



KONGU ARTS AND SCIENCE COLLEGE

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

ERODE – 638 107

PROGRAM NAME

B.Sc. (Biotechnology)



KONGU ARTS AND SCIENCE COLLEGE

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2019-2020



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SYLLABUS

Semester	Course Code	Core Paper I Cell Biology	Total Marks:100		Hours Per Week	Credits
I	19UAQCT101		CIA: 25	ESE: 75	5	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.

Course Outcome

On successful completion of the course, the students will be able to:

- CO1 Understand the basic concepts about cell and its classification
- CO2 Ability to analyze and interpret the behavior of cells in their microenvironment in multi-cellular organisms
- CO3 Elaborate the ideas regarding the function and cellular organization of intracellular organelles
- CO4 Explain the structure of chromosome and its organization
- CO5 Understand cell cycle and cell division and various techniques used in Cell Biology

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 (Fluid Mosaic model). 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.




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UNIT III

Structural organization and function of intracellular organelles: Cell wall, mitochondria, golgi complex, ribosomes, lysosomes, microbodies, plastids (chloroplast) and mechanism of photosynthesis, vacuoles. Cytoskeleton and its role in motility. Diseases caused by malfunctioning of cell organelles – Mitochondria, Endoplasmic Reticulum, Lysosomes.

UNIT IV

Nucleus: Ultra structure, Eukaryotic chromosome morphology- chromatin (euchromatin and heterochromatin), 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, tRNA, rRNA).

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.

Techniques in Cell Biology: Histochemistry of tissues, Karyotyping, Comet assay and Flow cytometry


TEXT BOOK

Ajoy Paul, Text Book of Cell and Molecular Biology, III Edition, Books and Allied Ltd, Kolkata, 2015.

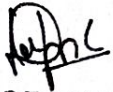
REFERENCES

1. Lodish *et al.*, Molecular Cell Biology, VIII Edition, W.H. Freeman & Company, New York, 2016.
2. Gerald Karp, Cell and Molecular Biology, VIII Edition, John Wiley and Sons, US, 2015.
3. Cooper, The Cell - A Molecular Approach, VIII Edition, Sinauer Associates, Inc., Massachusetts, 2018.





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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	Core Paper II Biochemistry	Total Marks:100		Hours Per Week	Credit s
			CIA: 25	ESE: 75		
I	19UAQCT102				5	4

Objectives:

- To understand the structure, function and metabolism of biomolecules
- To attain knowledge about enzymes and their mechanism.

Course Outcome

On successful completion of the course, the students will be able to:

- CO1 Elaborate the basic knowledge in structure, classification and function of carbohydrates and lipids
- CO2 Strengthen their knowledge with structural and functional biomolecules
- CO3 Relate their ideas with respect to enzyme classification, kinetics, regulation and inhibition of enzyme activity
- CO4 Create their significance towards the metabolic activity of carbohydrates and lipids
- CO5 Outline the ideas in synthesis and break down metabolism of amino acid and nucleotide

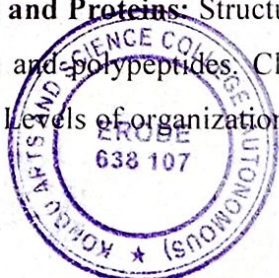
UNIT I

Carbohydrates: Classification, structure and functions of monosaccharides (trioses, tetroses, pentoses and hexoses), disaccharides (lactose, sucrose, maltose, cellobiose), polysaccharides (starch, glycogen, cellulose, hemicellulose, heparin and chondroitin sulphate).

Lipids: Structure, nomenclature and functions of fatty acids (saturated and unsaturated) Classification (simple, derived and compound) and uses of lipids, physical and chemical properties of lipids.

UNIT II

Amino acids and Proteins: Structure, classification and properties of amino acids. Peptides, oligopeptides and polypeptides. Classification of proteins based on structure, function and composition. Levels of organization of proteins - primary, secondary, tertiary and quaternary structures.



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Nucleic acids: Composition and structure of nucleic acids.

UNIT III

Enzymes: General properties, IUB classification of enzymes, active site - Lock and Key model, Koshland's induced fit hypothesis. Factors affecting enzyme activity (temp, pH, substrate concentration). Enzyme kinetics: Michalis - Menton equation, Line Weaver - Burke Plot. Regulation of enzyme activity: allosteric enzymes- positive and negative cooperativity. Enzyme inhibition – reversible (competitive, noncompetitive and uncompetitive) and irreversible. Co-enzymes, cofactors and vitamins.

UNIT IV

Carbohydrate Metabolism: Glycolysis (including aerobic and anaerobic fermentation), TCA cycle, gluconeogenesis, glycogen breakdown, ETC and oxidative phosphorylation, Pentose-phosphate pathway (sequence of reactions & regulation).

Lipid Metabolism: Oxidation of fatty acids (alpha and beta oxidation), Biosynthesis of cholesterol.

UNIT V

Amino acid metabolism: Amino acid deamination, Urea cycle, Outline scheme for amino acid breakdown and synthesis.

Nucleotide Metabolism: Biosynthesis of purine and pyrimidine (de novo and salvage pathway), degradation of purine and pyrimidine.

Minerals: Source, distribution, daily requirements, physiological functions and absorption of macronutrients (sodium, potassium, calcium, phosphorus) and micronutrients (iron and iodine).

TEXT BOOK

U.Satyanarayana and U.Chakrapani, Biochemistry, V Edition, Books and Allied, 2017.

REFERENCES


1. A.C.Deb, Fundamentals of Biochemistry, IX Edition, New Central Book Agency, Kolkata, 2008.
2. Nelson and Cox, Lehninger Principles of Biochemistry, VI Edition, W.H.Freeman and Company, 2012.



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3. Voet et al., Fundamentals of Biochemistry – Life at the Molecular Level,
V Edition, Wiley Plus, 2016.

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Semester	Course Code	Allied I Chemistry Paper I	Total Marks:75		Hours Per Week	Credits
			CIA: 20	ESE: 55		
I	17UAQAT103				4	3

Objectives

- To understand the importance of Atomic structure and chemical bonding.
- To know about Aromatic compounds and solutions.

Course outcome:

At the end of the course the students will be able to

- CO1 Predict atomic structure, chemical bonding or molecular geometry based on accepted models.
- CO2 Provide broad foundation about the merits and demerits of polymers.
- CO3 Acquire an idea about the chemical bonding polar bond and stereoisomerism
- CO4 Integrate the chemical reactions for fertilizers and usage of insecticides and pesticides
- CO5 Understand the principles of kinetics and thermodynamics as applied to rates and equilibrium positions of chemical reactions

UNIT I

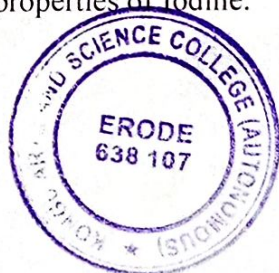
Atomic structure: Definition of Atoms, Molecules, Atomic particles- Proton, Neutron and Electron, Atomic weight, Atomic number. Isotopes, Isobars and Isotones.

Chemical bonding : Definition, Types – Covalent bond, Ionic bond, Coordinate covalent bond, Hydrogen bond and Vander Waal's Forces.

Molecular Orbital Theory: Concepts- Bonding and Anti-bonding molecular orbitals, Bond order. Applications of M.O Theory - H₂, N₂, O₂ and F₂. Diamagnetism and Para magnetism.

Interhalogen Compounds: Preparation, properties, structure and uses of Iodine mono Chloride (ICl).

Basic properties of Iodine.



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UNIT II

Industrial Chemistry

Synthetic Polymers: Preparation, Properties, Advantages, Disadvantages and Uses of Poly Vinyl Chloride (PVC) and Teflon.

Silicones: Preparation, Properties and Uses of Silicones.

Plastics: Definition of Thermoplastic and Thermosetting polymers - Preparation and Uses of Polythene and Epoxy Resins.

Dye: Chromophore, Auxochrome. Preparation, Properties and Uses of Azo dye (Methyl orange) and Vat dye (Indigo).

UNIT III

Covalent Bond: Orbital Overlap, Hybridisation, Geometry of organic molecules - CH_4 , C_2H_2 , C_2H_4 and C_6H_6 .

Polar Effects: Inductive effect, Electrometric, Mesomeric and Steric effects.

Stereoisomerism: Optical isomerism – Elements of symmetry. Isomerism in Tartaric acid. Racemisation and Resolution. Geometric isomerism – Maleic acid and Fumaric acid.

UNIT IV

Agricultural Chemistry

Fertilizers: Definition of Macronutrients - Ammonium Sulphate, Calcium Ammonium Nitrate, Urea, Calcium Super Phosphate and Triple Super Phosphate.

Soil Organic Matter: Definition and Sources of Soil Organic matter, Stability and benefits of Humus.

Insecticides: Properties, Uses and Applications of Organo Chlorides (DDT), Organo phosphate and Carbamates.

Herbicides: Definition, Classification, activity and mode of action - ACCase inhibitors and ALS inhibitors.

UNIT V

Solutions: Definition- Normality, Molality and Molarity. Types of Solutions - Liquid in Liquid. Raoult's law. Definition of Ideal solution, Deviation from ideal behaviour. Binary liquid mixtures. Fractional Distillation.

Chemical Kinetics: Introduction, Order and Molecularity, Determination of Order. Measurement of reaction - Effect of Temperature on the reaction rate.



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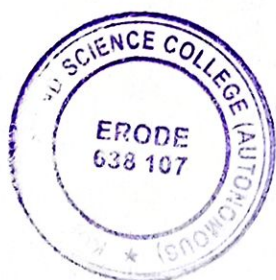
TEXTBOOKS:

1. B.R.Puri, L.R.Sharma, K.C.Kalia, Principles of Inorganic Chemistry, 28th Edition, Vishal Publication, New Delhi, 2004.
2. R.D.Madan Advanced Inorganic Chemistry, 2nd Edition. S. Chand & Company, New Delhi, 2005.
3. D.Van Samuel Glasstone, Thermodynamics - Nostrand company, Inc., 5th Edition, Eastern Wiley Publication, 2002.
4. B.S.Bahl and Arun Bahl, Advanced Organic Chemistry, 1st Edition, S.Chand and Company Ltd, New Delhi, 1998.

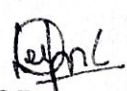
REFERENCES:

1. R.T.Morrison, and R.N.Boyd, Organic chemistry, 6th Edition, Prentice Hall Private Limited, New Delhi, 1997
2. B.R.Puri, L.R. Sharma and Madan S.Pathania, Elements of Physical chemistry, 30th Edition, Vishal publication, Jalandhar-Delhi 2007.
3. B.S.Bahl, G.D.Tuli and Arun Bahl, Essential of Physical chemistry, S.Chand publications, New Delhi, Reprint 2004.
4. Mohan Malhotra, Latest Cottage Industries, 20th Edition, Vishal publishers, Meerut, 1980.
5. Analytical chemistry: R.Gopalan, S.Chand & Co., New Delhi, 2007.

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Semester	Course Code	Core Paper III Bioanalytical Techniques	Total Marks: 100		Hours Per Week	Credits
II	19UAQCT201		CIA: 25	ESE: 75	5	3

Objectives

- To obtain an adequate knowledge about the different analytical techniques used in the field of Biotechnology.
- To become familiar with the working principle and applications of basic equipments.

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Generate the adequate knowledge in basic concepts of buffering system
- CO2 Get familiarized with working principles, tools and techniques of spectroscopic analysis
- CO3 Strengthen their conceptual understanding in centrifugation and radioactivity
- CO4 Have an common insight in chromatographic techniques
- CO5 Evaluate and perform electrophoresis and electrophysiological techniques

UNIT I

pH: Basics concepts in pH, Henderson Hasselbac equation, pH meter.

Buffers: Types, biological importance, buffering system (bicarbonate buffering system).

Spectroscopic Techniques: Definition of spectroscopy and spectrum, classification of spectra - absorption spectrum, emission spectrum and Stokes shift. Electromagnetic radiation and electromagnetic spectrum. Molecular absorption spectra – Fluorescence and Phosphorescence.

UNIT II

Spectroscopic Techniques: Analysis of biomolecules using Colorimeter, UV/Visible spectroscopy, Instrumentation and applications of spectro fluorimeter,



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flame photometer, atomic absorption spectroscopy. Structure determination using Infra red, Raman spectroscopy, X-ray diffraction and NMR spectroscopy.

UNIT III

Centrifugation: Principle, instrumentation and applications of preparative, analytical and ultracentrifugation.

Measurement of radioactivity: Introduction to radioisotopes. Scintillation counter, Geiger-Muller counter and autoradiography.

UNIT IV

Chromatographic Techniques: Definition and types of chromatography. Principle, working and applications of paper, thin layer, ion exchange, affinity, gel filtration, HPLC and GCMS.

UNIT V

Electrophoresis techniques: Definition, principle and types of electrophoresis. Electrophoresis of proteins – SDS PAGE and 2D gel. Electrophoresis of nucleic acids – agarose and pulse field gel electrophoresis. Capillary electrophoresis and Microchip electrophoresis

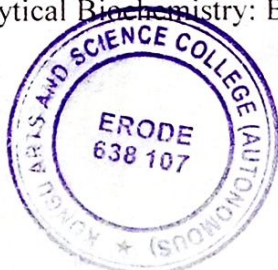
Electrophysiological methods: Principle and uses of ECG, EEG, X-ray, Ultrasound, CT scan, PET scan and MRI scan.

TEXT BOOK

K. Wilson and J. Walker, Principles and Techniques of Practical Biochemistry, V Edition, Cambridge and University Press, New York, 2002.

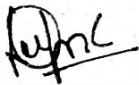
REFERENCES

1. S.K.Sawhney and Randhir Singh, Introductory Practical Biochemistry, V Edition, Narosa Publishing House, India, 2014.
2. Gurdeep R. Chatwal and Sham K. Anand, Instrumental Method of Chemical Analysis, V Edition, Himalaya Publishing House, India, 2011.
3. P. Asokan, Analytical Biochemistry: Biochemical Techniques, Chinnaa publications, India, 2009.




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SECTION - A	SECTION - B	SECTION - C
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Semester	Course Code	Core Practicals I Lab in Cell Biology and Biochemistry	Total Marks:100		Hours Per Week	Credits
II	19UAQCP202		CIA: 40	ESE: 60	5	4

Objectives

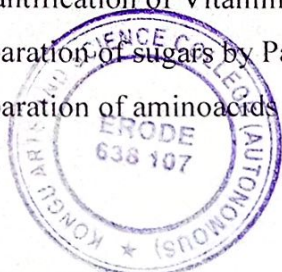
On successful completion of the practical the student should have experience in handling microorganisms, identification and characterization of them.


Course outcome:

On successful completion of the course, the students will be able to:

- CO1 Understand the morphological features of animal, plant and microbial cells
- CO2 Differentiate the phases in cell division
- CO3 Maximize their knowledge in the quantitative analysis
- CO4 Efficiently perform estimation procedures
- CO5 Improve their knowledge in separation of biomolecules

1. Sectioning of biological samples - Demo
2. Identification of Plant cells – Monocot and Dicot stem
3. Identification of animal cells –Blood smear, Buccal smear
4. Simple staining of Bacteria – *E.coli*
5. Enumeration of cell size – Micrometer
6. Cell counting using Haemocytometer
7. Mitotic Preparation of Onion Root Tip
8. Karyotyping
9. Estimation of Sugars by Anthrone method
10. Estimation of total free amino acids - Ninhydrin method
11. Estimation of Protein - Lowry's method
12. Estimation of DNA - DPA Method
13. Estimation of RNA - Orcinol method
14. Estimation of Cholesterol - Zaks method
15. Quantification of Vitamin C by Dye method
16. Separation of sugars by Paper Chromatography
17. Separation of aminoacids by Thin layer Chromatography

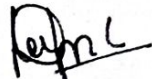



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REFERENCE

1. William H Heidcamp. Cell Biology – Laboratory Manual, CSHL Press, 2016
2. Sadasivam and Manickam. Biochemical Methods, III Edition New age Inc Publishers, 2018.

QUESTION PAPER PATTERN					
Major Expt	Minor Expt	Set up	Spotters	Viva voce	Record
1 x15 = 15 Marks	1 x12 = 12 Marks	1 x 8 = 8 Marks	5 x 3 = 15 Marks	5 Marks	5 Marks


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Semester	Course Code	Allied II Chemistry Paper II	Total Marks:75		Hours Per Week	Credits
II	19UAQAT203			CIA: 20	ESE: 55	4

Objectives

- To understand the importance of Coordination Chemistry
- To understanding in chemistry of Aromatic compounds and Industrial applications.

Course Outcome:

At the end of the course the students will be able to

- CO1 Learn the Laboratory principles and methods of metallurgy
- CO2 Get familiarized with the co ordination compounds
- CO3 Understand the mechanism of aromatic compounds
- CO4 Know the different processes of thermodynamics
- CO5 Develop basic knowledge with the electrochemistry and Get a theoretical exposure for safety aspects of chemistry laboratory

UNIT I

Laboratory principles: Safety and Hygiene in the Chemistry Lab: Storage and Handling of Chemicals - Acids, Ethers, Toxic and Poisonous chemicals. Antidotes and First Aid procedures

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.

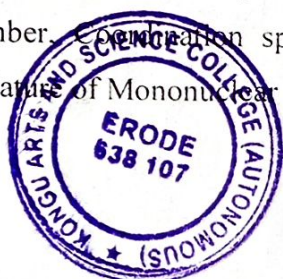
Furnaces: Blast and Reverberatory furnaces.

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.



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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.

UNIT IV

Energetics: Thermodynamics - Definition of First law of Thermodynamics. Types of systems - Reversible, Irreversible. Isothermal, Adiabatic and Spontaneous Process.

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.

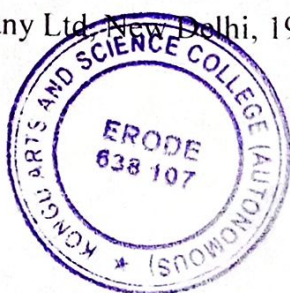
pH determination - Galvanic cells, EMF Standard electrode potentials, Reference electrodes.

Electrochemical series and its applications. Principles of Electroplating.

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

TEXTBOOKS

1. B.R. Puri, L.R. Sharma, K.C. Kalia, Principles of Inorganic Chemistry, 28th Edition, Vishal Publication, New Delhi.2004.
2. R.D. Madan Advanced Inorganic Chemistry, 2nd Edition. S. Chand & Company, New Delhi, 2005.
3. D. Van Samuel Glasstone, Thermodynamics- Nostrand company, Inc., 5th Edition, Eastern Wiley Publication, 2002.
4. B.S. Bahl and Arun Bahl, Advanced Organic Chemistry, 1st Edition, S.Chand and Company Ltd, New Delhi, 1998.

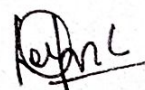


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REFERENCES

1. R.T. Morrison, and R.N. Boyd. Organic chemistry, 6th Edition, Prentice Hall Private Limited, New Delhi, 1997
2. B.R. Puri, L.R. Sharma and Madan S.Pathania, Elements of Physical chemistry, 30th Edition, Vishal publication, Jalandhar-Delhi 2007.
3. B.S. Bahl, G.D. Tuli and Arun Bahl. Essential of Physical chemistry, S.Chand publications, New Delhi, Reprint 2004.
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Semester	Course Code	Core Paper VIII rDNA Technology	Total Marks:100		Hours Per Week	Credits
			CIA: 25	ESE: 75		
V	17UAQCT502				5	4

Objectives:

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

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Differentiate the role of various recombinant enzymes
- CO2 Describe the fundamental features of plasmids
- CO3 Comprehend their knowledge about vectors
- CO4 Identify the recombinant clones
- CO5 Understand the techniques of recombination

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* and *Pfu* 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, 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.



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UNIT IV

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

UNIT V

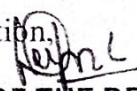
Molecular techniques: DNA sequencing – Maxam Gilbert method, Sanger’s Dideoxy chain termination method, Automated DNA sequencing method, NGS and Nanopore sequencing. Microarray. PCR – design and optimization, Types of PCR - Inverse, Nested, RT PCR, Hot Start PCR, Quantitative, Semi Quantitative and Real Time PCR, Applications of PCR. Site-directed mutagenesis, Autoradiography, DNA finger printing, Gene therapy – somatic- and germ line gene therapy, viral and non viral gene delivery systems.

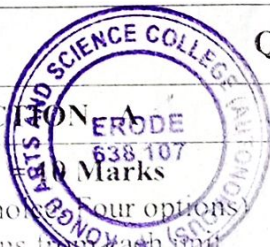
TEXT BOOKS

1. T.A.Brown, Gene Cloning and DNA Analysis – An Introduction, VI Edition, A John Wiley & Sons, Ltd., Publication 2010.

REFERENCES

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, I Edition, Panima Publishing Corporation, 2003.
3. K.Rajagopal, Recombinant DNA Technology and Genetic Engineering, I Edition, Tata McGraw Hill Education, Pvt. Ltd, 2012.
4. Richard M. Myers *et al.*, Recombinant DNA Genes and Genomes III Edition, W.H. Freemann and Company, 2007.


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QUESTION PAPER PATTERN		
 SECTION - A ERODE 638 107 (Multiple Choice - four options) Two questions from each unit	SECTION - B KONGU ARTS AND SCIENCE COLLEGE 5 x 7 = 35 Marks (Either or choice) Two questions from each unit	SECTION - C (AUTONOMOUS) 5 x 10 = 30 Marks NANJANAPURAM, ERODE - 638 107. (Answer any three Questions) One Question from each unit

Semester	Course Code	Core Paper XI Plant Biotechnology	Total Marks:100		Hours Per Week	Credits
			CIA: 25	ESE: 75	5	4
V	17UAQCT503					

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.

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Improve their knowledge regarding tissue culture media and its composition
- CO2 Understand the different available explants for tissue culture
- CO3 Describe the features of protoplast and its significance
- CO4 Outline the techniques of plant transformation
- CO5 Summarize the applications of molecular assisted breeding

UNIT-I

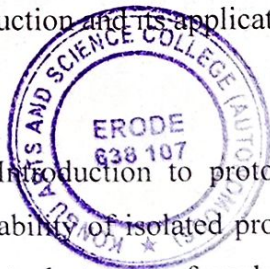
Introduction to tissue culture: Introduction and history of plant tissue culture, basic lab requirements, conditions of culture room, culture media – types, composition and preparation. Explant selection, sterilization techniques, growth regulators – types, structure and functions of Auxins, Cytokinins, 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

Protoplast: Introduction to protoplast, principle and applications of protoplast isolation, testing for viability of isolated protoplasts, steps in the regeneration of protoplasts, methods for fusing protoplasts, use of markers for selection of hybrid cells. Somatic hybridization and



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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 T DNA transfer, role of virulence genes, use of Ti and Ri as vectors, binary vectors.

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, terminator gene technology and antisense 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. Hairy root cell cultures. Plant as bioreactors, Industrial enzymes from plant origin, plantibodies and edible vaccines.

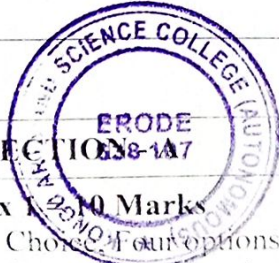
TEXT BOOK

Chawlah. S, Plant Biotechnology, III Edition Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi, 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, 2010.
3. Ramawat K G, Plant Biotechnology, III Edition, S.Chand and Company, New Delhi, 2008

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QUESTION PAPER PATTERN		
 <p>SECTION - A 10 x 10 Marks (Multiple Choice, Four options) Two questions from each unit</p>	Dr. N. RAMAN	
	<p>SECTION - B 5 x 7 = 35 Marks (Either or choice) Two questions from each unit</p>	<p>SECTION - C 3 x 10 = 30 Marks (Choose any three Questions) One Question from each unit</p>

Semester	Course Code	Elective I Environmental Biotechnology	Total Marks:100		Hours Per Week	Credits
			CIA: 25	ESE: 75		
V	17UAQET504				4	4

Objectives

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

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Have a clear idea on biotic and abiotic factors
- CO2 Understand the significance of bioremediation and biodegradation
- CO3 Generate an interest in field of energy sources
- CO4 Identify and involve in waste management
- CO5 Develop a basic idea regarding to Environmental Impact Assessment

UNIT I

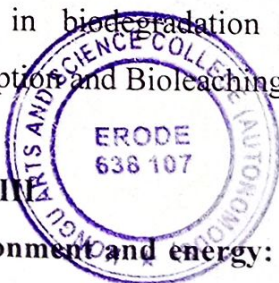
Introduction to Ecology: Scope and branches of ecology, Abiotic factors (water, soil, temperature, light. Biotic factors – Animal relationship, Symbiosis, Commensalisms, Mutualism, Antagonism, Antibiosis, Parasitism, Predation, Competition. Structure of pond and forest ecosystem, primary production,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

UNIT II

Bioremediation and Biodegradation: Bioremediation, Biodegradation - Factors affecting process of biodegradation; Methods in determining biodegradability; Biodegradation of plastics, pesticides and hydrocarbons. Xenobiotics - Use of microbes (bacteria and fungi) and plants in biodegradation and Biotransformation. Bioaccumulation, Biomagnifications. Biosorption and Bioleaching. Biosensors and Bioindicators for detection of pollution.

UNIT III

Environment and energy: Generation of energy and fuel using microorganisms (Hydrogen production and Methane production).



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Applications of Nanotechnology in Environment: Nanotechnology for environmental decontamination – Heavy metal pollution remediation, Solid waste remediation, Groundwater and wastewater remediation, Hydrocarbon remediation. Single enzyme nanoparticles in bioremediation.

UNIT IV

Waste Management: Solid waste – Classification and types of solid wastes and solid waste management. Integrated solid waste management – Components of ISWM and Benefits of ISWM. E-waste: Composition of E- waste, E – waste management, E – waste management in India. Radioactive waste: Classification of radioactive wastes, Management of radioactive wastes. Biohazardous waste management.

UNIT V

Environmental Impact Assessment (EIA): Need of EIA; Scope and objectives; Types of environmental impacts; Steps involved in conducting the EIA Studies; Environmental Impact Assessment techniques-Ad-hoc method, checklist method, overlay mapping method, network method, simulation and modeling technique, matrix method, and system diagram technique; Merits and Demerits of EIA studies.

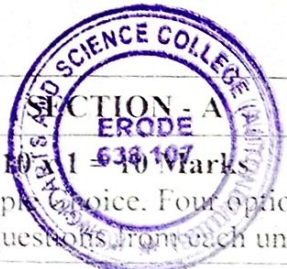
TEXT BOOK

1. Sharma, P.D, Ecology and environment. XI Edition Rastogi publications, Meerut, 2011.
2. Sulphey MM and Safer MM, Introduction to Environment Management, III Edition, PHI Learning Pvt. Ltd., 2015 (Unit IV)

REFERENCES

1. Durga Natha Dhar, Shalin Kumar, Triloki Vaish, Environment and Ecology, 1st edition, Vayu Education of India, 2009.
2. M. H. Fulekar, Bhawana Pathak, Environmental Nanotechnology, I Edition CRC Press, 2017
3. Nicholas P. Cheremisinoff, Biotechnology for Waste and Wastewater Treatment, Elsevier Science, 2013.

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QUESTION PAPER PATTERN		
 SECTION - A ERODE - 638 107 10 Marks (Multiple choice. Four options) Two questions from each unit	SECTION - B 5 x 7 = 35 Marks (Either or choice) Two questions from each unit	SECTION - C 3 x 10 = 30 Marks (Answer any three Questions) One question from each unit
	Dr. N. RAMAN PRINCIPAL KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS) NANJANAPURAM, ERODE - 638 107.	

Semester	Course Code	Elective I Virology	Total Marks:100		Hours Per Week	Credits
			CIA: 25	ESE: 75		
V	17UAQET506				4	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.

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Relate the modern and historical aspects of virology
- CO2 Generalize the classification and types of virus
- CO3 Distinguish the replication of virus from other microbes
- CO4 Understand the role of viruses in human diseases
- CO5 Familiarize with the various approaches employed for the control of virus

UNIT I

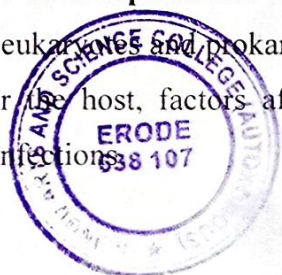
Historical perspectives of virology: Viruses and their importance, Properties of viruses- biochemical and morphological structure of viruses. Methods used in virology - cultivation and purification of viruses, Diagnostic methods - Nucleic acid based diagnosis, Microscopic techniques and Analytical techniques.

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 and plant virus.

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.



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UNIT IV

Virus and Diseases: Human viral pathogens, factors determining the nature and severity of viral disease, Common signs and symptoms of viral infection, Viral infection of respiratory tract and gastro intestinal tract. Carcinogenesis and tumor viruses.

UNIT V

Modern approaches of virus control: Interferons, designing and screening for antiviral compounds and its mechanisms of action, antiretrovirals drug therapy. Phage therapy, Anti-sense RNA, siRNA, ribozymes, in silico approaches for drug designing.

TEXT BOOKS

1. Carter J and Saunders V, Virology: Principles and Applications, II Edition, Wiley Publications, 2013. (UNIT I – III)
2. Ananthanarayanan, R. and C.K.J. Panicker, Text book of Microbiology, XI Edition Orient Longman. New Delhi, 2015. (UNIT I – III)
3. Dimmock *et al.*, Introduction to Modern Virology, VI Edition Blackwell Publishing, 2007. (Unit IV)

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.
3. Steven Specter, Clinical Virology, IV Edition ASM Press, 2010

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	Skill Based Subject III Biofarming	Total Marks:75		Hours Per Week	Credits
			CIA: 20	ESE: 55		
V	17UAQST507				3	3

Objectives:

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

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Get a generalized idea in the basics of farming
- CO2 Familiarized with the requirements of organic farming
- CO3 Formulate various approaches for developing mushrooms and Spirulina
- CO4 Compute the usage of Vermicompost and Biofertilizers
- CO5 Prepare a sericulture and aquaculture farm for economic up gradation

UNIT I

Introduction to Farming: Basic concept and principles of farming, Types of farming- Pure organic farming, Integrated farming, Mixed farming. Advantages and disadvantages of each system. Farming economics- Demand, supply, Economic Viability of a farm. Policies and incentives of organic production, Farm inspection and certification, Conversion to organic farming. Conventional farming v/s organic farming.

UNIT II

Requirements of Biofarming: Organic Production requirements, Biological Intensive Nutrition management, Green manuring, Recycling of organic manures, Soil improvement, Soil Fertility Management, Propagating Crops from seed and Greenhouse Management, Disease and Pest management.

UNIT III

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

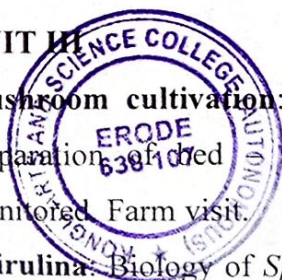
Spirulina: Biology of *Spirulina*, growth and culture conditions, nutritive value of spirulina, enhancement of spirulina nutrients and processing, commercial spirulina products, marketing. Farm visit.

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UNIT IV

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 fertilizers (NPK), uses and applications of biofertilizers, constraints in biofertilizer technology, Farm visit.

UNIT V


Sericulture: Introduction, biology and characteristics of silkworm – types, nutrients, culture conditions, Quality of silk, Farm visit.

Apiculture: Types of honeybees, types of bee culture and environment factors, biological properties of honey and its health aspects, Farm visit.

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

TEXT BOOKS

1. Kristensen, P., Taji, A. and Reganold, J. Organic Agriculture: A Global Perspective. CSIRO Press, 2006 (UNIT I)
2. Philip G. Miles, Shu-Ting Chang, Mushrooms: Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact, 2nd edition, 2004 (UNIT III)
3. M. E. Gershwin, Amha Belay, Spirulina in Human Nutrition and Health, I edition, CRC Press, 2007 (UNIT III)
4. U. Sathyanarayana, Biotechnology, Books and Allied Pvt. Ltd, 2007. (Unit IV)
5. Ganga, J. Sulochana Chetty, An Introduction to Sericulture, II Edition Oxford and IBH Publishing Company, 2008 (UNIT V)
6. R A Dunham, Aquaculture and Fisheries Biotechnology. Genetic Approaches, I edition, CABI Publishing, 2004 (UNIT V)
7. SS Rana, Organic farming, India organic, 2016 (UNIT II)


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 ERODE - 638 107.

QUESTION PAPER PATTERN		
<p style="text-align: center;">SECTION - A</p> <p style="text-align: center;">10 x 1 = 10 Marks</p> <p style="text-align: center;">((Multiple Choice questions))</p> <p style="text-align: center;">Two questions from each unit</p>	<p style="text-align: center;">SECTION - B</p> <p style="text-align: center;">5 x 7 = 35 Marks</p> <p style="text-align: center;">(Either or choice)</p> <p style="text-align: center;">Two questions from each unit</p>	<p style="text-align: center;">SECTION - C</p> <p style="text-align: center;">3 x 10 = 30 Marks</p> <p style="text-align: center;">(any three Questions)</p> <p style="text-align: center;">One question from each unit</p>



Semester	Course Code	Advanced Learners Course	Total Marks:100		Hours Per Week	Credits
V	17UAQAL509	Research Methodology	CIA: -	ESE: 100	-	2

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.

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Infer on the concepts for designing a work of research
- CO2 Familiarize with the methods of data collection
- CO3 Analyze the methods used for sample collection
- CO4 Understand the key facts for writing a thesis
- CO5 Correlate the research data's using statistical methods

UNIT I

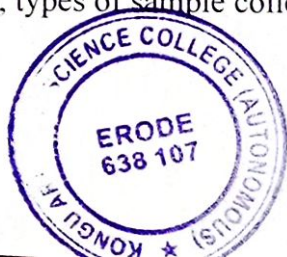
Introduction To Research Methodology: Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Literature collection, Literature citation,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


UNIT II

Data Collection: Ethics of data collection, methods of data collection – primary data, secondary data, processing of data – Editing, Coding, Classification and Tabulation. Analysis of data – Tables and graphs.

UNIT III

Sampling Methods: Concepts of sampling, Principles of sampling, Aim in selecting a sample, types of sample collection (Random, Non random, Mixed)




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UNIT IV

Report and Thesis Writing: Research report: components, Format of thesis and dissertation, Manuscript/research article, Review monographs, Bibliography and Reference, footnotes. Practice and use of visual aids, importance of effective communication. Plagiarism.

UNIT V

Statistical Methods: Measures of central tendency and dispersal; probability distributions (Binomial, Poisson and normal); sampling distribution; difference between parametric and non-parametric statistics; errors; p value, levels of significance; regression and correlation.

TEXT BOOKS

1. C.R. Kothari, IInd edition, Research Methodology, Methods and techniques, New Age International (P) Ltd, Publishers, New Delhi, 2004 (Unit I,II,IV)
2. Ranjith Kumar, Research Methodology – A step by step guide for Beginners, II Ed, Dorling Kindersky (India) Pvt Ltd, 2007 (Unit III)
2. Jerrod H. Zar, Biostatistical analysis by, Prentice Hall International, Inc. Press, London, 1999. (UNIT V)

QUESTION PAPER PATTERN		
SECTION - A	SECTION - B	SECTION - C
10 x 2 = 20 Marks (Answer any 10 question out of 12 questions)	5 x 7 = 35 Marks (Either or choice) Two questions from each unit	3 x 15 = 45 Marks (Answer any three Questions) One question from each unit



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Semester	Course Code	Core Paper X Industrial Biotechnology	Total Marks:100		Hours Per Week	Credits
			CIA:25	ESE: 75		
VI	17UAQCT601				5	4

Objectives:

- To acquire knowledge about various business fields in advanced Biotechnology.
- To enrich students about the current status of development of enzymes and economic importance of biotech products.

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Identify the requirements for fermentation technology
- CO2 Understand the different types of reactors
- CO3 Describe the process of down streaming and various techniques for product recovery
- CO4 Understand the production and use of industrially important enzymes
- CO5 Get a contented knowledge related to industrial chemicals

UNIT I

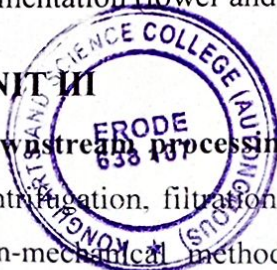
General requirements of fermentation processes: Introduction to fermentation. Isolation, screening, strain improvement and preservation of industrially important microorganisms. Types of media for fermentation processes. Development of inocula for industrial fermentations. Methods to achieve sterility- 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. Removal of cells - centrifugation, filtration, flocculation. Release of intracellular components - mechanical and non-mechanical methods, Product separation – distillation, liquid liquid extraction and evaporation. Product purification - membrane filtration, precipitation and chromatography.



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PRINCIPAL,
KONGU ARTS AND SCIENCE COLLEGE,
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UNIT IV

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.

UNIT V

Production of fuels and industrial chemicals: Production of alkanes (Methane), industrial ethanol, amino acids – L-Glutamic acid and L-Lysine, Organic acid- citric acid and lactic acid, alcoholic beverages – Beer and Wine. Production of vitamin B12 and Single cell protein.

TEXT BOOK


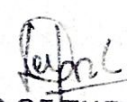
1. Nooralabettu Krishna Prasad, Downstream Process Technology – A New Horizon in Biotechnology, I Edition PHI Learning Private Limited, 2012.
2. Michael. J. Waites *et al.*, Industrial Microbiology- An Introduction, I Edition Blackwell Publishing, 2007.

REFERENCES

1. Wulf Crueger and Anneliese Crueger, Biotechnology A Textbook of Industrial Microbiology- II Edition, Sinauer Associates. Inc., 1990.
2. U. Sathyanarayana, Biotechnology, Books and Allied Pvt. Ltd, 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





Dr. N. RAMANA HEAD OF THE DEPARTMENT
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Semester	Course Code	Core Paper XI Animal Biotechnology, Bioethics and IPR	Total Marks:100		Hours Per Week	Credits
VI	17UAQCT602		CIA: 25	ESE: 75	5	4

Objectives:

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

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Describe the significance of growth media and primary culture
- CO2 Integrate with the methods used for the development of cell lines
- CO3 Apply the cells developed from tissue culture in various fields
- CO4 Know the ethics to be followed for transgenic studies
- CO5 Get a brief idea related to IPR

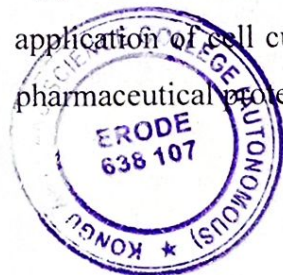
UNIT I

Introduction to Cell Culture: Scope of animal tissue culture, Lab requirements for aseptic conditions, Culture Media and importance of media components for the growth of animal cells, antibiotic growth supplements, sterilization of glassware and media. Primary culture – Types, Behavior of cells and their properties. Secondary culture, Transformed cell lines, Continuous cell lines, commonly used animal cell lines - their origin and characteristics.

UNIT II

Animal Cell Culture Techniques: 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. Scaling up of animal cell culture.

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, pharmaceutical proteins.



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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.

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. *In vitro* fertilization (IVF) in Humans and Embryo Transfer in Livestock, application of Embryo transfer technology

UNIT IV

Bioethics: Patentability of microorganism, animal cloning and experimenting on animals, safety and ethical issues of transgenic 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. Louis-Marie Houdebine, Transgenic Animals: Generation and Use 5th Edition, CRC Press, 1997.
3. M M Ranga, Animal Biotechnology, III Edition Student edition, 2007





Dr. N. RAMAN
PRINCIPAL,
KONGU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
NANJANAPURAM, ERODE - 638 107

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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KONGU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
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Semester	Course Code	Core Practicals III Lab in Immunology and Plant Tissue Culture	Total Marks:100		Hours Per Week	Credits
			CIA: 40	ESE: 60		
VI	17UAQCP603				4	4

Objectives

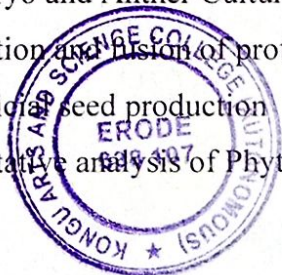
- To acquire skills about basic and advanced techniques in immunology.
- To develop hands-on training in plant tissue culture methodologies.


Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Experiment with test animals for immunological purposes
- CO2 Analyze and understand the significance of antibodies
- CO3 Prepare various culture media for plant tissues
- CO4 Compare and contrast the tissue culture techniques using various explants
- CO5 Analyze the phytochemical activity of plants

1. Preparation of serum from blood
2. Hemagglutination test -ABO blood grouping
3. Passive Agglutination test- ASO- Anti-streptolysin O Test
4. Agglutination inhibition test -pregnancy test
5. Single radial Immuno diffusion
6. Ouchterlony double diffusion
7. Immunoelectrophoresis- CIE and rocket tests – Demo
8. Plant tissue culture media preparation –MS media, Nitsch's media, White's media
9. Callus induction and differentiation
10. Micropropagation
11. Meristem Culture
12. Embryo and Anther Culture
13. Isolation and fusion of protoplasts
14. Artificial seed production
15. Qualitative analysis of Phytochemicals



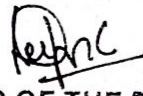

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REFERENCES


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

QUESTION PAPER PATTERN

Major Expt	Minor Expt	Set up	Spotters	Viva voce	Record
1 x 15= 15 Marks	1x12=12 Marks	1x8=8 Marks	5x3= 15 Marks	5 Marks	5 Marks


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Semester	Course Code	Core Practicals IV Lab in rDNA Technology and Industrial Biotechnology	Total Marks:100		Hours Per Week	Credits
			CIA: 40	ESE: 60		
VI	17UAQCP604				4	4

Objectives

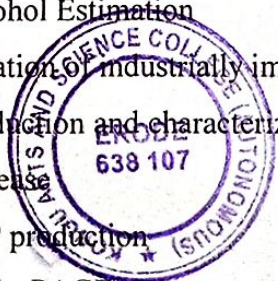
- To get hands-on training on Recombinant DNA Technology.
- To acquire knowledge about various experiments carried out in Industrial sector.

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Develop their skills in isolating DNA from various tissues
- CO2 Analyze the DNA and quantify it
- CO3 Perform restriction, ligation and transformation experiments
- CO4 Produce enzymes for industrial sectors
- CO5 Understand the blotting procedures of biomolecules

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. Bacterial Transformation
10. Fermentor – Parts and Design
11. Wine production
12. Alcohol Estimation
13. Isolation of industrially important organism - amylase and protease producing bacteria
14. Production and characterization of Industrially important enzyme – amylase and protease
15. SCP production
16. SDS - PAGE
17. Demonstration of Western blotting

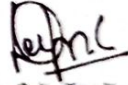


Dr. N. RAMAN
PRINCIPAL
KONGU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
MANJANAPURAM, ERODE - 638 107


REFERENCES

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

QUESTION PAPER PATTERN					
Major Expt	Minor Expt	Set up	Spotters	Viva voce	Record
1 x 15= 15 Marks	1x12=12 Marks	1x8=8 Marks	5x3= 15 Marks	5 Marks	5 Marks


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PRINCIPAL,
KONGU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
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Semester	Course Code	Elective II Bioinformatics	Total Marks:100		Hours Per Week	Credits
			CIA: 25	ESE: 75		
VI	17UAQET605				4	4

Objectives

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

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Understand the basic features of Bioinformatics
- CO2 Outline the databases used as a Bioinformatics tool
- CO3 Get familiarized with the methods used for sequence alignment
- CO4 Analyze data for gene prediction and construction of phylogenetic tree
- CO5 Predict and Characterize the molecules for the development of drugs

UNIT I

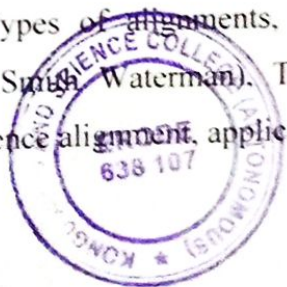
Introduction: Definition, Historical overview, Aim and Scope of Bioinformatics, Information search and retrieval systems. Various file formats for biological sequences. Data banks – Gen Bank, PDB, Pub Med, Med line, Ex PASy.

UNIT II

Database: Introduction, definition and importance of databases. Types of database - Biological database (Nucleic acids database – EMBL, DDBJ, NCBI, Protein database – SWISS PROT, PIR, PROSITE). 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.



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PRINCIPAL,
KONGU ARTS AND SCIENCE COLLEGE
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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). Molecular Docking – Protein - DNA interactions and Protein- Protein interactions. Phylogenetic analysis: Concept of trees and construction of phylogenetic trees

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.

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	Elective II Developmental Biology	Total Marks:100		Hours Per Week	Credits
			CIA: 25	ESE: 75		
VI	17UAQET606				4	4

Objectives

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

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Get familiarized with the process of development of gametes
- CO2 Understand the concept of fertilization in mammals
- CO3 Identify the reasons for evolution and be familiarize with embryology
- CO4 Characterize the methods used for experimental embryology
- CO5 Summarize the concepts of embryonic development in plants

UNIT I

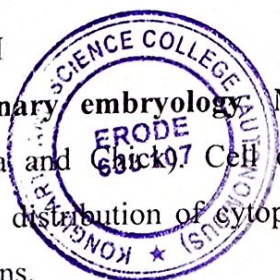
Development of gametes - Spermatogenesis and Oogenesis in mammals. Cell surface molecules in sperm and egg recognition in animals, activation of sperm and egg- interaction of sperm and egg, Sequence of events in sperm entry, egg surface changes. Post-fertilization changes.

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, Amphibial and Mammals). Cell division and chemical changes during cleavage, pattern of cleavage, distribution of cytoplasmic substances in the egg, metamorphosis of insects and amphibians.



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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 thaliana*. Development of Microsporangium and Mega sporangium, Pollination, Double fertilization, development of Endosperm, Embryo and Seed. Organization of shoot and root apical meristem and development.

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.

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	Skill Based Subject IV Medical Biotechnology	Total Marks:75		Hours Per Week	Credits
VI	17UAQST609		CIA: 20	ESE: 55	3	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.

Course Outcome:

On successful completion of the course, the students will be able to:

- CO1 Get familiarized with the field of Red Biotechnology
- CO2 Integrate their skills in diagnostic techniques
- CO3 Acquire knowledge in the steps of stem cell therapies
- CO4 Inculcate the ideology of protein therapeutics
- CO5 Briefly understand the broad field of vaccinology

UNIT I

Introduction: History and scope of Medical Biotechnology, future prospects, tools in Medical Biotechnology.

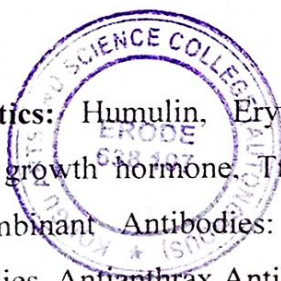
Identification of disease genes: Functional cloning (Eg. Haemophilia gene), Positional cloning (DMD and CGD genes), Candidate gene approach (Alzheimer's disease). Molecular basis of human diseases: Gain of function mutations (Oncogenes, Huntington Disease), Loss of function (Tumour Suppressor Genes),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

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 IV

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.

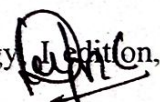
UNIT V

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

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.

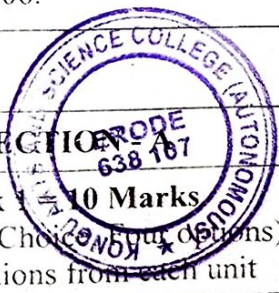
TEXT BOOK

Bernard R. Glick, Terry L. Delovitch, Cheryl L. Patten, Medical Biotechnology, 4th Edition, ASM Press, 2013.


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REFERENCES

1. Bernard R. Glick, Jack J Pasternak, Cheryl L. Patten, Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th 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.

QUESTION PAPER PATTERN		
 SECTION - A 10 x 10 Marks (Multiple Choice Questions) Two questions from each unit	SECTION - B 5 x 3 = 15 Marks (Either or choice) Two questions from each unit	SECTION - C 10 = 30 Marks (Answer any three Questions) One Question from each unit
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KONGU ARTS AND SCIENCE COLLEGE

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

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ACTIVITIES



KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE

DEPARTMENT OF BIOTECHNOLOGY

DBT INAUGURATION

REPORT



DBT Inauguration

DATE: 28.06.2019

Beneficiary : I UG Students

Resource person: Dr.R.RAJENDRAN,
PSG College of Arts and Science,
Coimbatore

Dr.R.PARVATHY,
Vellalar College for Women,
Erode

The Students were educated about the benefit of DBT Star College scheme. Both the resource person elaborated the advantages of Student through this scheme. They also encourage student to take part in various programme, Research and Publications which could elevate the profile for their higher.

Rajendran

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DEPARTMENT OF BIOTECHNOLOGY
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N. Raman
**Dr. N. RAMAN
PRINCIPAL,
KONGU ARTS AND SCIENCE COLLEGE
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KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE

DEPARTMENT OF BIOTECHNOLOGY

**DEPARTMENT ASSOCIATION INAUGURATION (Creauctus-19') and
GUEST LECTURE on Plant Pathology"**

REPORT



**DEPARTMENT ASSOCIATION
INAUGURATION (Creauctus-19')**

and

**GUEST LECTURE on Plant Pathology DATE:
29.6.2019**

Beneficiary :UG BIOTECHNOLOGY STUDENTS

Resource person: Dr.B.PARAMESHWARI,

Senior Scientist,

Indian Council of Agriculture

Research,

New Delhi.

Students were exposed to different pathological conditions of Sugarcane and Rice. she also explained about the opportunities of getting into research in Indian Council of Agriculture Research.

Kejane
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**Dr. N. RAMAN
PRINCIPAL,
KONGU ARTS AND SCIENCE COLLEGE
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KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE

DEPARTMENT OF BIOTECHNOLOGY

MODEL PRESENTATION on
Nature and Energy Conservation

REPORT



MODEL PRESENTATION
on
Nature and Energy Conservation

DATE :31.07.2019
Beneficiary :II and III B.Sc Biotechnology Students

Students displayed various models to demonstrate the ways and means to conserve nature and energy. Students were able to come out with different ideas as models to conserve nature, natural resources and energy

Rajkumar

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DEPARTMENT OF BIOTECHNOLOGY
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PRINCIPAL,
KONGU ARTS AND SCIENCE COLLEGE
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DEPARTMENT OF BIOTECHNOLOGY

**HANDS ON TRAINING PROGRAMME on
Mushroom Cultivation**

REPORT



**HANDS ON TRAINING PROGRAMME
on
Mushroom Cultivation**

DATE : 02.08.2019

Beneficiary : III Year UG Student

Resource person: **Mr. L.GOPALAKRISHNAN,**

Mushroom Cultivation Trainer,
Hardeep Mushroom Farm,
Erode.

Students were given hands on training on the method to prepare Mushroom bed. They have also explained about the mushroom cultivating techniques which helped the student in developing entrepreneur skill.

Repnc

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Dr.
**Dr. N. RAMAN
PRINCIPAL,
KONGU ARTS AND SCIENCE COLLEGE
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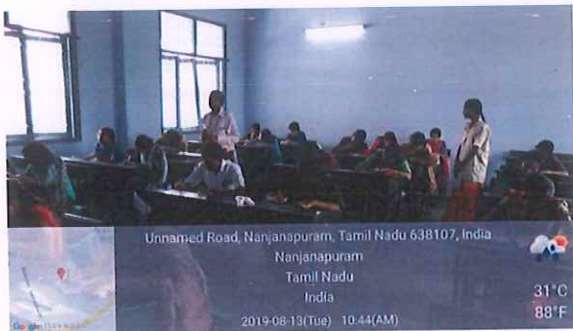


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DEPARTMENT OF BIOTECHNOLOGY

COMPETITIONS

REPORT



COMPETITIONS

On

Periodic Table

DATE :13.08.2019

Beneficiary :Students of Biochemistry,
Biotechnology and
Physics Students

Students were imparted with different key information's in periodic table. Students were so enthusiastic in this competition. Through this learning becomes like adventure. The students were able to gain knowledge of periodic table.

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DEPARTMENT OF BIOTECHNOLOGY

GUEST LECTURES

REPORT



GUEST LECTURES

on

Periodic Table

DATE :13.08.2019

Beneficiary :Students of Biochemistry,
Biotechnology and
Physics Students

Resource person: **Dr. A. CHANDRA MOHAN,**
Associate Professor and Head,
Department of Chemistry,
Sri Ramakrishna Mission
Vidhyalaya College of Arts
and Science, Coimbatore

Dr. N. CHANDRASEKARA,
Former Associate Professor,
Department of Chemistry,
CBM College, Coimbatore

Students were given awareness about the importance of periodic table and gained knowledge in important concepts of physical and inorganic chemistry

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KONGU ARTS AND SCIENCE COLLEGE
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DEPARTMENT OF BIOTECHNOLOGY

GUEST LECTURE
on
Application of Mathematics in Biology

REPORT



GUEST LECTURE

on

Application of Mathematics in Biology

DATE : 17.08.2019

Beneficiary : II B.sc Biotechnology and
Biochemistry Students

Resource person: Dr. R. PARVATHI,
Professor and Head,
Department of Mathematics,
Vellalar College for Women,
Erode

Students were given information's on various concepts of Mathematics and the methods to apply it in biological field. Student were able analyze the concept of maths in biology which could help in their future need.

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DEPARTMENT OF BIOTECHNOLOGY

INDUSTRIAL VISIT REPORT



INDUSTRIAL VISIT

DATE : 23.08.2019.

Beneficiary : II Year Students and
III Year Students

Venue : 1) **Central Silk Board, Mysore.**
2) **Parle Biscuits Pvt Ltd, Chennai .**

Students of II B.Sc Biotechnology were taken to **Central Silk Board, Mysore** Students visited CSRTI and understood the mechanization in mulberry cultivation and methods of silkworm rearing and Students of III B.Sc Biotechnology were taken to **Parle Biscuits Pvt Ltd, Chennai .** Students were taken to Parle G industry and they got a clear idea in processing and packaging of baked products



Raman
**HEAD OF THE DEPARTMENT
DEPARTMENT OF BIOTECHNOLOGY
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(AUTONOMOUS)
ERODE - 638 107.**



Raman
**Dr. N. RAMAN
PRINCIPAL,
KONGU ARTS AND SCIENCE COLLEGE
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DEPARTMENT OF BIOTECHNOLOGY

A GUEST LECTURE
on
Enzyme Kinetics and its Regulation

REOPRT



A GUEST LECTURE
on
Enzyme Kinetics and its Regulation


DATE :13.09.19

Beneficiary : I and II B.Sc


Biotechnology Students

Resource person:Dr.S.MOHANDASS,
Associate Professor and Head
(SF),Department of
Biochemistry,PSG College of
Arts & Science, Coimbatore.

Students were given information on Enzyme kinetics and its various aspects of doing. he also given information about the enzymes that are used in Industries


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(AUTONOMOUS)
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DEPARTMENT OF BIOTECHNOLOGY

PERSONALITY DEVELOPMENT PROGRAM

REPORT



SPECIAL TALK

on
Career Opportunities in Life Science after Graduation


DATE : 13.09.19
Beneficiary : I and II B.Sc
Biotechnology Students

Resource person : **Dr. G. KALYAN KUMAR,**
Regulatory Manager,
HCL Technology Solutions,
Chennai.

Students were exposed to different Career opportunities in Life Science. He has acknowledged various carrier opportunities in all the need both in Industries and corporate sectors.

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PRINCIPAL,
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(AUTONOMOUS)
NANJANAPURAM, ERODE - 638 107



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DEPARTMENT OF BIOTECHNOLOGY

INDUSTRIAL VISIT

REPORT



INDUSTRIAL VISIT

DATE : 22.11.2019

Beneficiary : I B.Sc Biotechnology Students

Venue : **Central Leather Research I
Institute (CLRI)
and Birla Planetarium,**

The I B.Sc Biotechnology Students were taken to
Central Leather Research Institute (CLRI) and Birla
Planetarium, Chennai.

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KONGU ARTS AND SCIENCE COLLEGE
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DEPARTMENT OF BIOTECHNOLOGY

GUEST LECTURE

REPORT



A GUEST LECTURE

on

**Importance of ISO Auditing in Food Industries
and Career Opportunities in ISO Auditing**

DATE : 04.12.2019

Beneficiary : UGBiotechnology Students

Resource person: **Ms.T.RAMYA DEVI,**

Qmax Business Assurance,

Chennai.

The programme was arranged for the UG students of Biotechnology, Biochemistry and Catering Science and Hotel Management on 04.12.2019. Ms.T.RAMYA DEVI, Qmax Business Assurance, Chennai.

Rupak

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PRINCIPAL,
KONGU ARTS AND SCIENCE COLLEGE
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FARM VISIT

REPORT



FARM VISIT

DATE : 04.12.2019

Beneficiary : I B.Sc Biotechnology

I B.Sc Biotechnology students were taken to **Aavin Diaries, Chithode** as a Farm Visit.



Rajprc
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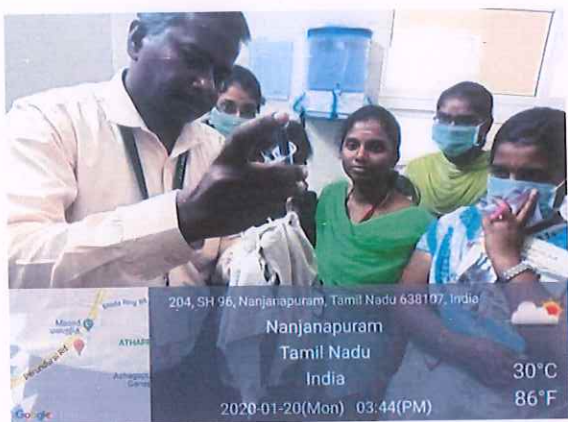


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DEPARTMENT OF BIOTECHNOLOGY

WORKSHOP On Animal Handling

REPORT



A WORKSHOP on Animal Handling

DATE : 04.12.2019

Beneficiary : III B.Sc Biotechnology Students

Venue : Erode Pharmacy, Erode.

Students were taken to Erode pharmacy to learn about the of Animal Handling. They were elaborated about the Animal Handling in the Lab.



Rajini
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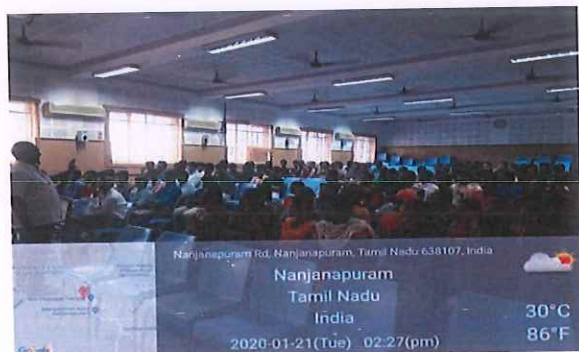
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GUEST LECTURE on Emerging Trends in Computational Chemistry REPORT



A GUEST LECTURE on Emerging Trends in Computational Chemistry

DATE : 04.12.2019
Beneficiary : I B.Sc Biotechnology

Resource Person: Dr.P.PERUMAL,
Rtd Professor,
Department of Chemistry,
Erode Arts and Science
College.

Students of Biotechnology, Biochemistry and Physics were educated about Emerging Trends in Computational Chemistry which could be helpful in their higher education and carrier.

Perumal
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DEPARTMENT OF BIOTECHNOLOGY

HANDS ON TRAINING
ON
HISTOPATHOLOGY AND CHROMATOGRAPHY



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HANDS ON TRAINING
on
Histopathology and Chromatography

DATE : 11.01.2020
Beneficiary : I B.Sc Biotechnology
Resource person: Ms.K.INDHUMATHI,
Alumna, Department of Biotechnology, Kongu
Arts and Science College, Erode.

The students of I B.Sc Biotechnology were educated on Hands on Training on “Histopathology and Chromatographic Techniques” by Ms.K.INDHUMATHI, Alumna, Department of Biotechnology, Kongu Arts and Science College on 11.01.2020.

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PRINCIPAL,
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DEPARTMENT OF BIOTECHNOLOGY

BIOFAIR

REPORT



BIOFAIR

Health Club

DATE : 28.01.2020
Beneficiary : UGBiotechnology Students

The **Health Club** (a part of Creactus Association) organized '**BIOFAIR**' - an Exhibition of Natural and Value Added Biological Products on 28.01.2020. The Ceremonial Opening was done by our Correspondent **Thiru. K.Palanisamy** and students exhibited biological products available from various districts of Tamilnadus.

Palani
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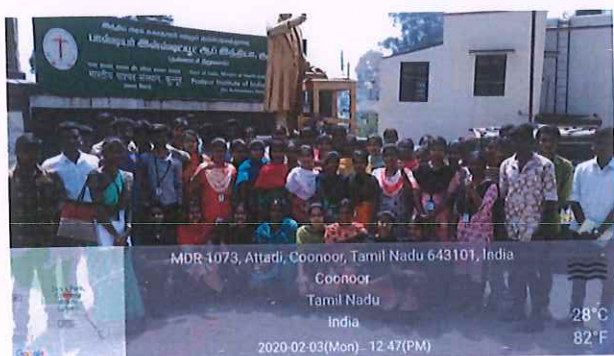
INSTITUTIONAL VISIT REPORT



INSTITUTIONAL VISIT

DATE : 03.02.2020
Beneficiary : III B.Sc Biotechnology
Venue : Pasteur Institute of India

Students were taken to Pasteur Institute of India, Coonoor as INSTITUTIONAL VISIT. They were able to gain Knowledge about Cultures of Micro organisms through this Industrial visit.



Rajendra

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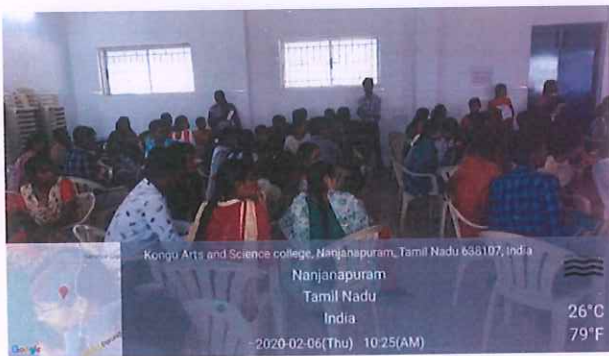


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DEPARTMENT OF BIOTECHNOLOGY

VALEDICTORY PROGRAMME

REPORT



INSTACRACKERS

An Intramural Quiz Competition

DATE :06.02.2020

Beneficiary : UG Biotechnology students

The Department organized **INSTACRACKERS – An Intramural Quiz Competition** on 06.02.2020 for UG Biotechnology students.



Report
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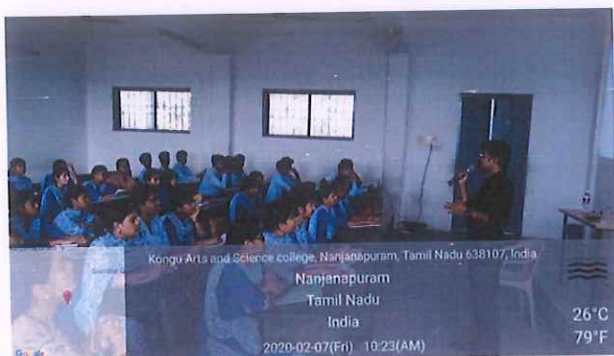


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DEPARTMENT OF BIOTECHNOLOGY

VALEDICTORY PROGRAMME

REPORT



GUEST LECTURE
on
Career Opportunities in Medical Transcription

DATE : 06.02.2020
Beneficiary : UG Biotechnology students
Resource Person: Mr. M. MOHAN KUMAR,
ImedX Information

Services Pvt. Ltd
Coimbatore.

Students were given awareness about the Career Opportunities in Medical Transcription and gained knowledge in important aspects of Medical transcriptions how it deals in Biotechnology



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KONGU ARTS AND SCIENCE COLLEGE
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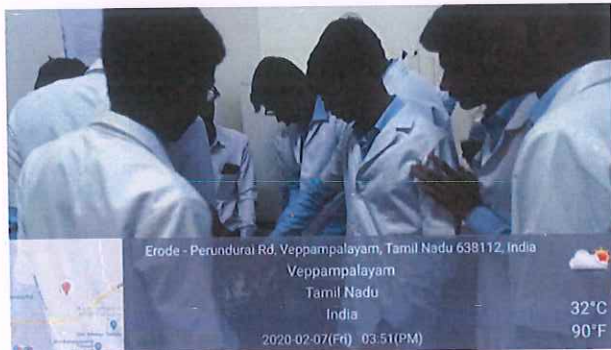
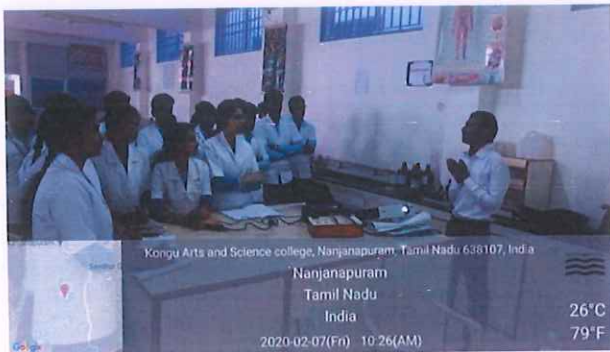


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VALEDICTORY PROGRAMME

REPORT



A WORKSHOP

On

Bioinstrumentation

DATE : 06.02.2020

Beneficiary : UG Biotechnology students

Resource Person: Mr. A. BALACHANDAR,
Service Provider,
Sasti Institution,
Avinashi.

Students were educated about the dos and don'ts of every instrument was demonstrated and elaborated to the students in the Biotechnology Lab.

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ERODE - 638 107.



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(AUTONOMOUS)
NANJANAPURAM, ERODE - 638 107.



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HANDS ON TRAINING

On

Hematology

REPORT



HANDS ON TRAINING

on

Hematology


DATE : 17.02.2020.

Beneficiary : I B.Sc Biotechnology students

Resource Person: Ms. M. P. SATHYA,
Lab Technician,
Sudha Hospital.

Students were educated about the Hematology of instrument was demonstrated and elaborated to the students in the Biotechnology Lab.




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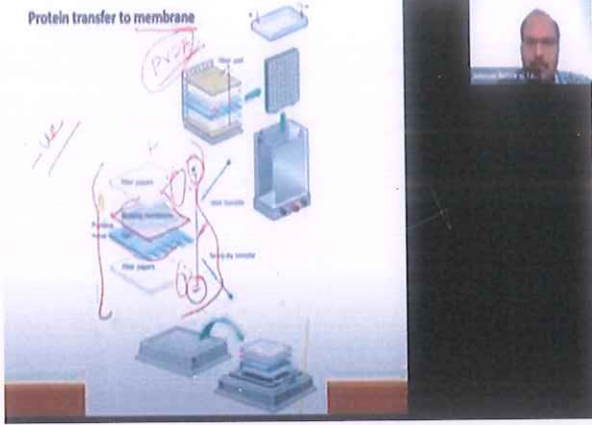

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REPORT



Webinar on “Molecular Tools for the Effective Diagnosis of COVID 19”

Date and : 13.05.2020


Resource Person Details: Dr. S. Johnson Retnaraj Samuel,

Scientist C,
International Research Centre,
Sathyabama Institute of Science and Technology,
Chennai.


Beneficiaries: UG Students of Biotechnology (150)

The students were given knowledge about the various possible Molecular Tools that are used for diagnosing COVID19. They were also addressed about the molecular mechanism that takes place during the time of infection. This session explained the pandemic situation in the world. And it gave an idea about diagnosing the disease through Molecular Tools.

This helps us to think differently from different ways about diagnosing the COVID. The session was effective and informative. This will enable students to do research in this field. The research Scientist gave an awesome idea to the students. Thus it was neat and clear explanation.


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DEPARTMENT OF BIOTECHNOLOGY

WEBINAR ON "FOOD TECHNOLOGY"

REPORT

Webinar on "Food Technology"


DATE: 20.05.2020

BENEFICIARIES:UG Biotechnology and
Biochemistry students (100)


RESOURCE PERSON: Dr.Palanivel Ganesan, Assistant Professor, Nanotechnology Research Centre, Department of Biomedical Chemistry, Konkuk University, South Korea.

The students were benefitted with the information on the latest approaches in Food Technology and its thrust areas. Entrepreneurial Prospects were also explained. The session was very informative about the recent trends in Food Technology. They explained about the wide range of applications in this field. It gave a different perspective on situations. The approach was very effective and the knowledge sticks in our mind.

The entrepreneurial Prospects were clearly explained. And it gave an idea about this field. Everything was explained clearly. And we learned something new from this lecture. This helped Students to gain knowledge in this field.


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