



KONGU ARTS AND SCIENCE COLLEGE

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

ERODE – 638 107

PROGRAM NAME
M.Sc. (Biochemistry)



KONGU ARTS AND SCIENCE COLLEGE

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

ERODE – 638 107

2021-2022



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SYLLABUS

Sem.	Course Code	Core II - Advanced Bioanalytical Techniques and Bioinformatics	Total Marks: 100		Hours / Week	Credits
I	21PBFCT102		CIA: 50	ESE: 50	5	4

Course Objectives:

1. To have a basic understanding of the theoretical principles involved in Bioinstrumentation
2. To become competent in the basic experimental techniques of biochemistry
3. To gain knowledge on how to acquire information and compare sequence and structure information, search databases and interpret protein structure.

Course Outcomes (CO): On completion of the course, students should be able to

CO 1	Compile the basic principles and applications of analytical techniques	K1 - K4
CO 2	Discuss the different methodologies of biochemical techniques	
CO 3	Illustrate the instrumental set up of various Bioanalytical techniques	
CO 4	Practice the biological databases and Operate various tools in Sequence alignment methods.	
CO 5	Illustrate the methods of Protein prediction and Drug designing.	

K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

Unit - I | Chromatography and Electrophoresis

Chromatography: Principle, Instrumentation and Applications of Thin Layer, Ion-exchange, Affinity Chromatography, GLC, HPLC, HPTLC, Flow Cytometry, DNA Microarray.

Electrophoresis: Principle, Techniques and Applications of Agarose Gel Electrophoresis, SDS-PAGE, Isoelectric focusing, Capillary electrophoresis.

Principle and Applications of KASPar assay.

Unit - II | Centrifugation and Spectrophotometer

Preparative Ultracentrifuge: Differential centrifugation and Density gradient centrifugation

Analytical Ultracentrifuge: Instrumental Set-up, applications

Spectrophotometer: Principle, Techniques and Applications of UV-Visible Spectrometer, Flame Photometry, Fluorimeter, Mass Spectrometer and X-ray Diffraction technique.

Principle and Applications of GC-MS and LC-MS.

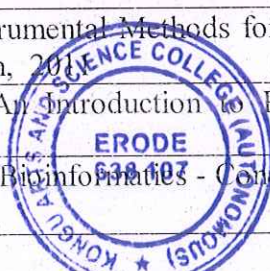


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Unit - III	Cytotoxicity Assays and Radioactivity
<p>Cytotoxicity Assay: Procedure and Applications of Comet and MTT Assay.</p> <p>Radioactivity: Types of radioactive decay - Alpha, Gamma & Beta emission; Principle, Techniques and Applications of GM Counter, Scintillation Counter and Autoradiography. Radiopharmaceuticals. Radioactive and Non-radioactive labeling, Applications of Radioisotopes in Biology.</p>	
Unit - IV	Biological Databases and Sequence Alignment
<p>Bioinformatics: Definition, Objectives, Scope and Applications of Bioinformatics</p> <p>Biological Databases: Primary, Secondary and Composite Databases</p> <p>Sequence Alignment: Local and Global Alignments; Needleman-Wunsch Algorithm and Smith-Waterman Algorithm, Scoring Matrices (PAM and BLOSUM), Similarity Search Tool (FASTA and BLAST), Multiple Sequence Alignment (CLUSTALW) and Phylogenetic Analysis (PHYLIP)</p>	
Unit - V	Protein structure prediction and CADD
<p>Secondary structure prediction: Chou-Fasman Method, Nearest Neighbor method, Neural Network method.</p> <p>Tertiary structure prediction: Ab initio method and threading method.</p> <p>Proteomics: Types; Tools (ExpASY) and Applications of Proteomics</p> <p>Computer Aided Drug Designing: Stages and applications of Molecular docking.</p>	

Skill Development Activities	Max. Marks (10)
Assignment	3
e-Content Creation	3
Case Study	3
Punctuality	1

TEXT BOOKS	
1	P. Asokan, Analytical Biochemistry, China Publications, 3 rd Edition, 2006.
2	A.Upadhyay, K.Upadhyay, N.Nath, Biophysical Chemistry - Principles and Techniques, Himalaya Publishing House Pvt. Ltd, 4 th Edition, 2016.
3	B. K. Sharma, Instrumental Methods for Chemical Analysis, Krishna Prakashan Media Pvt Ltd, 11 th Edition, 2016.
4	D. T. Plummer, An Introduction to Practical Biochemistry, McGraw Hill Education, 3 rd Edition, 2017.
5	S.C. Rastogi <i>et al.</i> , Bioinformatics - Concepts, Skills and Applications, CBS publishers, 1 st Edition, 2003.



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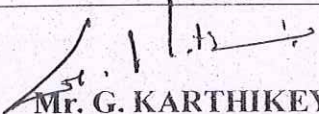

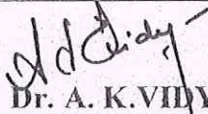
6	K. Mani and N. Vijayaraj. Bioinformatics for Beginners, Kalaikathir Achagam, Coimbatore, 1 st Edition, 2002.
7	Ambika Shanmugam, Fundamentals of Biochemistry for Medical Students, Published by the Author, 7 th edition, 2008

REFERENCE BOOKS

1	Keith Wilson and John Walker. Principles and Techniques of Biochemistry and Molecular Biology, Cambridge University Press, 6 th Edition, 2007.
2	A. Douglas, Skoog, M. Donald West, F. James Holler, Stanley R. Crouch, Fundamentals of Analytical Chemistry, Barkha Nath Printers, 9 th edition, 2008.
3	S. Sundararajan and R. Balaji, Introduction to Bioinformatics, Himalaya publishing house, 1 st Edition, 2002

WEB RESOURCES

1	https://microbenotes.com/category/instrumentation/
2	https://www.onlinebiologynotes.com/electrophoresis-principle-affecting-factors-and-types/
3	https://www.biologydiscussion.com/biodiversity/bioinformatics/notes-on-bioinformatics-genetics/38224

Course Designed By	Verified By	Approved By HOD
 Mr. G. KARTHIKEYAN	 Mrs. T. RADHA	 Dr. A. K. VIDYA

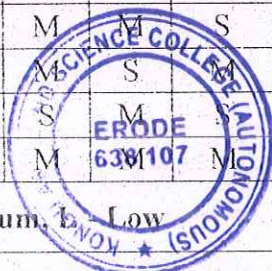
QUESTION PAPER PATTERN

Time: 3 hours		Max. Marks: 50
SECTION-A (10 X 1 = 10 Marks) Answer ALL the questions Choose the correct answer	SECTION-B (5 X 3 = 15 Marks) Answer ALL the questions Either or type Two questions from each unit	SECTION-C (5 X 5 = 25 Marks) Answer ALL questions Question Number: 16 to 19 (Either or type) Question Number 20 is Compulsory - Case Study

Mapping of COs with POs and PSOs:

PO/PSO CO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	S	M	S	M	S	S	S	S	M	S
CO 2	S	M	S	M	S	S	S	S	S	S	S	M
CO 3	S	S	S	S	S	M	S	S	S	S	M	S
CO 4	S	S	M	S	M	S	S	S	S	S	S	M
CO 5	S	M	S	M	S	S	S	S	S	S	M	S

S - Strong, M - Medium, L - Low



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Sem.	Course Code	Core III - Advanced Enzymology	Total Marks: 100		Hours / Week	Credits
			CIA: 50	ESE: 50	4	4
I	21PBFCT103					

Course Objectives:

1. To acquaint students with fundamental of enzymes and kinetics of enzyme catalyzed reactions.
2. To provide a comprehensive overview about the principles of enzymology and techniques employed in the utilization of enzymes.
3. To acquire a better understanding on the modern approaches of enzyme technology and their applications.

Course Outcomes (CO): On completion of the course, students should be able to

CO 1	Recall the fundamentals of concepts of enzymes	K1 - K4
CO 2	Identify the active site of enzyme, catalytic reactions	
CO 3	Evaluate the enzyme kinetic mechanisms. Compare the enzyme inhibitors	
CO 4	Describe the methods for production, purification, characterization and immobilization of enzymes.	
CO 5	Illustrate the industrial applications of enzymes	

K1: Remember ; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

Unit - I Enzymes

Enzymes: Introduction, Nomenclature and Classification of enzymes, Factors affecting enzyme activity.

Active site: Definition, Salient features and Theories of active site – Lock and Key theory and Induced Fit Theory, Investigations of active site structure - Trapping ES complex, Enzyme modification by treatment with proteases, Enzyme modification by site directed mutagenesis.

Isoenzymes: Lactate Dehydrogenase and Creatine Kinase.

Multi Enzyme Complex: Fatty acid Synthetase complex.

Unit - II Enzyme catalysis, Coenzymes & Cofactors

Enzyme catalysis: Acid-base catalysis and covalent catalysis. Structure and Mechanism of Lysozyme and Chymotrypsin

Coenzymes: Structure and Mechanism of TPP, NAD, FAD, Pyridoxal Phosphate and Coenzyme A.

Cofactors: Metal activated enzymes and Metallo enzymes - Role of metal ions in mechanism of Carbonic anhydrase, Carboxy peptidase and Superoxide dismutase.



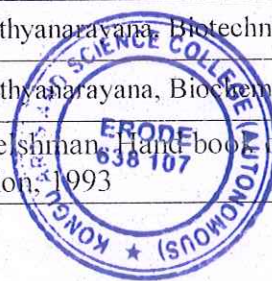
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Unit - III	Enzyme kinetics & Enzyme inhibition
<p>Enzyme kinetics: Michaelis-Menten Equation, Line weaver Burk plot, Eadie - Hofstee plot and Hanes plot.</p> <p>Allosteric enzymes: Definition, Cooperativity, Regulation - Concerted and Sequential Model - Aspartate Transcarbamylase</p> <p>Enzyme inhibition: Types – Difference between the Competitive, Non-competitive and Uncompetitive inhibitions. Ribozyme and Abzyme</p>	
Unit - IV	Applications of enzymes
<p>Industrial applications of enzymes: Extraction and Purification of Amylase and Protease (Bacteria and Fungi).</p> <p>Applications of Enzymes: Enzymes in Brewing, Baking, Meat processing industry. Role of enzymes in Detergent, Leather and Textile Processing.</p> <p>Clinical application of enzymes: Diagnostic and Therapeutic enzymes.</p>	
Unit - V	Immobilization & Biosensors
<p>Enzyme immobilization: Techniques – Adsorption, Cross linking, Covalent bonding, Entrapment and Encapsulation and applications of immobilized enzymes.</p> <p>Biosensors: Principle and applications of Calorimetric, Potentiometric, Optical, biosensors, Immunosensors and Genetic biosensors (For monitoring Plant Stress)</p> <p>Advances in Enzyme Technology: Enzymes in recombinant DNA technology, Protein engineering.</p>	

Skill Development Activities	Max. Marks (10)
Assignment	3
e-Book Review	3
Case Study	3
Punctuality	1

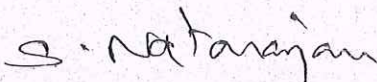
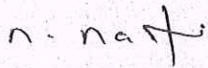
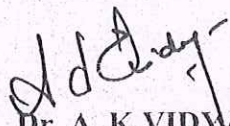
TEXT BOOKS	
1	Palmer, Understanding Enzymes, Printice Hall, 3 rd edition, 1991
2	Trevor Palmer and Philip Bonner, Enzymes, Woodhead publishing, 2 nd Edition, 2007.
3	Dr. U. Sathyanarayana, Biotechnology, Books and allied (P) Ltd, Kolkata, 4 th edition, 2013.
4	Dr. U. Sathyanarayana, Biochemistry, Elsevier Health Sciences, 4 th edition, 2013.
5	Alan Welshman, Hand book of enzyme biotechnology, Cambridge University Press, 2 nd Edition, 1993



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REFERENCE BOOKS	
1	Marangoni, John Wiley. Enzyme Kinetics - A Modern Approach, Wiley Online Library, 1 st Edition, 2002.
2	Chapline. Bucke, Enzyme Technology, Cambridge University Press, 1 st Edition, 1990.
3	Price and Stevens, Fundamentals of enzymology, Oxford University Press, 2 nd edition, 1995
4	Nooralabettu Krishna Prasad, Enzymes technology, PHI Learning Pvt, Kindle Edition, 2011.
5	EE. Conn and PK. Stumpf, G. Bruening and RY. Doi, Outlines of biochemistry, John Wiley and Sons, New York, USA, 5 th edition, 2010

WEB RESOURCES	
1	www.sciencedirect.com
2	www.cheric.org.cybertecture

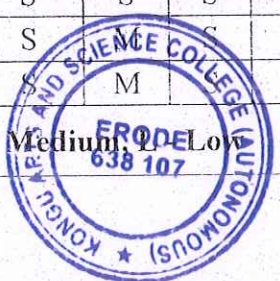
Course Designed By	Verified By	Approved By HOD
 Mr. S. NATARAJAN	 Mr. R. RASU	 Dr. A. K. VIDYA

QUESTION PAPER PATTERN		
Time: 3 hours	Max. Marks: 50	
SECTION-A (10 X 1 = 10 Marks) Answer ALL the questions Choose the correct answer	SECTION-B (5 X 3 = 15 Marks) Answer ALL the questions Either or type Two questions from each unit	SECTION-C (5 X 5 = 25 Marks) Answer ALL questions Question Number: 16 to 19 (Either or type) Question Number 20 is Compulsory - Case Study

Mapping of COs with POs and PSOs:

PO/PSO CO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	S	S	S	S	M	S	S	S	M	M
CO 2	S	S	M	S	S	M	S	M	M	S	S	M
CO 3	S	S	S	S	M	S	S	S	S	S	M	S
CO 4	S	S	S	S	M	M	S	S	S	M	S	S
CO 5		M		M	S	M	S	S	S	S	M	S

S - Strong, M - Medium, L - Low



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Sem.	Course Code	Elective I: Animal Biotechnology and Nanotechnology	Total Marks: 50		Hours / Week	Credits
			CIA: 50	ESE: 50		
I	21PBFET107				4	4

Course Objectives:

1. To understand the components of culture media and various tissue culture techniques
2. To enable the students to have a sound knowledge on advantages of transgenesis
3. To synthesize and characterize nanomaterials using natural sources

Course Outcomes (CO): On completion of the course, students should be able to

CO 1	Outline the basic principles of Animal cell culture.	K1 - K4
CO 2	Discuss the properties of various types of animal cell cultures	
CO 3	Investigate the concepts of transgenic animals production	
CO 4	Discriminate the properties and synthesis of Nanomaterials.	
CO 5	Investigate the characterization and applications of Nanomaterials.	

K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

Unit - I Animal Cell Culture Media

Animal Cell Culture: Facilities for animal cell culture - Infrastructure, equipment, Cell sources and cell types required for Animal cell culture.

Culture media: Physico-Chemical properties of culture media. Complete culture media- EMEM and RPMI, Balanced Salt Solution, Composition of Earle's BSS and Hank's BSS.

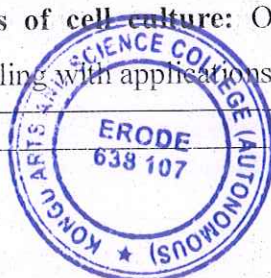
Natural media:- Serum and Tissue extracts. Serum free media- Advantages and Disadvantages. Sterilization of media.

Unit - II Types of Culture

Biology of cultured cells: Cell adhesion, Cell Proliferation, Cell differentiation, Metabolism of cultured cells. Measurement of growth parameters of cultured cells. Cell synchronization. Apoptosis and its measurement.

Primary cell culture: Mechanical and Enzymatic method. Cell line- Finite and Continuous cell line. Subculture

Types of cell culture: Organ culture, Three dimensional culture. Tissue engineering and Tissue modeling with applications.

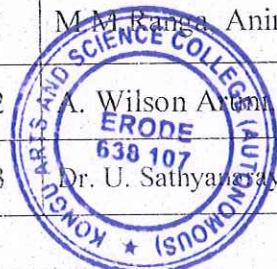


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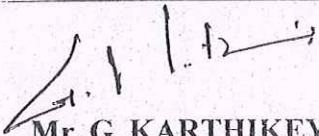
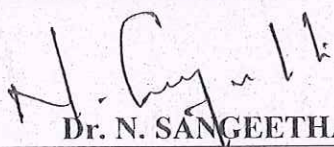
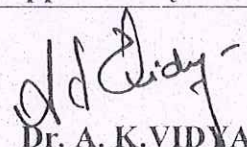
Unit - III	Transgenesis
<p>Embryo Culture: An overview of collection and preservation of embryos - IVF and Embryo transfer.</p> <p>Transgenic animals: Methods - Microinjection method and Embryonic Stem cell method.</p> <p>Transgenesis in Large animals: Transgenic Cattle, Transgenic Sheep, Goat and Chicken</p>	
Unit - IV	Nanotechnology
<p>Nanotechnology: Basics of Nano science and Nano scale.</p> <p>Classification of Nanomaterials: Quantum Dots, Synthesis, Properties and applications of Carbon nanotubes</p> <p>Metal based nanomaterials: Preparation and applications of Nano gold, Nano silver and Silica metal oxide.</p> <p>Properties of Nanostructured materials: Size and Shape dependent properties, Thermal Property, Magnetism, Conductivity and Band Gap.</p> <p>Synthesis of Nanomaterials: CVD, Sol-Gel processing, Biological method - use of Plant extracts, Bacteria and Fungi.</p>	
Unit - V	Characterization and Applications of Nanomaterials
<p>Characterization of Nano phase materials: Principle and Working of Scanning Electron Microscopy, Transmission Electron Microscopy, Scanning Tunneling Microscopy and Atomic Force Microscopy</p> <p>Applications of Nanotechnology: In Medicine, Textile, Cosmetics, Food & Agriculture.</p> <p>Nano remediation: Environmental Cleanup technologies.</p>	

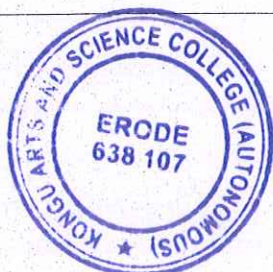
Skill Development Activities	Max. Marks (10)
Journals Review	3
e-Content Creation	3
Case Study	3
Punctuality	1


TEXT BOOKS	
1	M.M.Ranga, Animal Biotechnology, AgroBios, 2 nd edition, 1993.
2	A. Wilson and P.Ramadass, Animal Tissue Culture, MJP Publishers, 1 st Edition, 2011.
3	Dr. U. Sathyavayana, Biotechnology, Books and allied (P) Ltd, Kolkata, 4 th Edition, 2013.



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4	B.S.Murty, P. Shankar, B.Raj, B.B.Rath, Murday, Textbook of Nanoscience and Nanotechnology. Universities Press Pvt Ltd, 1 st Edition, 2013											
REFERENCE BOOKS												
1	T.Pradeep. Nano: The Essentials: Understanding Nanoscience and Nanotechnology. McGraw Hill Education, 1 st Edition, 2017											
2	R. Ian Freshney, Culture of Animal cells-A Manual of Basic technique, A John Wiley & Sons.Inc Publications, 4 th Edition, 2000.											
WEB RESOURCES												
1	https://www.notesonzooology.com/animal-cell-culture/animal-cell-and-cell-culture-notes-introduction-substrates-isolation-types-and-techniques/13503											
2	https://microbeonline.com/animal-cell-culture-introduction-types-methods-applications/											
3	https://www.vedantu.com/biology/transgenic-animals											
Course Designed By		Verified By		Approved By HOD								
 Mr. G. KARTHIKEYAN		 Dr. N. SANGEETHA		 Dr. A. K. VIDYA								
QUESTION PAPER PATTERN												
Time: 3 hours			Max. Marks: 50									
SECTION-A (10 X 1 = 10 Marks) Answer ALL the questions Choose the correct answer		SECTION-B (5 X 3 = 15 Marks) Answer ALL the questions Either or type Two questions from each unit		SECTION-C (5 X 5 = 25 Marks) Answer ALL questions Question Number: 16 to 19 (Either or type) Question Number 20 is Compulsory - Case Study								
Mapping of COs with POs and PSOs:												
PO/PSO	PO							PSO				
CO												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	S	M	S	M	S	S	S	S	M	S
CO 2	S	M	M	S	M	S	S	S	S	S	S	M
CO 3	S	M	S	M	S	M	S	S	S	S	M	S
CO 4	S	S	M	S	M	S	S	S	S	S	S	M
CO 5	S	M	M	M	S	S	S	S	S	S	M	S
S - Strong, M - Medium, L - Low												




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Sem.	Course Code	Elective I: Genomics and Proteomics	Total Marks: 100		Hours / Week	Credits
			CIA: 50	ESE: 50		
I	21PBFET108				4	4

Course Objectives:

1. To handle the data in analyzing and interpretation including annotation.
2. To provide students a detailed through background various wet lab techniques and data generation tools related to DNA sequences.
3. To educate students on standalone and online software for genetic studies.

Course Outcomes (CO): On completion of the course, students should be able to

CO 1	Memorize the structure and functions of Genomes	K1 - K4
CO 2	Outline the concepts of Genome sequencing and mapping	
CO 3	Identify the importance of Genome and Proteome data bases	
CO 4	Compute the techniques of protein-protein interaction	
CO 5	Explain the characteristics of genome annotations	

K1: Remember ; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

Unit - I

Genomics: Introduction to Genomics, Genome topology: Chromatin, super coiling and packaging.
Genome organization: Genome organization in prokaryotic and eukaryotic systems: Operon concept.
Genome Sequencing - Shot gun, clone - contigs, pyrosequencing, Next generation sequencing.
Genome analysis- Chromosome analysis and mapping: Basic strategy for genetic analysis in human, Linkage mapping, physical mapping, genetic mapping and restriction mapping.

Unit - II

Annotation of the Genome: Various approaches in gene prediction, ORF prediction, Gene prediction in prokaryotes, Gene prediction in eukaryotes, Hidden Markov Model, Pattern discrimination, Evaluation of gene prediction method and Prediction of promoter sequences. Applications of Genomics.

Unit - III

Functional Genomics: Gene expression analysis by cDNA micro arrays, GEO, SAGE. EST databases (DBEST, UNIGENE).

Genomic Diversity- General Purpose of Comparative Genomics Database: Cog- Cluster of Orthologous Groups, Kyoto Encyclopedia of Genes and Genomes (KEGG) Microbial Genome Database (MBGD), Tools for Genomic Comparison and functional genomics




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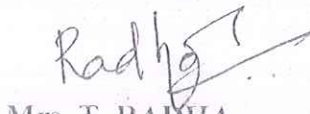
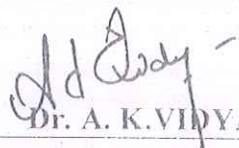
Unit - IV	<p>Principles of Protein classification: Based on Structural features, Phylogenetic relationship, CATH - Classification by Class, Architecture, Topology, Homology, SCOP - Structural Classification of Protein, FSSP – Fold classification based on structure - structure alignment, MMDB - Molecular Modeling Database. Secondary structure prediction: Chou – Fasman / GOR method, Neural network</p>
Unit - V	<p>Protein-protein interactions: Yeast two hybrid technique. Analytical proteomics: Sample preparation and processing, Proteome analysis techniques: 2D PAGE, Capillary Electrophoresis, Spectroscopy: NMR, MS and MALDI-TOF and its variants. 3D structural analysis: X-ray crystallography/X-ray diffraction analysis. Applications of proteomics.</p>

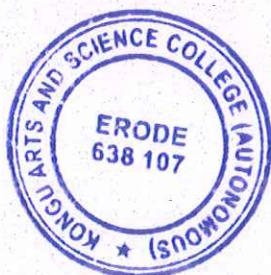
Skill Development Activities	Max. Marks (10)
Assignment	3
Journal Review	3
Group Discussion	3
Punctuality	1


TEXT BOOKS	
1	Andreas D. Baxevanis and B. F. Francis Ouellette, Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, Wiley Interscience, 2 nd Edition, 2004
2	A. Malcolm Campbell and Laurie J. Heyer, Discovering Genomics, Proteomics and Bioinformatics, Pearson Education, 2 nd Edition, 2009.
REFERENCE BOOK	
1	R.M.Twyman, Taylor & Francis group, Principles of Proteomics, BIOS Scientific Publishers, 2 nd Edition, 2004
2	Arthur M. Lesk, Introduction to Bioinformatics, Oxford University, 5 th Edition, 2019.
3	Jin Xiong, Essential Bioinformatics, Cambridge University Press, 3 rd Edition, 2014
WEB RESOURCES	
1	https://byjus.com/biology/genome-and-genomics/
2	http://www.genomenetwork.org/resources/whats_a_genome/Chp2.html




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 Mr. A. KARTHIKEYAN		 Mrs. T. RADHA				 Dr. A. K. VIDYA						
QUESTION PAPER PATTERN												
Time: 3 hours						Max. Marks: 50						
SECTION-A (10 X 1 = 10 Marks) Answer ALL the questions Choose the correct answer				SECTION-B (5 X 3 = 15 Marks) Answer ALL the questions Either or type Two questions from each unit				SECTION-C (5 X 5 = 25 Marks) Answer ALL questions Question Number: 16 to 19 (Either or type) Question Number 20 is Compulsory - Case Study				
Mapping of COs with POs and PSOs:												
PO/PSO CO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	S	M	S	M	S	S	S	S	M	S
CO 2	S	M	M	S	M	S	S	S	S	S	S	M
CO 3	S	M	S	M	S	M	S	S	S	S	M	S
CO 4	S	S	M	S	M	S	S	S	S	S	S	M
CO 5	S	M	M	M	S	S	S	S	S	S	M	S
S - Strong, M - Medium, L - Low												




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Sem.	Course Code	Core VII - Immunology and Immunotechniques	Total Marks: 100		Hours / Week	Credits
			CIA: 50	ESE: 50	5	4

Course Objectives:

1. To provide a clear understanding of the molecular and cellular components that comprise the immune system, including their function and interaction.
2. To enable students to learn diseases caused by disorders of the immune system (failure, aberrant action, and malignant growth of the cellular elements of the system).
3. To gain an insight on the latest methods of detecting disease causing pathogens, its treatment using novel vaccines.

Course Outcomes (CO): On completion of the course, students should be able to

CO 1	Locate the components of the immune system and how cells and organs play an important role in the immune responses.	K1 - K4
CO 2	Illustrate the structure and mechanism of action of different immune components and their resultant reaction responses.	
CO 3	Compare the principle and applications of various immuno techniques ranging from precipitation and agglutination reactions to ELISA, Radio immunoassay and flow cytometry.	
CO 4	Complete knowledge of the molecular mechanisms and kinetics of the immune responses, both humoral and cell mediated immunity.	
CO 5	The course will aid in understanding abnormal manifestations of the immune response in the form of Hypersensitive reactions, the mechanisms of transplantation of the various organs the principles of Graft rejection, Autoimmunity, Knowledge of pathogenesis of diseases and designing of immunology based interventions for effective treatment like Antibody based therapy.	

K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

Unit - I | Cells and Organs of Immune system

Immunity: Innate and Adaptive immunity. Hematopoiesis

Immune cells: Structure, properties and functions of the T and B - lymphocytes, NK cells, Monocytes and Macrophages, Dendritic cells, Neutrophils, Eosinophil, and Basophils.

Lymphoid organs: Primary and Secondary lymphoid organs (Bursa, Thymus, Bone marrow, Lymph nodes, Spleen, MALT, GALT and CALT).

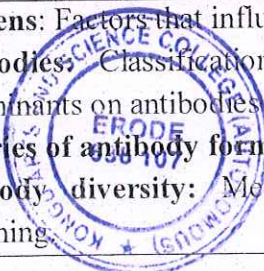
Unit - II | Antigens and Antibodies

Antigens: Factors that influence Immunogenicity, Haptens, B and T cells epitopes.

Antibodies: Classification, Structure, Function and Properties of the antibodies: Antigenic determinants on antibodies (isotype, allotype and idio type); Immunoglobulin Superfamily

Theories of antibody formation: Side chain and Clonal selection theory, Sars-Covid2 Spike Protein.

Antibody diversity: Mechanisms contributing to diversity - Somatic Recombination, Class Switching

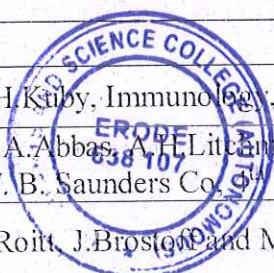


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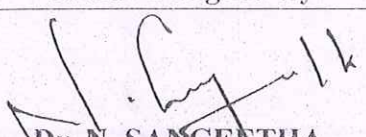
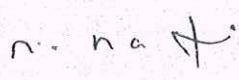
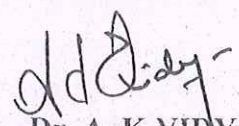
Unit - III	Vaccines and Techniques of Antigen-Antibody Interactions
<p>Vaccines: Subunit vaccines, Attenuated organisms, Recombinant vaccines, DNA vaccines, Synthetic peptide vaccines, Antidiotypic vaccines.</p> <p>Immunological techniques: Affinity and Avidity, Cross reactivity, Precipitation, Agglutination, Principle and Applications of Immunodiffusion, Rocket immuno electrophoresis, ELISA, RIA.</p> <p>Hybridoma technology: Techniques and applications of Monoclonal Antibodies.</p> <p>Experimental Animal models: SCID mice, Knockout mice and Nude mice.</p>	
Unit - IV	MHC, Cell and Antibody mediated immunity and Complement
<p>Major histocompatibility gene complex: Types - Structure and Functions, Structure and cellular distribution of HLA antigens.</p> <p>Cell mediated immunity: Cell types (CTLs, NK cells, macrophages and TDTH cells), Effector mechanisms and Effector molecules of cell mediated reactions.</p> <p>Cytokines: Interleukins and Interferons (outline only).</p> <p>Complement system: Components of the complement activation, Pathways - Classical, Alternative and Lectin pathways. Biological consequences of complement activation and complement deficiencies</p>	
Unit - V	Hypersensitivity, Autoimmunity and Transplantation immunology
<p>Hypersensitivity: mechanism of types I, II, III and IV Hypersensitivity reactions.</p> <p>Autoimmune diseases: Definition, Mechanisms of induction of organ specific (Myasthenia Grave's disease and IDDM) and systemic diseases (Rheumatoid arthritis and SLE).</p> <p>Transplantation immunology: Graft – Definition, Types, Immunologic basis of graft rejection, Properties and types of rejection, Tissue typing, Immunosuppressive therapy.</p> <p>Tumor Immunology: Types of tumors, Tumor antigens, Immune response to tumors, Cancer Immunotherapy (Cytokine Therapy and Monoclonal Antibody Therapy)</p> <p>Diseases weakening immune system: AIDS – Structure of HIV, HIV Transmission and Infection of target cells, Diagnosis and Treatment. An overview on signs and symptoms of Dengue, Swine flu, Sars Covid.</p>	

Skill Development Activities	Max. Marks (10)
Assignment	3
Journal Review	3
Case Study	3
Punctuality	1


TEXT BOOKS	
1	J.H.Kuby, Immunology, W. H. Freeman Publication, 6 th Edition, 2007
2	K.A.Abbas, A.L.Littman and J.S.Pober, Cellular and Molecular Immunology, W. B. Saunders Co., 6 th Edition, 2007.
3	I.Roitt, J.Brosnan and M.David, Immunology, Mos by publisher



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REFERENCE BOOKS													
1	R.I.Tizard. Immunology. Saunders college publishing, 4 th Edition, 2007.												
2	Ivon Roitt. Essential Immunology. Blackwell Publishing, 11 th edition. 2006.												
WEB RESOURCES													
1	https://csmb.co.uk												
2	https://www.roitt.com												
Course Designed By				Verified By				Approved By HOD					
 Dr. N. SANGENTHA				 Mr. R. RASU				 Dr. A. K. VIDYA					
QUESTION PAPER PATTERN													
Time: 3 hours						Max. Marks: 50							
SECTION-A (10 X 1 = 10 Marks) Answer ALL the questions Choose the correct answer				SECTION-B (5 X 3 = 15 Marks) Answer ALL the questions Either or type Two questions from each unit				SECTION-C (5 X 5 = 25 Marks) Answer ALL questions Question Number: 16 to 19 (Either or type) Question Number 20 is Compulsory - Case Study					
Mapping of COs with POs and PSOs:													
CO	PO								PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO 1	S	M	M	S	S	M	S	S	S	S	M	M	
CO 2	S	M	M	S	S	M	S	S	S	S	M	M	
CO 3	S	S	M	S	M	M	M	S	S	S	S	M	
CO 4	S	M	M	M	S	M	S	S	S	S	S	S	
CO 5	S	S	S	S	S	S	M	S	S	S	M	M	
S - Strong, M - Medium, L - Low													




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Sem.	Course Code	Core VIII - Molecular Biology and Molecular Genetics	Total Marks: 100		Hours / Week	Credits
			CIA: 50	ESE: 50		
II	21PBFCT203				5	4

Course Objectives:

1. To enlighten the basic principles of genetics and the roles of genes and inheritance.
2. To understand the gene structure, replication, transcription, translation, recombination, mutation and DNA repair.
3. To become familiar with the diagnostic molecular biology.

Course Outcomes (CO): On completion of the course, students should be able to

CO 1	Analyze the molecular organization of genes	K1 - K4
CO 2	Evaluate the mechanism of DNA repair and DNA replication.	
CO 3	Distinguish the importance of enzymes in transcription process.	
CO 4	Compute the strategies of synthesis and translocation of proteins.	
CO 5	Explain the basic principles of transmission genetics.	

K1: Remember ; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

Unit - I Organization of Chromosomes

Molecular structure of Genes and Chromosomes: Molecular definition of gene, chromosomal organization of genes and non-coding DNA - Protein coding genes and tandemly repeated genes.

DNA sequence Polymorphism: Single Nucleotide Polymorphism.

Transposons: Bacterial transposons and retroviral transposons.

Structural organization of Eukaryotic chromosomes; Functional elements of Eukaryotic chromosomes;

Epigenetics - Fundamentals only

Unit - II DNA - Mutation, Repair & Replication

Mutation – Definition, Types.

DNA Damage and DNA Repair: Types - Excision repair, Mismatch Repair, Photo reactivation Repair and SOS Repair.

DNA Replication: Modes of Replication - Semiconservative mechanism;

DNA replication Machinery in Prokaryotes and Eukaryotes. Role of Topoisomerase in DNA Replication



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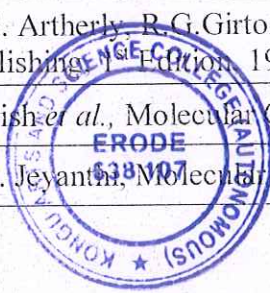
Unit - III	Transcription
<p>Prokaryotic Transcription: Initiation, Elongation and Termination.</p> <p>Operon Model: Lac operon and Trp operon.</p> <p>Eukaryotic Gene Control: Regulatory sequences in protein coding genes – TATA box, Promoter proximal elements, distant enhancer sites.</p> <p>Eukaryotic RNA Polymerases: I, II & III.</p> <p>Post-transcriptional modification: Processing of Eukaryotic pre-mRNA, rRNA and tRNA.</p>	
Unit - IV	Translation & Recombination
<p>Translation: Activation of amino acids, Initiation, Elongation and Termination.</p> <p>Genetic Code: Salient features and Wobble Hypothesis.</p> <p>Protein Sorting and Targeting of Mitochondria and Chloroplast proteins; Translocation of Secretory products across ER membrane; Post-translational Modification of Proteins; Protein glycosylation in ER and Golgi complex.</p> <p>DNA Recombination: Holliday Model of Recombination.</p>	
Unit - V	Transmission Genetics
<p>Transmission Genetics: Mendelian Analysis of Inheritance.</p> <p>Terms in Genetics: Genes, Chromosomes, Alleles, Homozygous, Heterozygous, Dominance and Recessive. Law of Dominance, Back cross and Test cross.</p> <p>Mendel's law: Law of Segregation and Law of Independent Assortment.</p> <p>Linkage: Definition and Types. Salient features of Autosomal Dominance, Autosomal Co-dominance and Autosomal Recessive, X-linked Recessive and Y-linked characters.</p>	

Skill Development Activities	Max. Marks (10)
Model Presentation	3
e-content creation	3
Case Study	3
Punctuality	1

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TEXT BOOKS	
1	A.G. Artherly, R.G.Girton, J.F.McDonald, The Science of Genetics, Saunders Publishing Co. Edition, 1999.
2	Lodish <i>et al.</i> , Molecular Cell Biology, W.H. Freeman and Company, 4 th Edition, 2000.
3	G.P. Jeyanthi, Molecular Biology, MJP Publishers, 1 st Edition, 2009.

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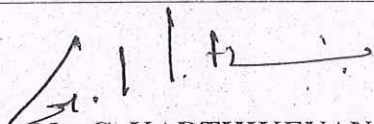
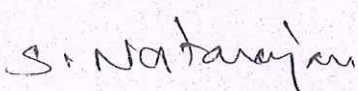
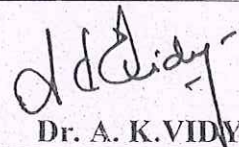


REFERENCE BOOKS

1	Twyman. Advanced Molecular Biology. Viva publication, 2 nd Edition, 1998.
2	Lewin. Genes VIII, Prentice Hall International, 8 th Edition, 2004.
3	Alberts <i>et al.</i> , Molecular Biology of the cell, Garland Science Publications, 4 th Edition, 2002.
4	Watson, Molecular Biology of the gene, Pearson Education, 5 th Edition, 2004.

WEB RESOURCES

1	https://byjus.com/biology/dna-replication-machinery-enzymes/
2	https://byjus.com/biology/genetics/
3	http://www1.biologie.uni-hamburg.de/b-online/library/biology107/bi107vc/fa99/terry/RNAprot.html

Course Designed By	Verified By	Approved By HOD
 Mr. G. KARTHIKEYAN	 Mr. S. NATARAJAN	 Dr. A. K. VIDYA

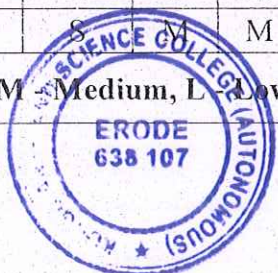
QUESTION PAPER PATTERN

Time: 3 hours		Max. Marks: 50
SECTION-A (10 X 1 = 10 Marks) Answer ALL the questions Choose the correct answer	SECTION-B (5 X 3 = 15 Marks) Answer ALL the questions Either or type Two questions from each unit	SECTION-C (5 X 5 = 25 Marks) Answer ALL questions Question Number: 16 to 19 (Either or type) Question Number 20 is Compulsory - Case Study

Mapping of COs with POs and PSOs:

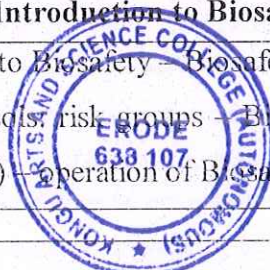
PO/PSO CO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	S	M	S	M	S	S	S	S	M	S
CO 2	S	M	M	S	S	S	S	S	S	S	S	S
CO 3	S	M	S	M	S	M	S	S	S	S	M	S
CO 4	S	S	M	S	S	S	S	S	S	S	S	S
CO 5	S	M	M	M	S	S	S	S	S	S	M	S

S - Strong, M - Medium, L - Low



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Sem.	Course Code	Core IX - Bioethics, Biosafety, TQM & IPR	Total Marks: 100		Hours / Week	Credits
			CIA: 50	ESE: 50		
II	21PBFCT204				5	3
Course Objectives:						
To provide basic concepts and importance of biodiversity, bioethics and biosafety, TQM and IPR						
Course Outcomes (CO): On completion of the course, students should be able to						
CO 1	Describe the concepts of Biodiversity in India and global level					K1 - K4
CO 2	Describe the Biosafety levels of microbes, plants and animals					
CO 3	Demonstrate Ethics and Ethical issues in GMO's					
CO 4	Understand the Trade Quality Management					
CO 5	Illustrate the concepts of IPR					
K1: Remember ; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create						
Unit - I	Biodiversity					
Biodiversity: Introduction, levels, values, loss of biodiversity. Species concept - Classification and systematics: biological nomenclature – biological classification;						
Biodiversity conservation: in situ and ex situ - Magnitude and distribution of biodiversity - wild life biology – conservation strategies – measures of biodiversity – biodiversity in India and global level – biodiversity hot spots.						
Unit - II	Introduction to ethics/bioethics					
Introduction to ethics/bioethics: Framework for ethical decision making; biotechnology and ethics – benefits and risks – genetic engineering and bio warfare.						
Ethical implications of cloning: Reproductive cloning, therapeutic cloning; Ethical, legal and socio-economic aspects of gene therapy						
GM crops and GMO's: biotechnology and bio piracy – ELSI of human genome project.						
Unit - III	Introduction to Biosafety					
Introduction to Biosafety – Biosafety issues in biotechnology – risk assessment and risk management – safety protocols, risk groups – Biosafety levels – Biosafety guidelines and regulations (National and International) – operation of Biosafety guidelines and regulations – types of Bioterrorism containment.						




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Unit - IV	Total Quality Management
<p>TQM: Principles, Tools, steps, techniques and methods for TQM (Six sigma, charts, Ishikawa diagram, tree diagram, RCA and PDCA cycle),</p> <p>Requirements for supplementing TQM - steps for supplementing TQM – questionnaire preparation and assessment through questionnaire, mission statement, benefits of TQM, check list for implementing TQM - Introduction to GMP and GLP.</p>	
Unit - V	Intellectual property rights
<p>IPR: protection of biotechnological inventions, patents- types, patenting of genes, biological organisms, plants, animals, microbes and transgenic organisms, trade secrets, copyright, World Intellectual Property Rights organization (WIPO), GATT (General agreement of tariff and trade), biodiversity bill of India.</p>	

Skill Development Activities	Max. Marks (10)
Journal Review	3
e-content creation	3
Case Study	3
Punctuality	1

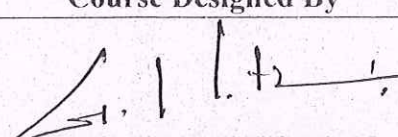
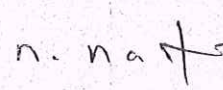
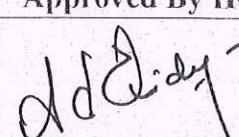
TEXT BOOKS	
1	Radhakrishnan R. and Balasubramanian, S, Intellectual Property Rights: Text and Cases, 1 st edition. Excel Books, 2008
2	Subbaram, N. R., Viswanathan, S, Handbook of Indian Patent Law and Practice. 1st Edition. Printers and Publishers Pvt. Ltd, 1998.
REFERENCE BOOKS	
1	Krishna, V. S, Bioethics and Biosafety in Biotechnology, 1 st Edition. New Age International Publishers, 2007.
2	Cohen.G, Technology Transfer. 1 st Edition. Sage Publications, 2004
3	Ram Narain. Twelve management skills for success. Viva books private limited, Chennai.
4	A. Rao, L.P.Carr, I.Dambolena, R.Kopp, J.Martin, F.Rafii and P.FSchlesinger, Across functional perspectives of TQM. First Edition. John Wiley and sons, New York, 1996
5	Martinez, W. and Schinzinger. R, Ethics in engineering, Tata McGraw-Hill, New Delhi, 4 th Edition, 2004.
6	DEBHELINGS, Biosafety issues related to transgenic crops, Biotech Consortium India Limited, New Delhi, 2005.




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WEB RESOURCES

1	World Trade Organisation - http://www.wto.org
2	World Intellectual Property Organization - http://www.wipo.int
3	International Union for the Protection of New Varieties of Plants - http://www.upov.int
4	National Portal of India - http://www.archive.india.gov.in
5	National Biodiversity Authority - http://www.nbaindia.org
6	Recombinant DNA Safety Guidelines, 1990 Department of Biotechnology, Ministry of Science and Technology, Govt. of India - Retrieved from http://www.envfor.nic.in/divisions/csurv/geac/annex-5.pdf
7	Guidelines and Standard Operating Procedures for Genetically Engineered Plants, 2008 - http://www.igmoris.nic.in/guidelines1.asp

Course Designed By	Verified By	Approved By HOD
 Mr. G. KARTHIKEYAN	 Mr. R. RASU	 Dr. A. K. VIDYA

QUESTION PAPER PATTERN


Time: 3 hours	Max. Marks: 50	
SECTION-A (10 X 1 = 10 Marks) Answer ALL the questions Choose the correct answer	SECTION-B (5 X 3 = 15 Marks) Answer ALL the questions Either or type Two questions from each unit	SECTION-C (5 X 5 = 25 Marks) Answer ALL questions Question Number: 16 to 19 (Either or type) Question Number 20 is Compulsory - Case Study

Mapping of COs with POs and PSOs:

PO/PSO CO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	S	M	S	M	S	S	S	S	M	S
CO 2	S	M	M	S	S	S	S	S	S	S	S	S
CO 3	S	M	S	M	S	M	S	S	S	S	M	S
CO 4	S	S	M	S	S	S	S	S	S	S	S	S
CO 5		M	M	M	S	S	S	S	S	S	M	S

S - Strong, M - Medium, L - Low




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Sem.	Course Code	Elective II: Hospital Management and Health Care	Total Marks: 100		Hours / Week	Credits
			CIA: 50	ESE: 50		
II	21PBFET207				5	4

Course Objectives:

1. To understand the basic concepts in hospital management.
2. To learn the Benefits of Hospital management systems
3. To focus the history and impact of Medical Transcription

Course Outcomes (CO): On completion of the course, students should be able to

CO 1	Discuss the concepts of modern hospital management system	K1 - K4
CO 2	Prepare the layout for Functioning of modern hospitals	
CO 3	Plan and implement new aspects of medical transcription	
CO 4	Examine the impacts of medical transcription	
CO 5	Focus on web friendly operating system for hospital management	

K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

Unit - I Introduction on Hospital management

Hospital management: Eligibility and personal skills required, Job opportunities in Hospital management. Important hospital management Institutes in India and World.

Concept of Modern Hospital & privatization in Health Sector, Public Sector Hospitals and Level of care offered, facilities, Effects of Globalization in Health care, Concept of Corporate Hospital in developing countries.

Unit - II Hospital management system & Infrastructure

Infrastructure and lay out of an ideal corporate hospital, Functioning of modern hospitals & Hospitality in Hospital Care, Invasive and noninvasive diagnostic facilities in modern hospital Care offered in Specialty and Super specialty Hospitals.

Hospital management system: Benefits and Modules of Hospital management system. Interfacing of analyzer Pathology lab management. Radiology, Blood Bank, Pharmacology management software's.

Unit - III History of Medical Transcription

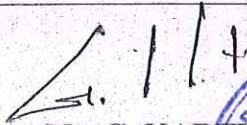
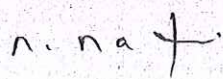
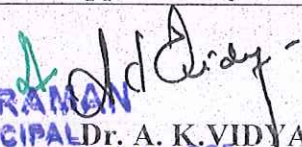
History of Medical Transcription: Drawbacks of MRP system, Advent of Medical Transcription. Web friendly operating system. Market information on companies. Planning on Medical Transcription set up Induction and orientation.

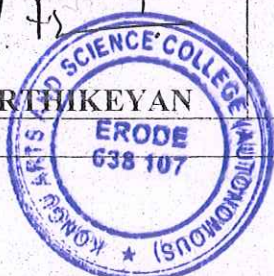


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Unit - IV	Impact of Medical Transcription
<p>Impact of Medical Transcription: Medical Transcription impact on its stock holders Impact during the implementation process. Impact on Departments, Organization as whole, Employment, Nature of job, Information access and Individual employees. Advantages in corporate entity, Disadvantages.</p>	
Unit - V	Medical Transcription implementation
<p>Implementation of Medical Transcription: Medical Re-engineering, Choosing appropriate transcription.</p> <p>Customize to suit the changes Medical Transcription: Best practices Costs, Failure, Gap analysis. Implementation, Life cycle Medical Transcription-Trouble and their solutions.</p>	

Skill Development Activities	Max. Marks (10)
Field Work & Report	3
e-Content Presentation	3
Case Study	3
Punctuality	1

TEXT BOOKS		
1	Hospital Management module II- NIHF, New Delhi	
2	G. D. Kunders. Hospital Administration	
REFERENCE BOOKS		
1	Tabish, Hospital Administration, Calorie malnutrition in children. protein and energy/ requirements Nitrogen balance	
WEB RESOURCES		
1	https://www.healthcare-management-degree.net/top-places-of-employment-health-care-management/	
2	https://searchhealthit.techtarget.com/definition/medical-transcription-software-MTS	
Course Designed By	Verified By	Approved By HOD
 Mr. G. KARTHIKEYAN	 Mr. R. RASU	 Dr. N. RAMAN PRINCIPAL Dr. A. K. VIDYA



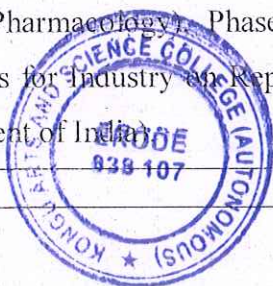
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QUESTION PAPER PATTERN												
Time: 3 hours						Max. Marks: 50						
SECTION-A (10 X 1 = 10 Marks) Answer ALL the questions Choose the correct answer				SECTION-B (5 X 3 = 15 Marks) Answer ALL the questions Either or type Two questions from each unit				SECTION-C (5 X 5 = 25 Marks) Answer ALL questions Question Number: 16 to 19 (Either or type) Question Number 20 is Compulsory - Case Study				
Mapping of COs with POs and PSOs:												
PO/PSO	PO							PSO				
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	S	M	S	M	S	S	S	S	M	S
CO 2	S	M	M	S	S	S	S	S	S	S	S	S
CO 3	S	M	S	M	S	M	S	S	S	S	M	S
CO 4	S	S	M	S	S	S	S	S	S	S	S	S
CO 5	S	M	M	M	S	S	S	S	S	S	M	S
S - Strong, M - Medium, L - Low												



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Sem.	Course Code	Elective II: Concepts of Drug Delivery and Clinical Research	Total Marks: 100		Hours / Week	Credits
			CIA: 50	ESE: 50		
II	21PBFET208				5	4
Course Objectives:						
<ol style="list-style-type: none"> To understand the phases of clinical trials To know the basics of approval of new drugs To understand the clinical data management for drug efficacy 						
Course Outcomes (CO): On completion of the course, students should be able to						
CO 1	Understand the mechanism of drug designing					K1 - K4
CO 2	Analyze the toxic level of drug					
CO 3	Understand the different methods of clinical trials					
CO 4	Outline the clinical research organizations in India					
CO 5	Describe the ethical guidelines for biomedical research					
K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create						
Unit - I						
<p>Biopharmaceutical Product Pipeline: Drug Discovery - Combinatorial chemistry and molecular diversity. Therapeutic targets for drug discovery.</p> <p>Molecular Docking Drug design: Cheminformatics – Role of computational chemistry in therapeutic drug design. Peptide and peptidomimetic engineering. Structure activity relationship (SAR and QSAR). Applications of pharmacophore-based and structure-based drug design. Use of X-ray, NMR, and computer aided drug design (CADD).</p>						
Unit - II						
<p>Biopharmaceutical Product Pipeline: Drug Development - Drug Regulation, Phases in Drug Development. PK and ADME (Absorption, Distribution, Metabolism, Elimination) studies - cell-based permeability, uptake and cytotoxicity studies. Animal Toxicity Studies. Regulatory processes in New Drug Development (IND; ANDA).</p>						
Unit - III						
<p>Overview of Drug Prescribing, Personalized Drugs, Essential Drugs, and Orphan Drugs. Types of clinical trials, observational studies and patient-centered therapeutics. Overview of Phase I (Human/Clinical Pharmacology), Phase II drug reactions (events) and therapeutic drug monitoring. Draft Guidelines for Industry on Reporting Serious Adverse Events Occurring in Clinical Trials (CDSCO, Government of India)</p>						

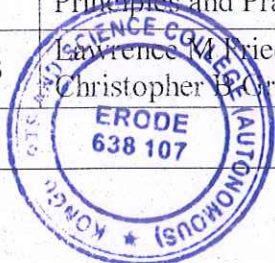


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Unit - IV	Clinical Research in India: Clinical Research Organizational Chart (key functions of Data Management, Pharmacovigilance, Regulatory affairs, Biostatistics and SAS), Contract Research Organizations (CROs). The role of MNCs and Indian Pharma companies in Clinical Trials in India. Concepts of cGMP, IPR and Patenting.
Unit - V	ICMR Ethical Guidelines for Biomedical Research on Human Participants - Chapter I (General Principles), Chapter II (Basic Responsibilities, Composition, Review Procedures only of Institutional Ethics Committee), Chapter III (Informed Consent Process, Compensation, Conflict of Interest, Special Groups, Post-Trial Access, International Collaboration), Chapter IV (Drug Trials only). Definitions and Declaration of Helsinki from Guidelines of the CDSCO on Good Clinical Practice. Care and use of Animals in Scientific Research (INSA and CPCSEA Guidelines) only with reference to - sourcing of experimental animals, housing & environment, breeding & genetics, transgenics, nutrition & feeding, hygiene & disease control, personnel & training, recordkeeping and SOPs, anaesthesia & euthanasia, and Institutional Biosafety Committee.

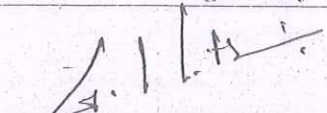
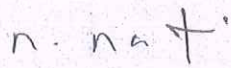
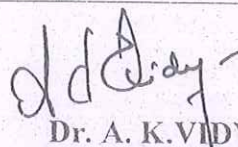
Skill Development Activities	Max. Marks (10)
Assignment	3
e-Content Presentation	3
Case Study	3
Punctuality	1

TEXT BOOKS	
1	Laurence Brunton, Bjorn Knollmann, Randa Hilal-Dandan, Goodman and Gilman's, The Pharmacological Basis of Therapeutics, McGraw-Hill Professional Publishing, 13 th edition, 2017.
2	Satoskar, Nirmala Rege and Bhandarkar, S.D, Pharmacology and Pharmacotherapeutics. Elsevier, 24 th Edition, 2015.
REFERENCE BOOKS	
1	Victoria, F. Roche, S. William, Zito, Thomas Lemke and David A. Williams, Foye's Principles of Medicinal Chemistry, Wolters Kluwer, 8 th edition, 2019.
2	Donald J. Abraham and David P. Rotella, Burger's Medicinal Chemistry and Drug Discovery. Principles and Practice, Wiley, 7 th edition, 2010.
3	Lawrence M Friedman, Cut D Furberg, David L DeMets, David M Reid and Christopher D Granger, Fundamentals of Clinical Trial, Springer, 5 th edition, 2015.
WEB RESOURCES	



Dr. N. RAMAN
 PRINCIPAL
 KONGU ARTS AND SCIENCE COLLEGE
 (AUTONOMOUS)
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1	Handbook on ICMR Ethical Guidelines.pdf
2	https://www.scientific-european-federation-osteopaths.org/different-types-of-clinical-trials/

Course Designed By	Verified By	Approved By HOD
 Mr. G. KARTHIKEYAN	 Mr. R. RASU	 Dr. A. K. VIDYA

QUESTION PAPER PATTERN


Time: 3 hours		Max. Marks: 50
SECTION-A (10 X 1 = 10 Marks) Answer ALL the questions Choose the correct answer	SECTION-B (5 X 3 = 15 Marks) Answer ALL the questions Either or type Two questions from each unit	SECTION-C (5 X 5 = 25 Marks) Answer ALL questions Question Number: 16 to 19 (Either or type) Question Number 20 is Compulsory - Case Study

Mapping of COs with POs and PSOs:

CO \ PO/PSO	PO							PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1												
CO 2												
CO 3												
CO 4												
CO 5												

S - Strong, M - Medium, L - Low




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ERODE – 638 107

ACTIVITIES



KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE
DEPARTMENT OF BIOCHEMISTRY
DBT STAR COLLEGE SCHEME

**Extension activity - COVID-19 Vaccination Drive
(06.09.2021)**

REPORT

KONGU ARTS AND SCIENCE COLLEGE
(Autonomous)
(An Autonomous Institution Affiliated to Bharathiar University, Coimbatore)
Erode - 638107

DBT STAR COLLEGE SCHEME
Department of Biochemistry

Cordially invite you for the
**Extension Activity on
"COVID-19 Vaccination Drive"**

in the presence of
Thiru. K.Palanisamy
Correspondent

Dr.N.Raman
Principal

Date: 06.09.2021
Time : 10.00 am
Venue: Auditorium

KONGU
Assuring the Best

Department of Biochemistry conducted an Extension activity (COVID-19 Vaccination Drive) for our Students, Teaching and Non-Teaching of our college on 06.09.2021 under DBT Star College scheme. 93 Members were benefitted by this camp.

It was exclusively organized for Students and Faculty members who were not provided with necessary vaccination earlier, the camp was set up to vaccinate them in a proper way. This activity supported people to be aware of their health and preventive measures to be followed in this pandemic situation about their health.



Dr. N. Raman
HEAD OF THE DEPARTMENT
DEPARTMENT OF BIOCHEMISTRY
KONGU ARTS AND SCIENCE COLLEGE
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ERODE - 638 107.



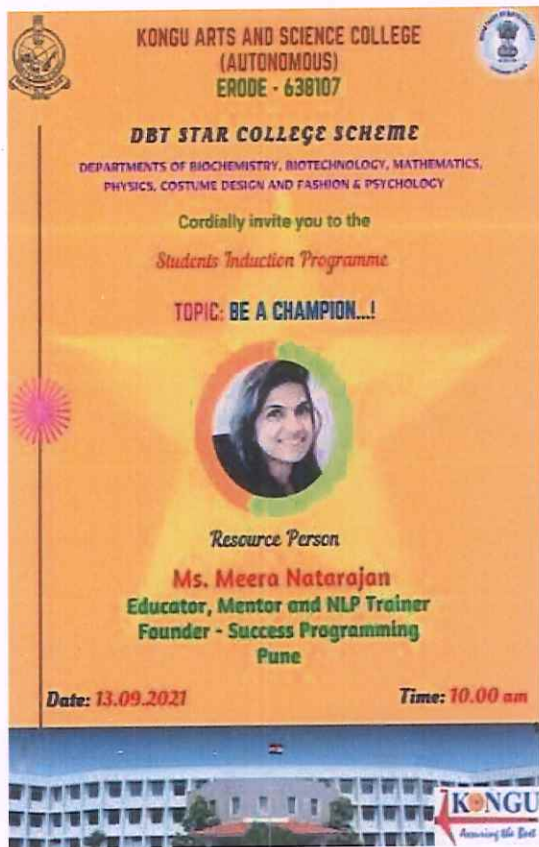
Dr. N. Raman
Dr. N. RAMAN
PRINCIPAL,
KONGU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
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KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE
DBT STAR COLLEGE SCHEME
BIOCHEMISTRY, BIOTECHNOLOGY, MATHEMATICS,
PHYSICS, COSTUME DESIGN AND FASHION & PSYCHOLOGY

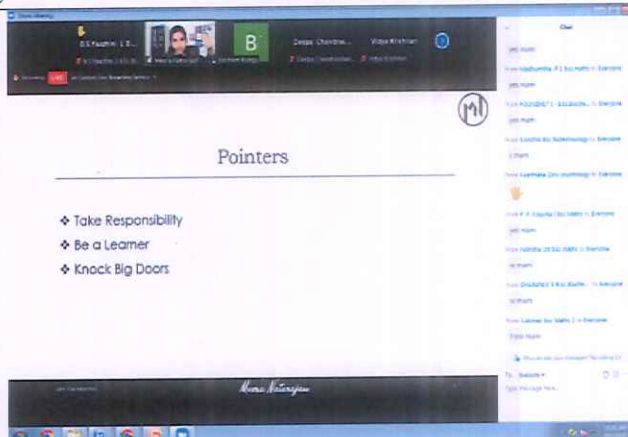
Student's Induction Programme
Topic - WEBINAR ON "BE A CHAMPION..!"
(13.09.2021)

REPORT



A webinar on "Be a Champion..!", was organized for I UG Students of Departments of Biochemistry, Biotechnology, Mathematics, Physics, Costume Design and Fashion & Psychology by DBT STAR Departments as part of Student's Induction programme on 13/09/2021 to motivate the student minds. The meeting platform was zoom and it was live streamed on You tube Special address was given by Ms.Meera Natarajan, Educator, Mentor and NLP Trainer, Founder-Success Programming, Pune and 300 students from the above departments participated in this webinar.

The Chief Guest gave an enthralling Speech and motivated students to shine in their life with 100% Dedication and Hardwork.She revealed new ideas and tips as pointers for being a star and smart student. She also insisted students to knock big doors and be a lifelong learner. She also encouraged the students interaction and made them to enjoy and learn from her session. She explained how to achieve success and be a champion. She suggested books like (THE POWER OF SUBCONCIOUS MIND, THE MONK WHO SOLD HIS FERRARI, THE MAGIC OF THINKING BIG) to students to enrich their young minds with positive thoughts.



Dr. N. Raman
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Dr. N. Raman
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DEPARTMENT OF BIOCHEMISTRY
DBT STAR COLLEGE SCHEME

INAUGURATION OF BIOCHEMISTRY SYMBION ASSOCIATION CUM
Webinar on “Cancer Vaccines and Immunotherapeutics”
(29.09.2021)

REPORT

A webinar on “Balanced Immune system: A Key to disease free state” was organized for Students of Biochemistry Department under DBT Star College Scheme as part of Biochemistry Association Symbion - Inauguration programme on 29/09/2021. The meeting platform was Google Meet and it was recorded. Ms.T.Radha, Assistant professor, Department of Biochemistry, Presented the activities done by Biochemistry Association under DBT Star College Scheme during the academic year (2020-2021). Special address was given by Ms.Sowbarnika Ratliff (Alumni), Scientist, Immunology, Cancer Vaccines and Immunotherapeutics, Pfizer, San Diego, California. and 140 students participated in this webinar.

She started her key note address by sharing her views about the importance of Biochemistry with the students. Her talk Carried several informations regarding Immune system and immunotherapy preferred to treat cancer and her research on treatment of type I Diabetes by regulating immune system. This webinar made students to clearly understand about the role of immune system to live a balanced life. As she was a scientist in Pfizer, She also clarified students’ doubts regarding vaccines too. The programme completed with knowledge sharing and interaction.

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DBT STAR COLLEGE SCHEME DEPARTMENT OF BIOCHEMISTRY

Cordially invite you to the Inauguration of Biochemistry Association SYMBION'21

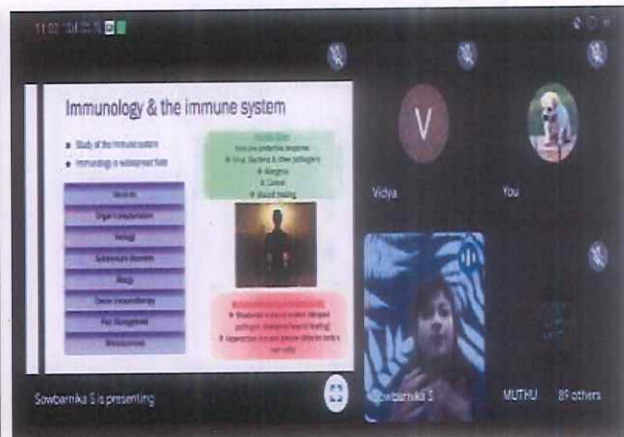
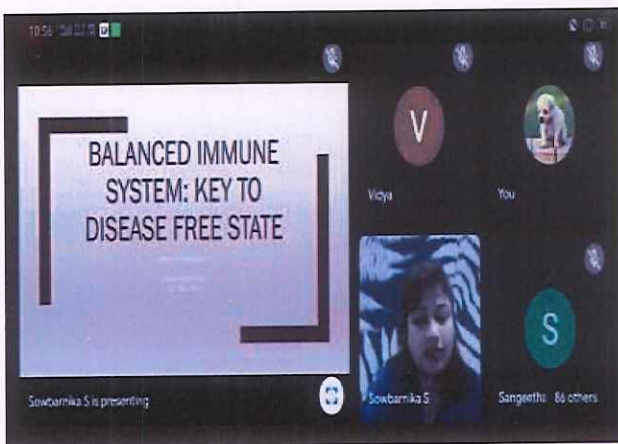
PRESIDENTIAL ADDRESS
Thiru.K.PALANISAMY
Correspondent

FELICITATION
Dr.N.RAMAN
Principal



Inaugural Address
Ms.Sowbarnika Ratliff (Alumni)
Scientist
Immunology, Cancer Vaccines and Immunotherapeutics
Pfizer
San Diego, California

Date: 29.09.2021
Time: 10.00 am

Dr. N. Raman
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DEPARTMENT OF BIOCHEMISTRY
KONGU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
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Dr. N. Raman
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KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE
 DEPARTMENT OF BIOCHEMISTRY
 DBT STAR COLLEGE SCHEME

**Academic Industry interface program on
 "Characterization of Biosimilars using Mass Spectrometry"
 (01.11.2021)**

REPORT

KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS) ERODE - 638107
DBT STAR COLLEGE SCHEME
DEPARTMENT OF BIOCHEMISTRY
 Cordially invite you to the
Academia-Industry Interface Program
 on
Characterization of Biosimilars using Mass Spectrometry

PRESIDENTIAL ADDRESS
 Thiru. K. PALANISAMY
 Correspondent

FELICITATION
 Dr. N. RAMAN
 Principal

Resource Person
Dr. Jayaprakash Natarajan (Alumni)
 Senior Scientist
 Analytical Development
 Stelis Biopharma Pvt. Ltd., Bangalore

Date: 01.11.2021
 Time: 10.00 am
 Venue: PG Seminar Hall

An Academic Industry interface program on "Characterization of Biosimilars using Mass Spectrometry" was organized for Students of Biochemistry Department under DBT Star College Scheme on 01/11/2021 in PG Seminar Hall. Special address was given by **Dr. Jayaprakash Natarajan (Alumni)**, Senior Scientist, Analytical Development, Stelis Biopharma Pvt Ltd., Bangalore. 140 students participated in this Guest Lecture.

In his presentation, Dr. Jayaprakash enlightened the students about biopharma medicines and explained how it differs from synthetic medicine. He insisted students to be updated on recent trends in biological field and explained clearly about new techniques and equipment's used in biopharma industries. This helped students to understand the working mechanism of several equipments. He motivated the students to read journals related to their field of interest. After the lecture he also had interaction with students in the classroom and cleared all their doubts and shared ideas to fit themselves in biopharma Industry.



[Signature]
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DEPARTMENT OF BIOCHEMISTRY
KONGU ARTS AND SCIENCE COLLEGE
 (AUTONOMOUS)
 ERODE - 638 107.



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



KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE

DEPARTMENT OF BIOCHEMISTRY

DBT STAR COLLEGE SCHEME

**Academic Industry interface program on
"Biochemistry- How it will help in FMCG industry and Pharma job sectors"
(22.11.2021)**

REPORT

An Academic Industry interface program on "Biochemistry- How it will help in FMCG industry and Pharma job sectors" was organized by Biochemistry Department for Students of Biochemistry and MBA Departments under DBT Star College Scheme on 22/11/2021 in PG Seminar Hall. Our Alumni **Mr. Rajiv Rathinam, (2003-2008 Batch), Zonal manager, Hindustan Unilever Limited, Chennai** was the resource person. 168 students participated in this Guest Lecture.

Mr. Rajiv Rathinam Started his session with motivational talk and discussed how to analyze the purpose of life and career. He requested students to set short and long term goals that would drive them towards success. Later he shared more informations regarding fast moving consumable goods. He also mentioned that communication, Interpersonal, Analytical (knowledge in MS word and Excel), and Negotiation were the basic skills required to fit in FMCG Industry. He gave a detailed account on working mechanism of several sectors in FMCG industries like Beauty and personal care, Food and refreshment, Home care and discussed job opportunities for biochemist in Production, Quality control and Management. He drew an career map for business startups. As a former scientist in several biopharma industries, he gave brief informations regarding diabetes and its prevention and treatment through life style and medicines. He also had interaction with students in the classroom after the program and clarified all their doubts regarding job opportunities in FMCG industry and Biopharma Industry.

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DBT STAR COLLEGE SCHEME
DEPARTMENT OF BIOCHEMISTRY

Cordially invite you to the
Academia-Industry Interface Program
on
Biochemistry - How it will help in FMCG Industry and Pharma Job Sectors?

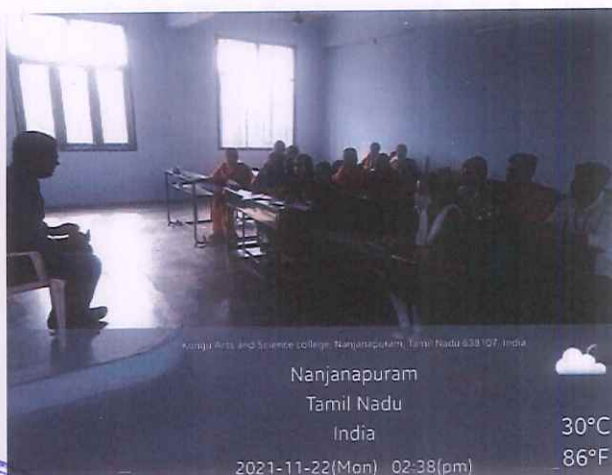
Presidential Address
Thiru.K.Palanisamy
Correspondent, KASC

Felicitation
Dr.N.Raman
Principal, KASC

Resource Person
Mr.Rajiv Rathinam (Alumni)
(2003 - 2008 Batch)
Zonal Sales Manager
Hindustan Unilever Limited
Chennai

Date: 22.11.2021
Time: 10.00 am

Venue: PG Seminar Hall



Dr. N. Raman
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KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE
DEPARTMENT OF BIOCHEMISTRY
DBT STAR COLLEGE SCHEME

**One Day Hands on Workshop on Advanced Immunohematology
(01.12.2021)**

REPORT

**KONGU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
ERODE - 638107**

DBT STAR COLLEGE SCHEME

DEPARTMENT OF BIOCHEMISTRY
in association with
Tamilnadu Voluntary Blood Bank and Research Centre, Erode

Cordially invite you to the
*One Day Hands on Workshop on
"Advanced Immunohematology"*
Organized for Second year B.Sc Biochemistry Students

Resource Person
Rtn.PHF.K.R.VENKATAACHALAM,
Alumni (1995-1998 Batch)
Tamilnadu Voluntary Blood Bank and
Research Centre, Erode

Date: 01.12.2021
Time: 10.00 am

Department of Biochemistry organized an one day hands on workshop on Immunohematology under DBT Star College scheme. The session was arranged in Tamil Nadu Voluntary Blood Bank and research center. 31 students from II UG Biochemistry were participants.

Rtn.PHF.K.R.Venkataachalam (Alumni batch 1995-1998), Tamil Nadu Voluntary Blood Bank and research center, Erode was the resource person. Mr.Vinoth and Mrs. Sangeetha, Lab Technicians in Tamil Nadu Voluntary Blood Bank and research center, demonstrated the practical session for the students. It was a great opportunity to the students to acquire knowledge about the routine practices like testing, separating in blood bank. In theory session Rtn. PHF. K. R. Venkataachalam also clearly explained about the blood grouping, Cross matching, Erythroblastosis fetalis and current treatment for this issue, ICT and DCT techniques both theoretically and practically. Students gained more knowledge about the role of biochemist in Blood Bank



N. Ram
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N. Ram
Dr. N. RAMAN
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KONGU ARTS AND SCIENCE COLLEGE
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KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE
DEPARTMENT OF BIOCHEMISTRY
DBT STAR COLLEGE SCHEME

Hands on Workshop on Molecular Techniques
(09.12.2021 & 10.12.2021)

REPORT

KONGU ARTS AND SCIENCE COLLEGE
 (Autonomous)
 (An Autonomous Institution Affiliated to Bharathiar University, Coimbatore)
ERODE

DBT STAR COLLEGE SCHEME
Department of Biochemistry
 Cordially invite you for the
Two Day Virtual Workshop on
MOLECULAR TECHNIQUES
 Organized for **B.Sc Biochemistry Students**

RESOURCE PERSON
Dr.H.Abdul Jaffar Ali
 Assistant Professor and Head
 Department of Biotechnology
 Islamiah College (Autonomous)
 Vaniyambadi

RESOURCE PERSON
Dr.S.U.Mohammed Riyaz
 Assistant Professor
 Islamiah College (Autonomous)
 Vaniyambadi

RESOURCE PERSON
Dr.ML.Mohammed Kaleem Arshan
 Assistant Professor
 Islamiah College (Autonomous)
 Vaniyambadi

Date : 09.12.2021 & 10.12.2021
Time : 10.30 am
 Join with us through **G Meet**

Department of Biochemistry conducted Two day hands on workshop on Molecular Techniques under DBT Star College scheme. The meeting platform was Google meet..Nearly 95.students from Biochemistry Department participated in the workshop.

Dr. H.Abdul Jaffar Ali ,Head, Biotechnology Department, Islamiah College, began the session with the introductory mark on Molecular Techniques and elaborated the unique features of DNA Barcoding, the Molecular Tool for Species identification and its significance in Molecular Taxonomy.

Dr. ML. Mohammed Kaleem Arshan, Assistant Professor explained about DNA isolation technique by Agarose Gel Electrophoresis and continued his session with the sequential steps followed in the PCR experiment. He further briefed on the possible pitfalls encountered while carrying out the experiments and the troubleshooting steps that would help out to resolve those issues.

Dr. S.U. Mohammed Riyaz, Assistant Professor demonstrated and explained the instruments available and the steps for proceeding with Gene Sequencing process. He also highlighted about Next Generation Sequencing and its future applications to the participants.

The workshop proved to be highly valuable for the students and they gained a new perspective on the fundamental and advanced techniques in Molecular Biology through this Program.



Address
HEAD OF THE DEPARTMENT
DEPARTMENT OF BIOCHEMISTRY
KONGU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
ERODE - 638 107.



Dr. N. RAMAN
 PRINCIPAL,
 KONGU ARTS AND SCIENCE COLLEGE
 (AUTONOMOUS)
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KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE
DEPARTMENT OF BIOCHEMISTRY
DBT STAR COLLEGE SCHEME

**One day Workshop on Animal cell culture techniques and its application
(21.12.2021)**

REPORT

**KONGU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
ERODE - 638107**

**DBT STAR COLLEGE SCHEME
DEPARTMENT OF BIOCHEMISTRY**

Cordially invite you to the
*One Day Workshop on
Animal Cell Culture Techniques and its Applications
Organized for Third year B.Sc Biochemistry Students*

**Resource Person
Dr. Arulselvan Palanisamy M.Sc., Ph.D.,
Managing Director and Scientist
Scigen Research Innovation Pvt. Ltd
Periyar Technology Business Incubator
Thanjavur**

Date: 21.12.2021
Time: 10.00 am

KONGU
Autonomous

Department of Biochemistry organized an one day workshop on Animal cell culture techniques and its application under DBT Star College scheme. The session was arranged in Biotechnology lab... students from III UG & II PG Biochemistry attended the workshop.

Dr. Arulselvan Palanisamy M.Sc., Ph.D., Managing Director and scientist, Scigen Research Innovation Pvt. Ltd, Periyar Technology Business Incubator, Thanjavur served as the resource person. He shared basic information about cell culture techniques and made students to gain knowledge about cell culture and its applications. He explained the difference between normal cells and cancer cells and practically demonstrated the method of primary culture and cell line production. He made students to understand the Working of Phase contrast microscope for viewing cells. He also insisted the important ethics of animal tissue culture techniques.



Dr. Arulselvan
**HEAD OF THE DEPARTMENT
DEPARTMENT OF BIOCHEMISTRY
KONGU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
ERODE - 638 107.**



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



KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE
 DEPARTMENT OF BIOCHEMISTRY
 DBT STAR COLLEGE SCHEME

Two day virtual workshop on “Bioinformatics tools and its applications in research”
 (28.01.2022 & 29.01.2022)

REPORT

KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS) ERODE - 638107

DBT STAR COLLEGE SCHEME
 DEPARTMENT OF BIOCHEMISTRY

Cordially invite you to the
Two Day Virtual Workshop on
"Bioinformatics tools and its Applications in Research"
Organized for Biochemistry Students

Resource Person
Dr. R. SATHISH KUMAR
 Assistant Professor and Head i/c
 Department of Biotechnology (UG)
 Kongunadu Arts and Science College
 (Autonomous)
 Coimbatore

Date: 28.01.2022
 Time: 10.00 am

Part of Moll Activity Join with us through G Meet

Department of Biochemistry conducted Two day virtual workshop on “Bioinformatics tools and its applications in research” under DBT Star College scheme. The meeting platform was Google meet. Nearly 80 students from Biochemistry Department participated in the workshop. **Dr.R.Sathish Kumar**, Assistant Professor and Head i/c, Department of Biotechnology (UG), Kongu Nadu Arts and Science College (Autonomous), Coimbatore began the session with the introductory mark on Bioinformatics and elaborated the unique features of several new software’s and its significance.

He continued his session with practical approach that helped students to get his points clearly. He further presented his screen and demonstrated Scoring matrices- PAM, BLOSUM and BLAST, FASTA. He also highlighted about advantages of softwares to the participants. He also sowed an idea about Computer Aided Drug Designing. The workshop proved to be highly valuable for the students and they gained a new perspective on the fundamental and advanced softwares and techniques though this Program.

What is Bioinformatics?

➤ Bioinformatics is a new scientific discipline created from the interaction of Biology and Computer.

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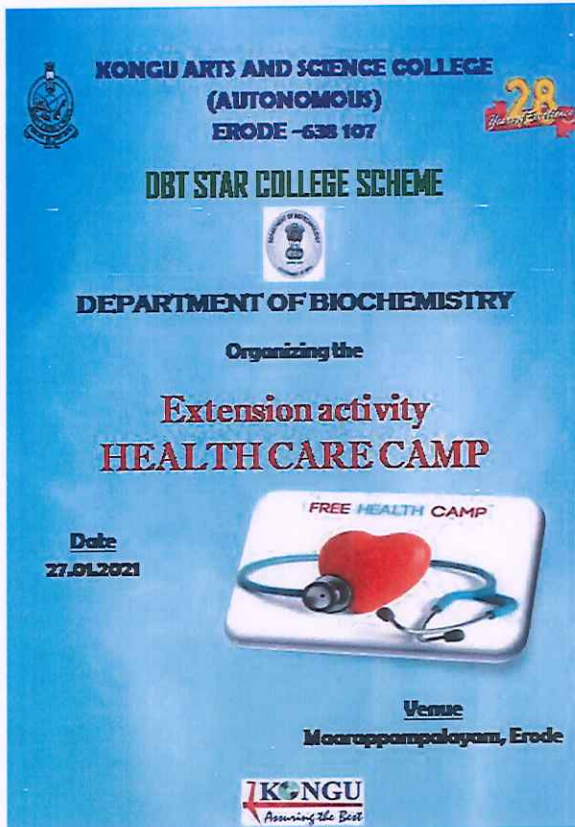
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DEPARTMENT OF BIOCHEMISTRY
DBT STAR COLLEGE SCHEME

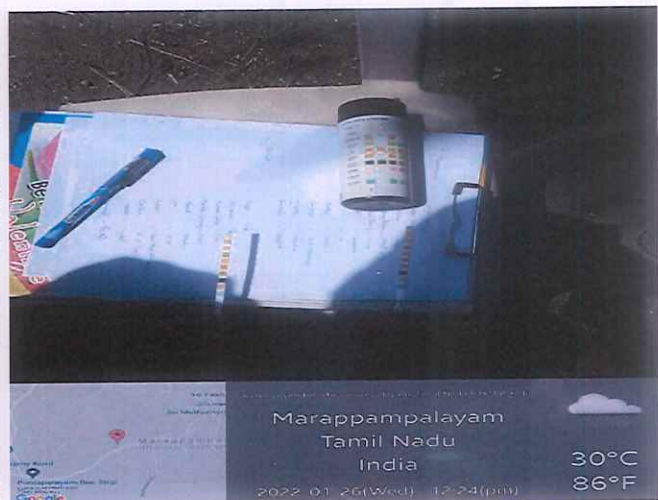
Extension activity - Health Care Camp
(26.01.2022)

REPORT



Department of Biochemistry conducted a [Health care camp] Extension activity in Maarappampalayam under DBT Star College scheme. 30 Members in Maarappampalayam were the beneficiaries.

Students from Department of Biochemistry gave awareness about the COVID vaccine among non vaccinated people and shared pamphlets indicating its importance, They suggested vaccinated people to get booster dose under the guidance of Mr.S.Natarajan, Assistant Professor, Department of Biochemistry .They also carried out blood grouping and blood sugar tests for 30 members in that area. This activity supported people to be aware of their health and preventive measures to be followed in this pandemic situation about their health.



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