip, meristem, anther and microspore culture. Haploid production and its applications, somaclonal variations and applications.

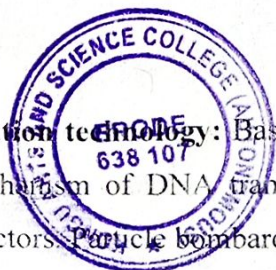
**UNIT III**

**Introduction to protoplast isolation:** Principle and application, testing for viability of isolated protoplasts, steps in the regeneration of protoplasts, methods for fusing protoplasts (chemical and electrical), use of markers for selection of hybrid cells, Somatic hybridization and practical applications of somatic hybridization (hybrid vs. cybrids). Synthetic seed technology.

**Cryopreservation of germplasm:** Short-term and long-term conservation of plant genetic resources, *in situ* and *ex situ* conservation of plants.

**UNIT IV**

**Plant transformation technology:** Basis of tumor formation, hairy root, features of Ti and Ri plasmids, mechanism of DNA transfer, role of virulence genes, use of Ti and Ri as vectors, binary vectors, Particle bombardment, electroporation.



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**Transgenic plants:** Genetic modification of plants for herbicide resistance, pest resistance, bacterial, virus and fungal resistance, abiotic stresses, post harvest losses, long shelf-life of flowers, delayed fruit ripening, terminator gene technology.

#### UNIT V:

**Molecular marker aided breeding:** RFLP maps, linkage analysis, RAPD markers, STS, microsatellite, SCAR (sequence characterized amplified regions), SSCP (single-strand conformational polymorphism), QTL, map-based cloning, molecular marker-assisted selection.

**Plant metabolic engineering and industrial products:** Primary and secondary metabolites. Plant as bioreactors, hairy root cell cultures. Industrial enzymes, antibodies and edible vaccines.

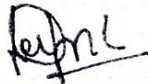
#### TEXT BOOK


C. B. Nirmala, G. Rajalakshmi, Chandra Karthick, Plant Biotechnology, MJP Publishers, 2009.

#### REFERENCES

1. Old, R.W., and Primrose, S.B, Principles of Gene Manipulation: An Introduction to Genetic Engineering. Blackwell Scientific Publications, Oxford, 2004.
2. Gupta. P.K, An Introduction to Biotechnology, Rastogi Publications, Meerut, 1990.
3. Ravishankar G.A and Venkataraman L.V, Biotechnology applications of Plant Tissue and Cell culture. Oxford and IBH Publishing co., Pvt Ltd., 1997.
4. Bhan, Tissue culture, Mittal Publications, New Delhi, 1998.



  
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## SEMESTER V

Course : Developmental Biology

Hours per week: 4

Course Code : 15UAQET504

Credit: 4

### Objectives

- To study the morphogenesis of Plants and Animals.
- To study the experimental approach of Development Biology

### UNIT I

**Development of gametes** - Spermatogenesis and Oogenesis in mammals. Cell surface molecules in sperm and egg recognition in animals, activation of sperm and egg- interaction of sperm and egg, Sequence of events in sperm entry, egg surface changes. Post-fertilization changes.

### UNIT II

**Mammalian fertilization:** morphogenetic gradients; cell fate and cell lineages; genomic equivalence and the cytoplasmic determinants. Zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; menstrual cycle- monitoring of estrus cycle.

### UNIT III

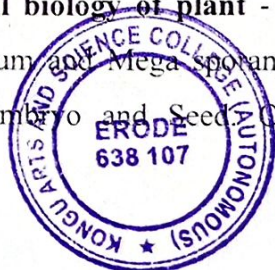
**Evolutionary embryology:** Morphogenesis and organogenesis in animals (Drosophila, Amphibia and Chick). Cell division and chemical changes during cleavage, pattern of cleavage, distribution of cytoplasmic substances in the egg, metamorphosis of insects and amphibians.

### UNIT IV

**Experimental embryology:** Artificial insemination, methodology and success rate of invitro fertilization and embryo transfer, Sperm banking. Micropropagation. Embryo cloning.

### UNIT V

**Developmental biology of plant** - Embryogenesis of plant -Arabidopsis. Development of Microsporangium and Mega sporangium, Pollination, Double fertilization, development of Endosperm, Embryo and Seed. Organization of shoot and root apical meristem, and development.




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## REFERENCES

1. Balinsky, B.I. An Introduction to Embryology, W. B. Saunders Co., Philadelphia, 1981.
2. Maheswari, P. Introduction to the embryology of Angiosperm, McGraw Hill Publishers, 1981.
3. P.S. Verma., V.K. Agarwal and Tyagi. Chordate embryology, S. Chand & Co., New Delhi, 1995.
4. Gilbert, Scott's, Developmental Biology Sinauer Association, Inc., Publishers, 1985.
5. Rover, C.P., An Outline of Developmental Physiology, Pergamon Press, 1968.



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## SEMESTER V

Course : Marine Biotechnology  
 Course Code : 15UAQET505

Hours per week: 4  
 Credit: 4

**Objectives:**

- To develop ideas regarding exploration of Marine Biology
- To gain a deep knowledge in Marine organisms and their related products.

**UNIT I**

**Marine Biotechnology** – History of marine biotechnology, Application in aquaculture, pharmaceutical and biofouling. Bioactive compounds from marine organisms (Microorganisms, Sponges). Seaweeds as a source of polysaccharides. Seaweeds for removal of heavy metal pollutants.

**UNIT II**

**Bacterial cell Aquaculture** – cell communication system - Quorum sensing and its inhibition – types of autoinducers - QS inhibitor compounds and its role in expression of virulence genes among bacterial pathogens.

**UNIT III**

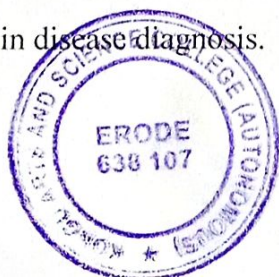
**Marine Enzymes** – sources and their application, Marine lipids- source and their application. Transgenic fish technology. Transgenic fishes with growth hormone (GH) and antifreeze genes. Transposon in fish.

**UNIT IV**

**Bioactive marine products**- membrane receptors, anti tumor compounds, and anti viral agents. Isolation and identification of marine bioactive compounds such as labile protein and carotenoids.

**UNIT V**

**Probiotics:** Bacteria and their importance in aquaculture. Vaccines for aquaculture. PCR and other techniques for identification of bacterial and viral pathogen in aquaculture. Gene probes and their applications in disease diagnosis.




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## REFERENCES

1. Y.K. Lee and S. Salminen, Handbook of Probiotics and Prebiotics Second edition. Wiley, A John Wiley and sons inc publication, 2009.
2. Y.LeGal, R. Ulber. Springer Verlag Berlin Heidelberg. Advances in Biochemical Engineering/Biotechnology- Marine Biotechnology I & II Edition, 2005.
3. I.S. Bright Singh, S. Somnath Pai, Rosamma Philip and A. Mohan Das. Aquaculture Medicine, First edition , Paico Printing Press, Kochi, India, 2003.

  
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## SEMESTER V

Course : Food and Nano Biotechnology

Hours per week: 4

Course Code : 15UAQET506

Credit: 4

### Objectives:

- To study about the role of various foods, economically.
- To acquire knowledge about the uses of Nanoparticle and its characterization.

### UNIT I

**Classification of food:** Healthy food, ethnic food, organic food, functional food, nutraceuticals, fabricated foods, convenience foods, GM foods. Preservatives used in Food Processing.

**Food Additives:** Classification and purpose - Role of thickeners, sweeteners, stabilizers, emulsifiers, leaveners, colors, flavoring agents, flour improvers, anti-caking agents, sequestrants, humectants, preservatives.

### UNIT II

**Processing principles:** Canning, chilling, freezing, dehydration, control of water activity, and fermentation.

**Packaging:** Functions of packaging, Types of packaging materials, Selection of packaging material for different foods, Selective properties of packaging film; Methods of packaging and packaging equipment.

### UNIT III

**Waste management of food industries:** Classification and characterization of food industrial wastes from fruit and vegetable processing industry, beverage industry, fish, meat and poultry industry, sugar industry and dairy industry; Waste disposal methods – physical, chemical and biological; Economical aspects of waste treatment and disposal.

### UNIT IV

**Nanobiotechnology:** Introduction to nanotechnology, Nano particles, Biologically Synthesized Nanoparticles, Characterization of Nanoparticles - TEM, FTIR and Synthetic Nanocomposites, Bionanomachines in action-Modern Biomaterials.



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## UNIT V

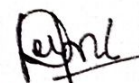
**Approaches to Developing Nanomedicines:** Various Kinds of Nanosystems in use, Anti-AIDS drugs. Immunotoxins as cell killers, Artificial blood, Cyclic peptides from nanotubes. **Nanotechnology in Diagnostic Applications:** Materials for Use in Diagnostic and Therapeutic Applications.

## TEXT BOOKS


1. Subash Chand, S.C.Jain., Fermentation Biotechnology – Industrial Perspectives, A release of All India Biotech Association, 1999.
2. Ran Tel-Vered, Omer Yehezkeli *et al.*, Nano-Biotechnology for Biomedical and Diagnostic Research, 2012.

## REFERENCES

1. L.Kathleen Mahan, Sylvia Escott – Stump, Krause's Food, Nutrition and Diet Therapy, Eleventh edition, Saunder's Publications, 2004.
2. Isao Endo, Teruyuki Nagamune, Nano Micro Biotechnology, Advances in Biochemical Engineering Biotechnology, Volume 119, 1st Edition, Springer publishers, 2010.
3. Yao He, Yuanyuan Su, Silicon Nano-biotechnology, Springer publishers, 2014.
4. Bharat Bhushan, Handbook of Nano-technology, 1<sup>st</sup> edition. Springer publishers, 2003.



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## SEMESTER V

Course : Biofarming

Hours per week: 3

Course Code : 15UAQST507

Credit: 3

**Objectives:**

- To learn innovative ideas on entrepreneurship.
- To acquire knowledge about various business fields in advanced Biotechnology.

**UNIT I**

**Mushroom cultivation:** Types of mushrooms – edible and toxic, preparation of spawn, preparation of bed – sterilization, straw preparation, environmental conditions to be monitored. Farm visit.

**UNIT II**

**Spirulina:** Biology of *Spirulina*, growth and culture conditions, nutritive value of spirulina, enhancement of spirulina nutrients and processing, commercial spirulina products, marketing. Farm visit.

**UNIT III**

**Vermicompost:** Earthworms used in vermicomposting, culture conditions and raw materials for compost, vermiwash, packaging. Panchakavya – preparation, importance, medicinal uses, marketing. Farm visit.

**Biofertilizers:** Types, mass production of NPK fertilizers, uses and applications of biofertilizers, constraints in biofertilizer technology. Farm visit.

**UNIT IV**

**Sericulture:** Introduction, biology and characteristics of silkworm – types, nutrients, culture conditions. Quality of silk. Bee Rearing: types of honeybees, types of bee culture and environment factors, biological properties of honey and its health aspects. Farm visit.

**UNIT V**

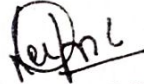
**Aquaculture:** Pearl culture – types, pearl enhancement conditions, harvesting, economical importance. Fisheries – shrimp culture, prawn culture, ornamental fishes, nutritive value of fish. Farm visit.




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## REFERENCES

1. Philip G. Miles, Shu-Ting Chang, Mushrooms: Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact, 2<sup>nd</sup> edition, 2004.
2. M. E. Gershwin, Amha Belay, Spirulina in Human Nutrition and Health, 1<sup>st</sup> edition, CRC Press, 2007.
3. R A Dunham, Aquaculture and Fisheries Biotechnology. Genetic approaches, 1<sup>st</sup> edition, CABI Publishing, 2004.

  
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SEMESTER – V

Course : Cancer Biology

Credit : 2

Course Code: 15UAQAL508

**Objectives**

- To understand the common cellular and molecular mechanisms in cancer cells.
- Encourage the development of critical thinking and analytical skills that enable critical interpretation of primary scientific literature.

**UNIT I**

**Basics of Cancer:** History, Scope and Current scenario of Cancer research. Cancer – Types and their prevalence, –Carcinoma, Lymphoma and Malignancy - Classification based on Origin/Organ: Breast, Colon, Lung, Prostrate, Cervical and Oral cancers.

**UNIT II**

**Cell cycle and cell culture:** Regulation of the Eukaryotic cell cycle, Cell birth, Lineage and cell death. Cellular morphology, Primary and Established cell lines, Kinetics of Cancer cell growth, Genetics of cancer cells. Cancer stem cell culture and their applications. Cell culture based Vaccines.

**UNIT III**

**Molecular mechanism of Oncogenesis:** Proto oncogenes, Oncogene, Oncoproteins, Other tumour suppressor proteins and Receptors proteins involved in cancer.

**Apoptosis and Cancer:** Mechanism of apoptosis - Proteins involved in apoptosis - Signaling pathways: Types and their impact on apoptosis and oncogenesis - Significance of RB, Cyclins, RTK, CDKs, related pathways.

**UNIT IV**

**Cell Signalling in Cancer Cell lines:** MCF-7, HeLa, HepG2 and A549. Types of Signaling pathways that control gene activity, Integration of signals and gene controls. Moving proteins into membranes and organelles, Vascular traffic, secretion and endocytosis, Metabolism and movement of lipids.



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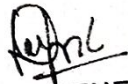
## UNIT V

**Principle and methods of cancer diagnosis:** Biochemical, Genetic, Cytotoxic and cell growth and viability tests.


**Cancer Therapy:** Cellular level- Gene level- Protein level. Principles of Cancer biomarker and their applications – Chemotherapeutics for Cancer, Phytotherapy for Cancer.

## REFERENCES:

1. Tannock IF and Hill RP, The Basic Science of Oncology, Third Edition, McGraw- Hill, New York, 1998.
2. Bronchud MH, Foote M, Giaccone G, Iopade O and Workman P. Principles of Molecular Oncology, Third Edition, Humana Press. New Jersey, 2008
3. Depatin KM and Fulda S, Apoptosis and Cancer Therapy, WILEY-VCH Verlag GmbH and Co., New York, 2008
4. Hayat MA, Methods of Cancer Diagnosis, Therapy, and Prognosis, Vol-7; Springer. Netherland, 2010
5. Missailidis S, Anticancer Therapeutics, John Wiley and Sons, Ltd., USA, 2008.

  
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## SEMESTER V

Course : Research Methodology

Credit: 2

Course Code: 15UAQAL509

### Objectives

- To gain a knowledge in the field of research.
- To ensure and develop in various advanced techniques and get a crystal clear ideas in recent advents and to overcome the obstacles faced during research.

### UNIT I

**Introduction To Research Methodology:** Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Literature collection, Literature citation, Criteria of Good Research.

### UNIT II

**Report and Thesis Writing:** Research report: components, Format of thesis and dissertation, Manuscript/research article, Review monographs, Bibliography and Reference, footnotes, Significance of research. oral presentation, Preparation, Making presentation, Practice, Use of visual aids, Importance of effective, communication.

### UNIT III

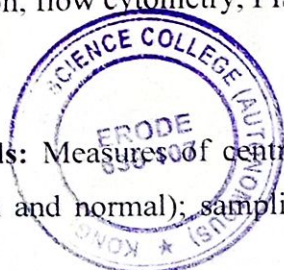
**Biophysical Methods:** Fluorescence, mass spectrometry and surface plasma resonance methods. SEM, TEM-different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM

### UNIT IV

**Immunological Methods:** Radio isotopes used in biology, radioisotopes detection and measurement. Immunotechniques: Antibody generation, ELISA, RIA, western blot, immunoprecipitation, flow cytometry, FISH and GISH.

### UNIT V

**Statistical Methods:** Measures of central tendency and dispersion, probability (Binomial, Poisson and normal); sampling distribution; difference between parametric and

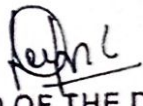


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## REFERENCES

1. C.R. Kothari, 11nd edition, Research methodology, Methods and techniques, New Age Internation (P) Ltd, Publishers, New Delhi, 2004
2. Jerrod H. Zar. Biostatistical analysis by, Prentice Hall International, Inc. Press, London, 1999.
3. Attwood. T.K and Parry-Smith D.J., Introduction to Bioinformatics, Pearson education Singapore, 2002.
4. Sharma.BK.Instrumental methods of chemical analysis. GOEL Publishing House, Meerut, 2004.
5. Upadhyay, Upadhyay and Nath, Biophysical chemistry, Himalaya Publishing House, 2009
6. Khandpur R.S. Handbook of biomedical instrumentation , Tata Mc Graw Hill Publishers, 2011.

  
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## SEMESTER VI

Course : Introduction to Bioinformatics

Hours per week: 4

Course Code : 15UAQCT601

Credit: 3

**Objectives**

- To have an innovative idea on computational skills
- To acquire knowledge about various databases used.

**UNIT I**

**Introduction:** Definition, Branches of Bioinformatics, Aim of Bioinformatics, Scope and Research areas of Bioinformatics. Internet, World Wide Web, Web browser, data base browser and search engines. Various file formats for biological sequences. Data banks – Gen Bank, PDB, Pub Med, Med line.

**UNIT II**

**Database:** Introduction, definition and importance of databases. Types of database - Biological database (Protein and nucleic acids databases – EMBL, DDBJ, NCBI and DBMS). Structural database – KEGG. Specialized database – Genome database, metabolic pathway database and microarray database.


**UNIT III**

**Sequence Alignment:** Sequence analysis of biological data. Significance of sequence alignment. Use of scoring matrices (BLOSUM and PAM) and gap penalties in sequence alignments. Types of alignments, Pairwise sequence alignment, Algorithm (Needleman Wunsch and Smith Waterman), Tools for sequence alignment – FASTA and BLAST. Multiple sequence alignment, application of multiple sequence alignment.

**UNIT IV**

**Gene prediction:** Analysis and prediction of regulatory regions. Fragment assembly. Genome sequence assembly, Restriction Mapping, Repeat Sequence finder. Protein prediction strategies, molecular visualization tools (Rasmol, Swiss pdb viewer, Pymol, Jmol), phylogenetic analysis: Concept of trees, phylogenetic trees and multiple alignments.



  
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## UNIT V

**Gene Characterization and Drug Discovery:** Concepts of secondary structure prediction of RNA. Probabilistic models: Markov chain. Hidden Markov Models- other applications. Discovering a drug, target identification and validation, identifying the lead compound, optimization of lead compound, chemical libraries.

## TEXT BOOK

S. Ignacimuthu. Text book of Basic Bioinformatics, Alpha Science International, 2005.

## REFERENCES

1. T. K. Altwood, D. J. Parry-Smith, Introduction to Bioinformatics, Pearson Education, 2004.
2. S. C. Rastogi, N. Mendiratta and P. Rastogi, Bioinformatics – Methods and application. Third edition. PHI Learning Pvt Ltd, New Delhi, 2006.
3. Andreas, Baxevanis and Francis Ouellette, Bioinformatics – A practical guide to the analysis of genes & protein III Edition, Wiley Publishers, 2005.
4. David H Mount, Bioinformatics – Second Edition. CBS Publishers, New Delhi, 2005.

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## SEMESTER VI

Course : Animal Biotechnology, Bioethics and IPR

Hours per week: 5

Course Code: 15UAQCT602

Credit : 4

**Objectives:**

- To study about various culture techniques for animal cells.
- To acquire knowledge about principles followed in animal cell culture.

**UNIT I**

**Introduction to Cell Culture:** Scope of animal tissue culture, Lab requirements for aseptic conditions, Balanced Salt Solution, Culture Media - natural media, complex media, chemically defined media, advantage and disadvantage of serum in media, importance of different media components for the growth of animal cells, antibiotic growth supplements, sterilization of glassware and media. Explant isolation and culture, Primary culture – Types, Behavior of cells and their properties.

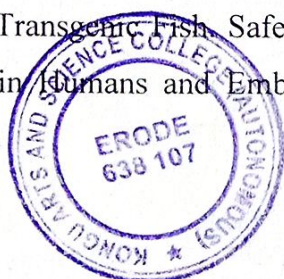
**UNIT II**

**Cell lines:** Secondary culture, Transformed cell lines, Continuous cell lines, commonly used animal cell lines, their origin and characteristics. Enzymatic and mechanical disaggregation of cells. Maintenance and growth kinetics of cells in culture - differentiation of cells, measurement of growth and viability of cells in culture, cytotoxicity assays and their applications. Cryopreservation, Thawing. Stem cell cultures, embryonic stem cells and their applications. Scaling up of animal cell culture.

**UNIT III**

**Applications:** Animal cell culture for *in vitro* testing of drugs and environmental pollutants, application of cell culture technology in the production of human and animal viral vaccines, monoclonal antibodies and pharmaceutical proteins.

**Concept of Transgene and Transgenics:** Transgene, Methods of gene transfer, Transgenic organisms, Transgenic Mice – expression of foreign genes and their application in research, Transgenic Cattle, Transgenic Fish, Safety and ethical issues of transgenic animals. *In vitro* fertilization (IVF) in Humans and Embryo Transfer in Livestock, application of Embryo transfer technology.



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## UNIT IV

**Bioethics:** Patenting live microorganism, animal cloning and experimenting on animals, human cloning and their ethical issues, testing drugs on human volunteers. Hazardous materials used in Biotechnology, their handling and disposal. Public concerns and risks associated with genetic engineering, public education of producing transgenic organism. Ethical, social and legal implications of Biotechnology.

## UNIT V

**Basic Concepts of Intellectual Property:** Introduction to intellectual property rights, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights. Intellectual property laws, Trade Related Aspects of Intellectual Property Rights. Forms of IPR like patent, design, copyright and trademark. Indian patent act 1970.

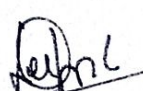
## TEXT BOOK


R. Ian Freshney: Culture of Animal cell; 6th edition, Wiley-Blackwell Publishers, 2010.

## REFERENCES

1. B.Hafez and E.S.E Hafez, Reproduction in farm animals, 7th Edition, Wiley Blackwell, 2000.
2. G.E. Seidel, Jr. and S.M. Seidel, Training manual for embryo transfer in cattle (FAO Animal Production and Health Paper-77), 1st Edition, W.D. Hoard and sons FAO, 1991.
3. I. Gordon, Laboratory production of cattle embryos, 2nd edition, CAB International, 2003.
4. Louis-Marie Houdebine, Transgenic Animals: Generation and Use 5th Edition, CRC Press, 1997.



  
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## SEMESTER VI

Course: Lab in Immunology and Plant Tissue Culture  
Course Code: 15UAQCP603

Hours per week: 4  
Credit: 4

### Objectives

- To acquire skills about basic and advanced techniques in immunology.
  - To develop hands-on training in plant tissue culture methodologies.
1. Methods of immunization and bleeding
  2. Preparation of antibodies
  3. Preparation of serum from blood
  4. Antigen – antibody reaction
  5. Haemoagglutination test -ABO blood grouping
  6. Passive agglutination test –ASO- Anti-streptolysin O Test
  7. Agglutination inhibition test -pregnancy test
  8. Immuno diffusion (Single radial, double, CIE and rocket) tests
  9. Plant tissue culture media preparation –MS media, Nitsch’s media, White’s media
  10. Micropropagation
  11. *In vitro* germination of seed
  12. Callus induction and differentiatio.
  13. Embryo Culture
  14. Anther Culture
  15. Isolation and fusion of protoplasts
  16. Artificial seed production
  17. Hardening- Demonstration.

### REFERENCES

1. John E. Coligan, Current Protocol in Immunology, Wiley Publishers, 2001.
2. Bhojwan Razdan, Plant Tissue Culture – Theory and Practice Revised Edition, Elsevier, 2011.



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**SEMESTER VI**

Course: Lab in rDNA Technology and Industrial Biotechnology Hours per week: 4

Course Code: 15UAQCP604

Credit: 4

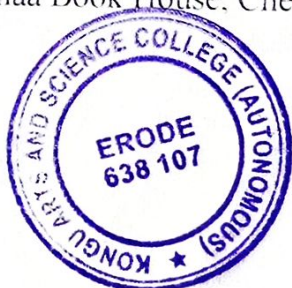
**Objectives**

- To get hands-on training on Recombinant DNA Technology.
- To acquire knowledge about various experiments carried out in Industrial sector.

1. Isolation of Genomic DNA from Bacterial cell
2. Isolation of DNA from Animal tissue
3. Isolation of DNA from Plant sample
4. Isolation of Plasmid DNA from bacterial cell
5. Quantification of DNA by UV spectrophotometry
6. Agarose Gel Electrophoresis
7. Restriction digestion of DNA
8. Ligation of DNA
9. Demonstration of Southern blotting
10. Fermentor – Parts and Design
11. Isolation of amylase-producing bacteria
12. Production of Industrially important enzymes – amylase, protease
13. SCP Production
14. Wine Production
15. Immobilization of cells
16. SDS - PAGE
17. Demonstration of Western blotting.

**REFERENCES**

1. Sambrook and Russell. Molecular cloning A laboratory manual- 3<sup>rd</sup> Edition. CSHL press, 2001.
2. S.Rajan and Ms. R.Selvi Christy, Experimental Procedures in Life Sciences, Anjanaa Book House, Chennai, 2012.



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## SEMESTER VI

Course : Industrial Biotechnology

Hours per week: 5

Course Code: 15UAQET605

Credit: 4

### Objectives:

- To have an innovative idea on entrepreneurship
- To acquire knowledge about various business fields in advanced Biotechnology.

### UNIT I

**General requirements of fermentation processes:** Isolation, screening, preservation and improvement of industrially important microorganisms, development of inocula for industrial fermentations. Types of media for fermentation processes. Methods to achieve sterility- physical and chemical methods. Thermal death kinetics of microorganisms.

### UNIT II

**Bioreactor parts and design:** Parts of a bioreactor, control systems (speed, temperature, gas supply, pH, dissolved oxygen, antifoam control), manual and automatic control. Types of reactor – Stirred Tank, Airlift, Bubble column, packed bed, Trickle bed and Fluidized bed. Types of fermentation- submerged fermentation (batch, fed-batch, continuous), Solid state fermentation (tower and drum).

### UNIT III

**Downstream processing:** Introduction to downstream processing, solid liquid separation - centrifugation, filtration, flocculation. Release of intracellular components - mechanical and non-mechanical methods, concentration (evaporation, membrane filtration, precipitation), purification, formulation.

### UNIT IV

**Production of pharmaceutical products:** penicillin and streptomycin, alcohol production - Beer and wine, organic solvent- ethanol and acetone, Organic acid- Citric acid, lactic acid and acetic acid, Fermented food- bread, cheese, yogurt, Production of vitamin B12, Single cell protein.



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## UNIT V

**Industrial enzymes:** Industrial applications of enzymes (food, paper, beverage and detergent industry). Enzymatic bioanalysis, Enzyme production – amylase, protease and lipase. Enzyme immobilization- Covalent linkage, adsorption, micro encapsulation, entrapment. Immobilization of cells.

## TEXT BOOK

Nduka Okaford, Modern Industrial Microbiology and Biotechnology, 4<sup>th</sup> edition, CRC press, 2001.

## REFERENCES

1. Michael J. Waites, Neil L. Morgan, John S. Rockey and Gary Higton, Industrial Microbiology: An Introduction, Wiley Publishers, 2001
2. Wulf Crueger and Anneliese Crueger, Biotechnology A Textbook of Industrial Microbiology- 2<sup>nd</sup> Edition, Sinauer Associates. Inc., 1990.
3. U. Sathyanarayana, Biotechnology, Books and Allied Pvt. Ltd, 2007.

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## SEMESTER VI

Course : Pharmaceutical Biotechnology

Hours per week: 5

Course Code : 15UAQET606

Credit: 4

### OBJECTIVES

- Identify appropriate sources of enzymes and relevant tests for specific infectious disease states.
- To enrich students about the current status of development of vaccines and economic importance of biotech products.

### UNIT I

**Introduction:** Pharmacology origins and antecedents, Pharmacology in the 20th century, Drugs – Sources, dosage forms and routes of administration. Absorption, factors modifying drug absorption, distribution, metabolism – Phase I, II reactions, action of cytochrome P450.

### UNIT II

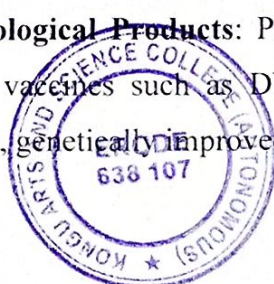
Targets for drug action, receptor proteins, ion channel and drug targets, control of receptor expression, assay of drug potency: Chemical, bioassay and immunoassay-Drug tolerance and drug dependence. Principles of basic Pharmacokinetics, Adverse response to drugs, drug intolerance, drug allergy, tachyphylaxis, drug abuse, vaccination against infection, factors modifying drug action and effect.

### UNIT III

Mechanism of action of drugs used in therapy of Respiratory systems – cough, bronchial asthma, pulmonary tuberculosis Cancer chemotherapy. Antimicrobial drugs – sulfonamide, trimethoprim, penicillins, aminoglycosides and bacterial resistance. Thyroid and anti thyroid drugs, insulin and anti diabetic drugs, anti fertility and ovulation inducing drugs.

### UNIT IV

**Immunological Products:** Principles, production and storage aspects of conventional and modern vaccines such as DNA vaccines, anticancer vaccines, genetically improved live vaccines, genetically improved sub unit vaccines, synthetic peptide based vaccines.



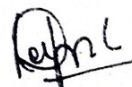
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## UNIT V


“Omic” technologies and Molecular tools: Overview of proteomics, genomics, pharmacogenomics and biomarkers. Application of biotechnology in pharmacokinetics and pharmacodynamics, in vitro expression of metabolic enzymes and their applications, isolation and characterization of receptors.

## REFERENCES

1. Jens T. Cartensen and C. T. Rhodes, Drug stability principle and practice, 3<sup>rd</sup> Ed. Vol. 107, Marcel Dekker.
2. Rodney pealman, Y. John wang, Formulation characterization and stability of protein drugs, 1996.
3. Eugene J. McNally, Jayne E. Hasted, Protein formulation and delivery 2<sup>nd</sup> Ed. Informa-healthcare.
4. Sven frokjaer and lars hovgaard, Pharmaceutical formulation development of peptides and proteins, 2000.
5. Sarfaraz K. Niazi. Handbook of Preformularion, Informa Healthcare, 2007.



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## SEMESTER VI

Course : Genomics and Proteomics

Hours per week: 5

Course Code : 15UAQET607

Credit: 4

### Objectives

- To acquire the knowledge of recent development in the field of Genomics
- To study the various techniques used in the field of Proteomics.

### Unit I:

**Structure and organization:** Prokaryotic and eukaryotic genome, gene structure and gene density of prokaryotes and eukaryotes, variations in the general structure and organization in genomes expression profiles.

### Unit II:

**Sequencing and cloning techniques:** Nucleotide and protein sequencing, Genome sequencing; various techniques: shot gun, clone contig approach, chromosome walking, primer walking, chromosome jumping, contig assembly.

### Unit III:

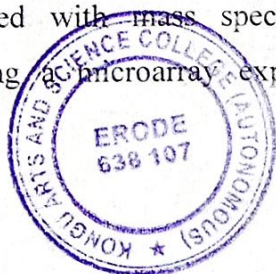
**Genetic markers:** RAPD, RFLP, STR, SSLP, VNTR. Physical markers, ESTs, STS, FISH, Radiation hybrid, Sequence marker, SNP'S, genome marking and mapping techniques, genomic DNA library, cDNA-library.

### Unit IV:

**Human genome project-** transcript on structural and functional genomics, comparative and population genomics, Pharmacogenomics and Phylogenetics, Functional Proteomics, genotype-phenotype relationship, polygenic nature of proteins.

### Unit V:

**Analytical methods:** Mass spectrometry based methods for protein identification, 2-D gel electrophoresis coupled with mass spectrometry, Micro array techniques- Types of micorarrays, Designing a microarray experiment. Microarray Technology in Treating Disease.



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### TEXT BOOKS

1. S. B. Primrose and R.M. Twyman. 7th Edition. Principles of Genome Analysis and Genomics. Blackwell Publishing. 2006.
2. S. Sahai Genomics and Proteomics. Functional and Computational Aspects, Plenum Publication, 1999.

### REFERENCES

1. Andrezej K Konopka and James C. Crabbe, Compact Hand Book- Computational Biology. Marcel Dekker. USA. 2004.
2. Pennington & Dunn, 1st edition. Proteomics from Protein Sequence to Function, . Academic Press. San Diego. 1996.

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## SEMESTER VI

Course : Project

Hours per week: 5

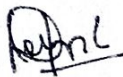
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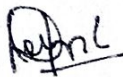
Credit : 4

### GUIDE LINES FOR PROJECT WORK

- Student has to take up the project work for a period of six months.
- Guide will be allocated to each students and the project title should be approved by the guide.
- The Project work should be compulsorily done in the college only under the supervision of the department faculty concerned.
- Students should communicate with their guides regularly regarding the progress of the project.
- The Project should be presented in the Two Project Review meeting with the approval of the guide.
- The drafted reports have to be submitted to their guides within ten days from the date of Review-II
- Students should submit one copy of the Final Project Report in the form of hard binding during the End Semester Examination after they are duly signed by the concerned guides and the Head of the Department.
- No Students shall be permitted to appear for Viva Voce without the project report.
- The following Guidelines should be followed in the preparation of Project Report:  
For the **General Text**: Font Colour: **Black**, Font Type and Size: **Times New Roman-12 point**, Line Spacing: **1.5**, Alignment: **Justified**, Margins: **Left-1.25", Right-1", Top and Bottom- 0.75"**.



  
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## SEMESTER VI

Course : Environmental Biotechnology

Hours per week: 5

Course Code : 15UAQET609

Credit: 4

### Objectives

- To have a deep knowledge in ecology and environmental cycles.
- To acquire knowledge about Biodiversity and its aspects.

### UNIT I

**Introduction to Ecology:** Scope and branches of ecology, Abiotic factors (water, soil, temperature, light. Biotic factors – Animal relationship, Symbiosis, Commensalisms, Mutualism, Antagonism, Antibiosis, Parasitism, Predation, Competition. Structure of pond and forest ecosystem, primary production, secondary production, food chain, food web, trophic levels, energy flow, ecological pyramids (number, biomass and energy). Ecological succession, Biogeochemical cycle: Nitrogen and Phosphorous.

### UNIT II

**Environmental Pollution:** Classification of pollutants, Air pollution, Gaseous pollution, water pollution, noise pollution, soil pollution, thermal pollution, marine pollution, solid water pollution. Green house effect, ozone and its importance, global warming, acid rain. Principles of environment impact assessment and environmental monitoring. Bioaccumulation, Biomagnification. Biosorption, Biosensors and Bioindicators for detection of pollution.

### UNIT III

**Environment and energy:** Renewable source of energy: Biomass and Biogas production. Generation of energy and fuel using microorganisms (Hydrogen production and Methane production). Brief account on alternative energy source: Biofuel. Bioremediation, Bioleaching, Biodegradation of plastic, pesticides and hydrocarbons, Biotransformation.



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**UNIT IV**

**Waste water treatment:** waste water collection, physico-chemical properties of waste water, physical, chemical and biological treatment processes - activated sludge, oxidation ditches, trickling filter, rotating discs, rotating drums, oxidation ponds. Anaerobic digestion, anaerobic filters, up flow anaerobic sludge blanket reactors. Treatment schemes for waste waters of distillery, tannery and sugar industries.

**UNIT V**

**Introduction to Biodiversity:** Levels of biodiversity, values of biodiversity, loss of biodiversity, Species concept, biodiversity conservation: *in situ* and *ex situ*. Magnitude and distribution of biodiversity, wild life biology and conservation strategies, measures of biodiversity, biodiversity in India and global level, biodiversity hot spots.

**TEXT BOOK**

Sharma, P.D, Ecology and environment. Rsatogi publications, Meerut, 1990.

**REFERENCES**

1. Durga Natha Dhar, Shalin Kumar, Triloki Vaish. Environment and Ecology, 1<sup>st</sup> edition, Vayu Education of India, 2009
2. SVS Rana, Environmental Pollution, Narosa Publishing House, 2009.
3. Ritu Bir, Environmental studies, 1<sup>st</sup> Edition, Vayu Education of India, 2009.
4. Dhandapani Alagiri, E. Naven kumar, Environmental pollution and Protection, 1<sup>st</sup> Edition, The Icfai University press, 2007.

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## SEMESTER VI

Course : Virology and Vaccinology

Hours per week: 5

Course Code: 15UAQET610

Credit: 4

## Objectives

- To obtain basic knowledge in morphology of virus and its replication
- To have a brief idea on development of vaccines and their applications.

## UNIT I

**Historical perspectives of virology:** Viruses and their importance, Properties of viruses- biochemical and morphological structure of viruses. Methods used in virology - cultivation and purification of viruses, Diagnostic methods - Nucleic acid based diagnosis, Microscopic techniques and Analytical techniques.

## UNIT II

**Classification and nomenclature of viruses:** Modern classification, Baltimore classification of virus, dsDNA virus, ssDNA virus, dsRNA virus. Plus and minus-strand RNA virus, Retrovirus, Human immunodeficiency virus, Reverse-transcribing DNA virus, Bacterial virus, Animal virus, Bacteriophages, emerging viruses.

## UNIT III

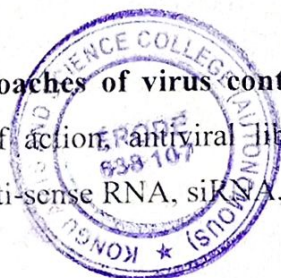
**Overview of virus replication:** Attachment and entry into cells, TRANSCRIPTION, translation and transport in eukaryotes and prokaryotes. Assembly and exit of virions from cells. Outcome of infection for the host, Factors affecting outcomes of infection, Non-productive infections, Productive infections.

## UNIT IV

**Vaccine and delivery methods:** Conventional vaccines -killed and attenuated, modern vaccines-recombinant proteins, subunits, DNA vaccines, peptides, immunomodulators (cytokines), Vaccine delivery and adjuvants

## UNIT V

**Modern approaches of virus control** Interferons, designing and screening for antivirals, mechanisms of action, antiviral libraries, antiretrovirals- mechanism of action and drug resistance. Anti-sense RNA, siRNA, ribozymes, in silico approaches for drug designing.



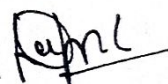
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### TEXT BOOKS

1. Carter J & Saunders V. 1st Ed Virology: Principles and Applications. Wiley Publications.2007.
2. Ananthanarayanan. R. and C.K.J. Panicker. 7th Edition. Text book of Microbiology. Orient Longman. New Delhi. 2005.

### REFERENCES

1. Stephen K. Tying. Antiviral Agents, Vaccines, and Immunotherapies. Publisher: Marcel Dekker, 2004.
2. Paul F. Torrence. Antiviral Drug Discovery for Emerging Diseases and Bioterrorism Threats, Wiley, John & Sons, Incorporated, 2005.



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## SEMESTER VI

Course : Medical Biotechnology

Hours per week: 3

Course Code : 15UAQST611

Credit: 3

### Objectives

- To study the biotechnological approaches used in the medical field
- To understand the various bio-techniques employed to serve mankind such as *in vitro* fertilization, diagnostics, gene therapy and vaccine.

### UNIT I

**Introduction:** History and scope of medical biotechnology, current status and future prospects, tools in medical biotechnology.

**Identification of disease genes:** Functional cloning (Eg. Haemophilia gene), Positional cloning (DMD and CGD genes), Candidate gene approach (Alzheimer's disease). **Molecular basis of human diseases:** Gain of function mutations (Oncogenes, Huntingtons Disease), Loss of function (Tumour Suppressor Genes), Gene Dosage Effect.

### UNIT II

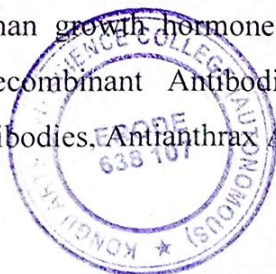
**Diagnostics:** Prenatal diagnosis - Invasive techniques (Amniocentesis, Fetoscopy, Chorionic Villi Sampling (CVS)), Non-invasive techniques (Ultrasonography, X-ray, TIFA, maternal serum and fetal cells in maternal blood). Diagnosis using protein and enzyme markers, monoclonal antibodies. DNA/RNA based diagnosis (Hepatitis, HIV - CD 4 receptor).

### UNIT III

**Stem cell therapy:** Embryonic and adult Stem Cells, Totipotent, Pluripotent and Multipotent Cells. Testing and generation of embryonic stem cells, Testing for adult stem cells and differentiation, Potential use of stem cells – Cell-based therapies.

### UNIT IV

**Protein therapeutics:** Humulin, Erythropoietin, Growth Hormone/Somatostatin, tPA, Interferon, human growth hormone, Tumor Necrosis Factor, Engineered Bacteriophages, Interleukin. **Recombinant Antibodies:** Hybrid Human-Mouse Monoclonal Antibodies, Anticancer Antibodies, Antianthrax Antibodies, Antiobesity Antibodies.



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## UNIT V

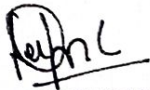
**Vaccinology:** Active and passive immunization, Live, killed, attenuated, sub unit vaccines. Vaccine technology - Role and properties of adjuvants, recombinant DNA and protein-based vaccines, plant-based vaccines, reverse vaccinology, Peptide vaccines, conjugate vaccines. Antibody genes and antibody engineering - chimeric- and hybrid monoclonal antibodies. Catalytic antibodies and generation of immunoglobulin gene libraries.

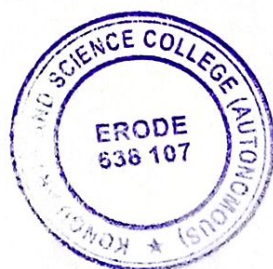
## TEXT BOOK

Bernard R. Glick, Terry L. Delovitch, Cheryl L. Patten, Medical Biotechnology, I edition, ASM Press, 2013.

## REFERENCES

1. Bernard R. Glick, Jack J Pasternak, Cheryl L. Patten, Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4<sup>th</sup> edition, ASM press, 2009.
2. M .M. Ranga, Animal Biotechnology, Agrobios India, 2006.
3. N. V. Bhagavan, Medical Biochemistry, IV Edition, Harcourt Academic Press, 2002.
4. Ciddi Veeresham, Medicinal Plant Biotechnology, CBS Publishers and Distributors, 2006.

  
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# **KONGU ARTS AND SCIENCE COLLEGE**

**(An Autonomous Institution, Affiliated to Bharathiar University, Coimbatore)**

**ERODE – 638 107**

# **ACTIVITIES**



KONGU ARTS AND SCIENCE COLLEGE  
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DEPARTMENT OF BIOTECHNOLOGY

DEPARTMENT INAUGRTION  
REPORT



The Department Inauguration -Creauctus-17' was held on 17<sup>th</sup> July 2017 (AN), Dr. A. S. Krishnamoorthy, Professor and Head, CPPS, TNAU, Coimbatore, was the Chief Guest.

An Orientation programme was organized for I B.Sc Biotechnology students on 17<sup>th</sup> July 2017(FN) and the Resource person was Dr. A. S.


Krishnamoorthy, Professor and Head, CPPS, TNAU, Coimbatore.

The Department ceremony of inauguration was enlightened by chief guest, biotechnology staffs and students. The association barriers were introduced.

The afternoon session was brightened by the guest delivering himself with all his experience overcome in his career. The I UG students interacted with guest and they were furnished with knowledge.

  
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## KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE

### INDUSTRIAL VISIT TO “CENTER FOR MARINE FISHERIES RESEARCH INSTITUTE”

#### REPORT




An Industrial visit to Centre for Marine Fisheries Research Institute, Cochin, Kerala, was arranged for III B.Sc Biotechnology on 11<sup>th</sup> August 2017.

The students of III B.Sc biotechnology were in thirst of knowledge in acquiring the details of fishery research. They had a trip inside the laboratory and were in enthusiasm to learn the different types of fishes.

Students also enquired about recent techniques implemented in their research and subjected to know the importance of Marine Biotechnology.

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FARM VISIT TO "R AND D LABS"

REPORT

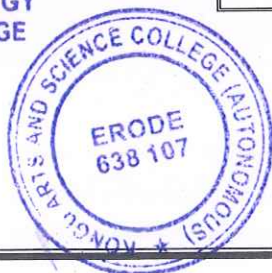



One day Farm visit has been arranged for IIB.Sc Biotechnology Students on 19<sup>th</sup> August 2017 and they have been taken to R& D Labs, Yercaud.

The lab was organized with objectives and protocols to be followed by the outsiders. Our students followed the procedures and entered inside. They were taught with SDS PAGE, Electrophoresis and other techniques.

The students were satisfied with the visit. They learned the technique and skills rapidly with interactions.

  
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INTRAMURAL QUIZ COMPETITION  
REPORT



The Department organized Intramural Quiz Competition- INSTACRACKERS' 17 on 07<sup>th</sup> September 2017.

The Quiz competition among students created a good team bond. They were much involved in answering the questions with interest. The group students also were fast and capable of answering all the rounds. The students who won the competition had a great victory on themselves.

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WORKSHOP ON PHOTOSHOP

REPORT



One day workshop on Photoshop was arranged to the II B.Sc Biotechnology students and the session was handled by Mr. K.V. Arun Kumar, Assistant Professor, Department of Costume Design and Fashion of our college on 11<sup>th</sup> December 2017.



The guest threw his knowledge on the designs and techniques which he recently approached. He also gave an hands on training in designing the fabrics. Also enforced the importance of biotechnology application used in costume designing.

*K.V. Arun Kumar*

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YOGA PROGRAMME

REPORT



Yoga programme was conducted to II B.Sc Biotechnology students by Dr. K.M.Jayalakshmi, IMAGO Activ Fitness Centre, Erode on 14<sup>th</sup> December 2017.

Yoga makes the body, mind and soul in a linear stage. All the 3 factors are important for human life. The guest gave a brief introduction about asana, balanced diet, yoga and meditation to be followed daily in their life. The students were much interest in practicing the yoga movements and in Shanthi meditation.



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### ONE DAY FARM VISIT TO "AAVIN DIARY"

#### REPORT



One day Farm visit has been arranged for First year Students on 28<sup>th</sup> December 2017 and they have been taken to Aavin Dairy, Chittode, Erode.

The students were keenly observing the process of milk collected from farmers, processed, packed and dispatched. They entered various sectors in the unit and learned the protocol. The students enquired about the eligibility of degree to work in this unit in future.



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**HANDS ON TRAINING ON MUSHROOM  
CULTIVATION  
REPORT**



Hands on training Programme on Mushroom Cultivation were arranged for III B.Sc Biotechnology students on 28<sup>th</sup> December 2017 and they have taken to Tamilnadu Agricultural University, Coimbatore.



Mushroom cultivation is an important task in producing the product without contamination. TNAU staffs gave on hands on training to the students on handling the spores and precursor methods to be followed in Cultivation unit. The students learned the skill of processing, inoculating, cultivating and packing

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GUEST LECTURE ON BASIC  
BIOINFORMATICS  
REPORT




A Guest Lecture on Basic Bioinformatics was arranged for III B.Sc Biotechnology students and the session was handled by **Ms.S.Karthikeyeni**, Associate Professor, Department of Computer Science (PG) of our college on 16.2.2018.

*In silico* studies are vital for Life Science students. The guest delivered the software applied in drug designing, importance of biology concepts in computer. She also discussed the Human Genome Project and sequencing.



  
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### PERSONALITY DEVELOPMENT PROGRAM

#### REPORT



Personality Development Programme was organized for III B.Sc Biotechnology students on 26<sup>th</sup> February 2018 and the chief guest was Mr. Arun Prasadh Trainer, Lions Club, Erode, Coimbatore.

The students were interested in developing their personality and they had a good approach with guest. The guest gave the idea of confidence, faith in them, also having a positive thoughts.

He listed out certain points which make the student successful in their future.



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GUEST LECTURE  
REPORT



The Department arranged for a Guest lecture on 28.02.18 (FN) for B.Sc Biotechnology students and the chief guest was Dr. H.Sridhar, Co-founder & CTO, GREENWRAP, Chennai.

The guest lecture was informative and interactive. He gave a broad topic on importance of biotechnology, applications, techniques and recent research. The students were content with the concepts.

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VALEDICTORY PROGRAMME  
REPORT




The Biotechnology department Association Valedictory function was conducted on 28<sup>th</sup> February 2018 and the chief guest was Dr. H.Sridhar, Co- founder & CTO, GREENWRAP, Chennai.

The overall activities for the academic year was delivered to the students. The day was ended with prize distribution to the winners and honored by the resource person.

  
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