



# **KONGU ARTS AND SCIENCE COLLEGE**

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

**ERODE – 638 107**

**B.Sc (Biochemistry)**



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**2017-2018**



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# **SYLLABUS**

Sem.	Course Code	CORE PAPER II CELL BIOLOGY	Total Marks: 100		Hours Per Week	Credits
			CIA: 25	ESE: 75		
I	17UAPCT102				4	3

**Objectives:**

- To understand the difference between Prokaryotic and Eukaryotic cells
- To learn relationship between Cellular organization and Biological function of normal cell.
- To know the various Cell Organelles with their Structure and Functions.
- To learn the Application of Cell Biology in research.

**UNIT I**

**Cells** – Definition, History, Cell theory, Classification of cells – Prokaryotic cells and Eukaryotic cells. Comparison of Prokaryotic and Eukaryotic cells. Comparison of Plant Cell and Animal Cell.

**Cytological techniques** – Smear preparation and Microtomy.

Cell organelles and their involvement in Human disease.

**UNIT II**

**Cell Membrane:** Fluid mosaic model. Overview of Membrane components - Protein, Lipids and Carbohydrates.

**Osmosis:** Definition; Hyper, Hypo and Isotonic solutions- Exosmosis and Endosmosis.

**Membrane Transport:** Passive diffusion, Facilitated diffusion (Sugar transport) and Active Transport ( $\text{Na}^+$  -  $\text{K}^+$  Pump).

**UNIT III**

**Endoplasmic reticulum** – Types, structure and functions.

**Golgi apparatus and Lysosomes** – Structure and functions.

**Ribosomes** - Types, structure and functions.

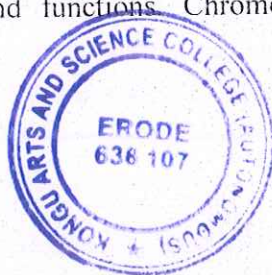
**Microbodies** - Morphology and functions.

**UNIT IV**

**Mitochondria:** Structure and functions.

**Cytoskeleton:** Microfilaments, Microtubules and Intermediary filaments and their functions.

**Nucleus:** Structure and functions. Chromosomes, Chromatin- Eu and Hetero chromatin.



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### UNIT V

**Cell Cycle and Cell Division:** An Overview of Cell Cycle, Cell division - Mitosis. Meiosis and its comparison.

**Oncology:** Definition, Types, Development (Initiation, Promotion and Progression) and Properties of Cancer cells. Difference between Cancer and Normal cells.

Treatment of Cancer – Radiation and Chemotherapy.

**Stem Cells** - Definition and Future Prospects.

### TEXT BOOK:

1. Ajoy Paul, "Textbook of Cell and Molecular Biology", Books and Allied (P) Ltd, 2011.
2. Verma and Agarwal, Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S.Chand & Company Ltd, New Delhi, 2012.

### REFERENCE BOOKS:

1. David E Sadava, "Cell Biology. Organelle structure and function", 1st Edition, Jones Bartlett Publishers, 1993.
2. Cooper M, "The cell molecular approach", 6<sup>th</sup> Edition, ASM Press, 1995.
3. Lewis J Kleinsmith, Valerie M Kish, "Principle of cell and molecular biology", 2nd Edition, ASM press, 1995.
4. DeRobertis, EDP, E.M.F Robertis, "Cell and molecular biology", 7th Edition, Saunders Company, 1980.
5. Harvey Lodish, Baltimore. Arnold Berk et al, "Molecular cell biology", 3rd Edition, 1995.

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

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Sem.	Course Code	CORE BIOCHEMISTRY PRACTICALS I	Total Marks: 75		Hours Per Week	Credits
			CIA: 30	ESE: 45	3	3
I & II	17UAPCP202					

(EXAMINATION AT THE END OF SECOND SEMESTER)

**I. Biochemical Calculations**

Preparation of Molar solutions, Normal solutions and Percentage solutions [v/v, w/v].

**II. Group Experiments**

a) Preparation of buffer and its pH measurements using pH meter.

**III. Demonstration Experiment**

- a) Separation of Aminoacids by Paper Chromatography
- b) Separation of Lipids by Thin Layer Chromatography

**IV. Qualitative Analysis**

**1. Analysis of Carbohydrates**

- a) Monosaccharides - Glucose, Fructose, Xylose,
- b) Disaccharides - Sucrose, Maltose and Lactose.
- c) Polysaccharides - Starch and Dextrin.

**2. Analysis of Amino Acids**

- a) Histidine b) Tyrosine c) Tryptophan d) Methionine e) Cysteine f) Arginine

**REFERENCES**

- 1. David T. Plummer, An Introduction to Practical Biochemistry.
- 2. Pattabiraman, Laboratory Manual in Biochemistry.
- 3. J.Jayaraman, Practical Biochemistry.
- 4. Sadasivam, Practical Biochemistry.

Question Paper Pattern							
Qualitative Analysis of Carbohydrates	20 Marks	Qualitative Analysis of Amino Acids	15 Marks	Viva Voce	5 Marks	Record	5 Marks



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Sem.	Course Code	ALLIED II: CHEMISTRY- II	Total Marks: 75		Hours Per Week	Credits
			CIA: 20	ESE: 55	4	3
II	17UAPAT201					

### Objectives

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

### UNIT I

#### Metallurgy

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

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

**Furnaces:** Blast and Reverberatory furnaces.

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

### UNIT II

#### Coordination Chemistry

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

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

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

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

Applications in quantitative and qualitative analysis of Coordination compounds.

### UNIT III

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

Naphthalene - Structural elucidation, Preparation, Properties and Uses.

Preparation, Properties and Uses of Saccharin and Aspartame.

### 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.



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#### 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.

#### TEXTBOOK

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

#### REFERENCE BOOKS

1. R.T. Morrison, and R.N. Boyd, Organic chemistry, 6<sup>th</sup> Edition, Prentice Hall Private Limited, New Delhi, 1997
2. B.R. Puri, L.R. Sharma and Madan S.Pathania, Elements of Physical chemistry, 30<sup>th</sup> 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, 20<sup>th</sup> Edition, Vishal publishers, Meerut, 1980.
5. Analytical chemistry: R.Gopalan, S.Chand & Co., New Delhi, 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 3 = 15 Marks (Either or choice) Two questions from each unit	3 x 10 = 30 Marks (Answer any three Questions) One Question from each unit



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**SEMESTER - V**  
**CORE PAPER VII: HUMAN PHYSIOLOGY AND ENDOCRINOLOGY**

Course Code: 15UAPCT501  
CIA: 25 ESE: 75

Hours/Weeks: 5  
Credits : 4

**Objectives:**

- Learn about the Structure and Function of different organs in the body system
- Describe the principal structural features, Functions and location of each component organ of the endocrine, Cardiovascular, Respiratory, Digestive, Renal and Reproductive system
- Able to demonstrate a basic understanding of the mechanisms of human body
- Learn more specific on the endocrinal activities

**UNIT - I**

**Human Body Systems:** Introduction and Overview

**Digestive system:** General outlines of the Digestive tract. Composition, Function and Mechanism of Secretion of Saliva, Gastric, Pancreatic, Intestinal and Bile juice. Digestion and Absorption of Carbohydrates, Fats and Proteins.

**Respiratory system:** Structure and Function of Respiratory tract. Diffusion of Gases in lungs - Transport of Oxygen, Factors influencing the Oxygen transport, Transport of Carbondioxide, Factors influencing the CO<sub>2</sub> transport.

**UNIT - II**

**Blood and Body fluid:** Composition and Functions of blood, Haemoglobin, Blood groups and Blood transfusion, Mechanism of blood coagulation. Formation and functions of Lymph.

**Physiology of Skeletal muscle:** Structure of Skeletal muscle, Process of Muscle contraction, Chemical changes during Muscle contraction.


**Cardiovascular system:** Structure and Functions of Heart, Electrical and mechanical events in Cardiac cycle, Regulation of Heart pumping.

**UNIT - III**

**Physiology of Vision:** Structure and Functions of Eye, Receptor mechanism (Rod and Cones), Photopigments, Defects of eye and Colour adaptation.

**Nervous system:** Structure and Functions of Neurons, Resting potential and Action potential, Synaptic transmission (Chemical and Electrical Transmission), Mechanism of Neuromuscular transmission, Neurotransmitters.



  
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#### UNIT - IV

**Excretory system:** Structure and Functions of Kidneys, Structure of Nephron, Mechanism of formation of Urine, Renal regulation of Acid base balance, Hormones of Kidneys.

**Endocrine system:** Overview about hormones and its types, Classification - Chemical nature of Hormones and Mechanism of action of hormones (Intracellular and Cell surface receptor

mechanism). Structure, Functions and Deficiency symptoms of hormones of Pituitary, Thyroid, Parathyroid, Adrenal glands.

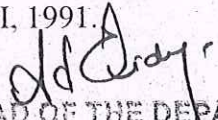
#### UNIT - V

**Male reproductive system:** Structure and functions of Testis, Process of Spermatogenesis, Structure and Physiological Functions of Androgen.


**Female reproductive system:** Structure and function of Ovary, Ovarian cycle, Menstrual cycle, Physiological changes and Hormones involved in Pregnancy and Lactation.

#### References:

1. Dr. C.C. Chatterjee, Human Physiology - Volume I and II, 11<sup>th</sup> edition, Medical Allied Agency, 1992.
2. A.C. Guyton, Textbook of Medical Physiology, 11<sup>th</sup> edition, Saunders of Elsevier Inc.2006.
3. Sarada Subramanyam, K.Madhavan Kutty and H.D.Singh -Text Book of Human Physiology, S.Chand & Company, 1996.
4. Robert K. Murray, Harper's Biochemistry, 26<sup>th</sup> edition, Mc Graw Hill, 2003.
5. M. M. Muthiah, Lecture notes on Human Physiology Volume II, 1991.

  
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SEMESTER – V  
CORE PAPER VIII – CLINICAL BIOCHEMISTRY

Course Code: 15UAPCT502  
CIA: 25 ESE: 75

Hours/Week: 5  
Credits: 4

**Objectives:**

- To realize the importance of Clinical aspects of various disorders associated with Carbohydrate, Lipids, Proteins and Amino acids, Purine and Pyrimidine metabolism.
- To understand the significance of the Organ function test.

**UNIT - I**

**Disorders of Carbohydrate Metabolism**

Blood Sugar Regulation, Normal, Random and Renal threshold level in blood.

**Diabetes Mellitus:** Introduction, Aetiology, Types, Clinical Pathology, Diagnosis – Urine test, GTT.

**Acute and Chronic complications of Diabetes mellitus**

Metabolic changes of Glycosuria, Fructosuria, Pentosuria, Galactosemia and Glycogen Storage diseases.

**UNIT - II**

**Disorders of Lipid Metabolism**

Introduction – Plasma lipids and Lipoproteins.

Hyperlipoproteinemia – Types I, II, III, IV, V and Hypolipoproteinemia – Alpha lipoproteinemia, Abetalipoproteinemia, Fatty liver, Lipidosis, Xanthomatosis.

Metabolic changes - Tangier's disease, LCAT deficiency, Atherosclerosis, Tay Sach's disease, Niemann's Pick disease.

**UNIT - III**

**Disorders of Amino acid Metabolism**

Cystinuria, Phenylketonuria, Maple syrup disease, Alkaptonuria, Albinism, Hartnup disease, Tyrosinemia, Fanconi Syndrome.

**Abnormalities of Non-protein nitrogen:** Urea, Uric acid, Creatinine, Ammonia, Porphyrria.

**Disorders of Purine metabolism:** Hyperuricemia and Gout.

**Disorders of Pyrimidine metabolism:** Oroticaciduria.


**UNIT - IV**

**Gastric and Pancreatic Function test**

**Gastric function test:** Stimulation test – Alcohol, Caffeine, Histamine, Insulin, Pentagastrin, Fractional gastric analysis and Tubeless gastric analysis.

**Pancreatic function test:** Serum Amylase and Lipase assay



  
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## UNIT - V

### Liver and Kidney Function test

**Liver function test:** Introduction to liver function test – Abnormal Bilirubin metabolism (Jaundice), Estimation of Bilirubin in serum (dialysis method), Bile salt in serum (Fouchet's test, Hay sulfur test, Thymol turbidity test), Prothrombin time, Serum enzymes in liver diseases.

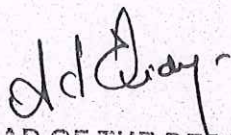
**Kidney Function test:** Clearance test – Definition, Urea, Creatinine and Inulin Clearance test. Renal blood flow and Filtration fraction – Water elimination test.

**Renal Calculi:** Composition and Diagnosis.


**Tumor Markers:** Definition, Markers produced by various tissue, Classification and Clinical importance.

### References:

1. Dr.S.Rajan, Manual for Medical Laboratory Technology, Anjanaa Book House, First Edition, 2012.
2. Varley.H, Practical Clinical Biochemistry, IV Edition, 1985.
3. Teitz. N, Fundamentals of Clinical Biochemistry, W.B.Saunders Company, 1982.
4. Joan Zilva and Pannall P.R., Clinical Chemistry, Diagnosis and treatment, PG Publishing Pvt Ltd.
5. Kanai. L. Mukherjee, Swarajit Ghosh, Medical Laboratory Technology, II Edition.

  
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SEMESTER – V  
CORE PAPER IX – MOLECULAR BIOLOGY

Course Code: 15UAPCT503  
CIA: 25 ESE: 75

Hours/Week: 5  
Credits : 4

**Objectives:**

- To understand the nature of Genetic material, Central Dogma of Life.
- To learn about Gene Repair mechanism and Gene mutation.
- To have an insight into Genetic Recombination.

**UNIT - I**

**DNA Replication and DNA Repair**

Genome Organization of Prokaryotes and Eukaryotes – Introduction, Central Dogma.

**Replication:** Evidences of DNA as genetic material – Experimental Proof.

Formation of DNA from Nucleotides. Semiconservative mechanism and Experimental proof.  
**DNA Replication in Prokaryotes:** Bidirectional Replication – Theta Model, Unidirectional Replication – Rolling Circle model.

Enzymology of DNA Replication, Steps in Replication – Initiation, Elongation and Termination.

Fidelity of Replication, Differences in Eukaryotic Replication. Inhibitors of Replication (Names Only)

**DNA Damage** - Types, DNA Repair Mechanism: Excision Repair, Mismatch Repair, Photoactivation and SOS Repair.

**UNIT - II**

**Transcription:** Prokaryotic RNA Polymerases.

Steps in Transcription: Intiation, Elongation and Termination of Transcription.

Eukaryotic RNA polymerases – Types and its Role.

Processing of mRNA, rRNA and tRNA. Reverse transcription.

**UNIT - III**

**Genetic Code and Translation**

**Genetic Code:** Genetic Code Table and its salient features. Composition of Prokaryotic and Eukaryotic Ribosomes. Coding and Non coding strands of DNA.

**Translation:** Activation of Aminoacids, Initiation, Elongation and Termination of Protein synthesis; Inhibitors of Protein synthesis (Names only). Post translational modifications of Proteins.



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#### UNIT - IV

**Gene transfer in bacteria:** Transformation, Transduction and Conjugation.

**Prokaryotic Gene Regulation:** Operon Model; Lac operon – Positive and Negative control; Trp operon – Repression and Attenuation.

**Recombination:** Definition and Mechanism of Holliday model for Homologous Recombination.

#### UNIT - V

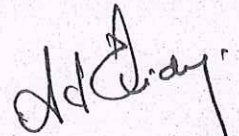
**Gene Mutation and Transposons**

**Gene Mutation:** Definition and Types. Test for Carcinogenicity – Ame's test. Selection of Auxotrophic mutants – Replica plating, Penicillin Enrichment Technique.


**Bacterial Transposons:** Insertion sequences; Mechanism of Transposition in bacteria.

#### References:

1. Lodish *et al.*, Molecular Cell Biology, IV Edition, W.H.Freeman and Company, 2000.
2. Alberts *et al.*, Molecular Biology of the cell, IV Edition, Garland Science Publications, 2002.
3. Watson, Molecular Biology of the gene, V Edition, Pearson Education, 2004.
4. Jeyanthi.G.P, Molecular Biology, I Edition, MJP Publishers, 2009.
5. Twyman, Advanced Molecular Biology, Viva publication, 1998.
6. Lewin, Genes VIII, Prentice Hall International, 2004.
7. Lewin, Genes IV, Prentice Hall International, 2004.

  
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SEMESTER – V  
PRACTICAL III – CORE BIOCHEMISTRY PRACTICALS III

Course Code: 15UAPCP504  
CIA: 30 ESE: 45

Hours/Weeks: 5  
Credits : 3

**I. Urine Analysis**

1. Estimation of Creatinine by Picric acid method.
2. Estimation of Urea by DAM - TSC method
3. Estimation of Uric acid by Carraway's method
4. Estimation of Calcium by Permanganate method

**II. Blood Analysis**

1. Estimation of Urea in serum by DAM - TSC method
2. Estimation of Uric acid in serum by Carraway method
3. Estimation of Glucose in serum by O-Toluidine method

**III. Kit Method**

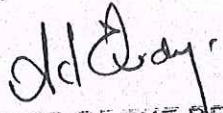
1. SGOT
2. SGPT

**IV. Demonstration Experiment**


1. Estimation of Alkaline phosphatase in serum
2. Estimation of Acid phosphatase in serum

**References:**

1. Ranjna Chawla, Practical Clinical Biochemistry, Third Edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.
2. Dr.S.Rajan, Manual for Medical Laboratory Technology, Anjanaa Book House, First Edition, 2012.
3. Alan H.Gowenlock, Janet R.McMurray and Donald M.McLauchlan, Varley's Practical Clinical Biochemistry, CBS Publishers and Distributors, New Delhi.

  
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SEMESTER – V & VI  
PRACTICALS IV – CORE BIOCHEMISTRY PRACTICALS IV

Course Code: 15UAPCT604  
CIA: 30 ESE: 45

Hours/Weeks: 5  
Credits : 3

**I. Microbial Biochemistry**

**a) Media preparation**

1. Preparation of Culture Media: Nutrient Agar, Nutrient Broth and Potato Dextrose Agar (PDA)

**b) Serial Dilution and Isolation of Microorganisms**

1. Serial Dilution technique
2. Pure Culture Techniques – Pour Plate, Spread Plate and Streak Plate Methods

**c) Staining Techniques**

1. Simple staining
2. Gram staining
3. Endospore staining
4. Negative staining
5. Fungal staining

**d) Biochemical Identification of Bacteria (Group Experiment)**

1. IMViC Test

**II. Plant Biochemistry**

1. Estimation of Chlorophyll
2. Estimation of Starch

**III. Enzymes**

1. Preparation of Crude enzyme extract.
2. Effect of pH on the activity of Acid Phosphatase and Catalase.
3. Effect of temperature on the activity of Acid Phosphatase and Catalase.
4. Effect of enzyme concentration on the activity of Acid Phosphatase and Catalase.
5. Effect of substrate concentration on the activity of Acid Phosphatase and Catalase.

**References:**

1. Dr.S.Rajan, Manual for Medical Laboratory Technology, Anjanaa Book House, First Edition, 2012.
2. Dr.N.Kannan, Laboratory Manual in General Microbiology, Panima Publishing Corporation, 2002.



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SEMESTER – V  
ELECTIVE PAPER I – PLANT AND ANIMAL BIOTECHNOLOGY

Course Code: 15UAPET506

Hours/Week: 4

CIA: 25 ESE: 75

Credits: 4

**Objectives:**

- To understand the basic concepts of Plant tissue culture and Plant transformation techniques
- To learn the techniques of maintaining animal cells/tissues in invitro cultures and use of cell cultures in production of biological products

**UNIT - I**

**Introduction to Plant Tissue Culture and Culture methods**

**Establishment of PTC laboratory:** General requirements - Infrastructure and Equipments, Terms used in PTC, Explants Sterilization.

**PTC Medium:** Composition, Preparation, Sterilization. Murashige Skoog Medium (MS medium) – Composition.

**Culture methods:** Callus culture and Suspension Culture.

**Micropropagation (Clonal Propagation):** Organogenesis and Somatic Embryogenesis.

**Applications of Plant tissue culture:** An overview. Production of Haploid Plants, Production of Phytochemicals from PTC,

**UNIT - II**

**Plant Transformation Techniques**

**Protoplast Culture and Somatic Hybridization:** Protoplast Isolation, Culture and Regeneration. Fusion of Protoplasts, Selection and Identification of Somatic hybrids.

**Gene transfer in Plants:** Vector mediated gene transfer methods – Agrobacterium mediated gene transfer: Ti Plasmid, Mechanism of T-DNA transfer. Direct gene transfer - Electroporation, Biolistics, Microinjection, PEG and Calcium phosphate coprecipitation mediated gene transfer.

**Application of Transformation:** Transgenic Plants - Herbicide, Insecticide and Virus Resistant plants. Flavr-Savr Tomato, Golden Rice. Plants as Biofactories.

**UNIT - III**


**Introduction to Animal cell culture**

Terms used in ATC, Facilities for ATC, Contamination, Aseptic Condition and Sterilization.

**Culture Media for Animal Cells**

Types of Media – Natural and Artificial Media, Physicochemical Properties of Media, BSS, Complete culture medium, Importance of Serum in Media, Serum-free media.



  
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**UNIT - IV**

**Establishment of Cells in Culture:** Primary cell culture – Mechanical disaggregation, Enzymatic disaggregation and Primary Explant Techniques. Cell lines – Finite and Continuous Cell lines.

**Cell transformation:** Properties of Transformed cells. Measurement of growth parameters of cultured cells. Cell Synchronization. Mass cultivation of cells – Scale-up in Monolayer and Suspension Culture.

**UNIT - V**

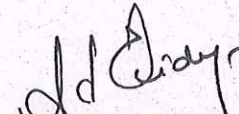
**Gene transfer in Animals:** Production of Transgenic Mice – Microinjection and Embryogenic Stem cell method.

**Animal Biotechnology:** In vitro fertilization (IVF): Stages, Advantages and Limitations.


**Recombinant proteins from Cell cultures:** Interferons, Viral Vaccines.

**References:**

1. D.Balasubramanian et al., Concepts in Biotechnology, Universal Press, India, 1996.
2. U.Satyanarayana, Biotechnology, I Edition, Books and Allied (P) Ltd, India, 1995.
3. R.Ian Freshney, Culture of Animal Cells – A manual of Basic Techniques, IV Edition, A John Wiley & Sons Inc. Publications, 2000.

  
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**SEMESTER – V**  
**SKILL BASED COURSE III - MEDICAL CODING**

Course Code: 15UAPST506  
CIA: 20 ESE: 55

Hours/week : 3  
Credits : 3

**Objectives:**

- To help meet the demands for industry-current professionals with the knowledge and skills to pursue Career opportunities in the growing Healthcare industry.
- To acquire knowledge in Medical terminology, Computerized billing procedures and Medical coding.
- To develop skills to accurately report diagnoses and procedure codes through the application of official coding guidelines in ICD, CPT, HCPCS.
- To effectively identify, understand, and utilize medical codes as they will be applicable to hospital reimbursement in the field of healthcare.

**UNIT - I**

**Anatomy and Pathophysiology**

Structure, functions and disorders of Cardiovascular, Respiratory, Musculoskeletal, Nervous, Endocrine, Digestive and Reproductive Systems.

**UNIT - II**

**Medical Terminology**

Fundamentals of the language for the medical profession. Definitions, Pronunciations, Spelling and Abbreviations of medical terms of major disease processes, Diagnostic procedures, Laboratory tests.

**UNIT - III**

**Health Information Management**


Introduction to Health Information Management - Content and structure of Healthcare data - Content of medical records - Documentation requirements for medical records. Healthcare Delivery Systems - Types of healthcare organizations and healthcare workers.

**UNIT - IV**

**Clinical Classification Systems**

Basic Diagnosis Coding Systems - Introduction to ICD-9-CM: Overview, General Structure, Basic Operating Guidelines. Introduction to Current Procedural Terminology (CPT) - Purpose, History, General Structure, Basic Operating Guidelines.



  
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## UNIT - V

### Reimbursement Methodologies

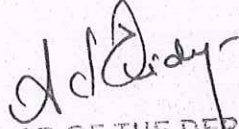
Ambulatory Surgery Center reimbursement - Third-party payers - Billing and Insurance procedures - Quality Improvement Organizations (QIO) and their role in the Payment process.

### Issues with Fraud and Abuse


Regulatory issues and guidelines - Department of Health and Human Services on Healthcare Fraud and Abuse. Standardization in Coding HIPAA Background and Explanation

### References:

1. Human Physiology -- Chatterjee
2. Anatomy and Physiology -- Guyton and Hall
3. Medical Terminology -- Barbara and Ellen Wedding
4. <http://www.icd9data.com>
5. Coders' Dictionary 2013 by Ingenix

  
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SEMESTER – V  
ELECTIVE PAPER I - MICROBIAL GENETICS

Course Code: 15UAPET505

Hours/week : 4

CIA: 25 ESE :75

Credits : 4

**Objectives:**

On successful completion of the course the students should have:

- Understood the foundation for the future subjects in Microbiology and Genetics.
- Learnt the basic terminology and techniques in Microbial genetics.
- Learnt on the applications of Microbial genetic engineering.

**UNIT - I**

**Essentials of Genetics**

Genetic nomenclature, Mutants and Mutations – Types of Mutants, Isolation and Characterizations of Mutants, Uses of Mutations. Genetic analysis of Mutants - Genetic recombination, Genetic Mapping, Linkage and Multifactor crosses.

**UNIT - II**

**Bacterial Genetics**

Bacterial genome, Plasmids – Types and Detection, Purification of Plasmid DNA, Properties of Bacterial Plasmids – F Plasmids, Drug resistant Plasmids and *Agrobacterium* Ti Plasmid.

**UNIT - III**

**Bacterial Transformation and Conjugation**

**Bacterial Transformation:** Discovery of Transformation, Biology of Transformation - Detection of Transformation, Competence and DNA uptake.

**Bacterial Conjugation:** Insertion of F Plasmid into *E.coli* chromosome and Hfr Transfer.

**UNIT - IV**

**Phage Genetics**

**Phage T<sub>4</sub>:** Structure, Features of the life cycle, Genetic map and DNA replication.


**Phage λ:** Structure, Genetic map, Lytic and lysogenic cycle, Lysogenic repression and Phage immunity.

**UNIT - V**

**Applications of Microbial genetic Engineering**

Restriction mapping of DNA molecules, Production of Proteins from cloned genes, Construction of industrially important Bacteria, Genetic engineering of Plants, Production of Drugs and Synthetic Vaccines.

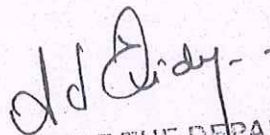


  
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**References:**

1. Stanly R. Maloy, John E. Cronan, Jr. David Freifelder, Microbial Genetics, Narosa Publishing House.
2. Jeremy W. Dale, Simon F Park, 4<sup>th</sup> edition, Molecular Genetics of Bacteria, John Wiley and Sons Ltd.
3. Larry Snyder and Wendy Champress, 2<sup>nd</sup> edition, Molecular Genetics of Bacteria, ASM Press.
4. Prescott L. M: J.H Harley and D. A Klein, Microbiology, C. Brown Publishers, 1993.
5. Roger Y. Stanier, John L. Ingraham, Mark L. Wheelis, Page R. Painter 5<sup>th</sup> edition, General Microbiology, Macmillan Press Ltd.

  
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SEMESTER – V  
ELECTIVE PAPER I – GENETIC ENGINEERING

Course Code: 15UAPET507

CIA: 25 ESE: 75

Hours/Week: 4

Credits: 4

**Objectives:**

- To understand the basic concepts of Gene cloning, Enzymes used in genetic engineering, Construction of vectors
- To learn the techniques and applications of Gene technology
- To have an idea about the ethical issues of Genetic engineering and Patenting

**UNIT - I**

**Basics of Gene cloning:** Restriction Endonuclease – Types and features; Ligation; Linkers and Adaptors

**Vectors of Gene cloning:** Plasmid Vectors – Basic features – pBR322, Bacteriophage Vectors: Cosmids. Cloning hosts.

Preparation of Plasmid DNA from Bacteria.

**UNIT - II**

**Introduction of DNA into Bacterial Cell:** Transformation of *E.coli*, Selection of transformed cells, Identification of Recombinants.

**Introduction of Phage DNA into Bacterial Cell:** Identification of Recombinant Phage. Genomic library and cDNA library.

**Hybridization probes:** Southern, Northern and Western blotting techniques.

**UNIT - III**

**DNA Sequencing:** Outline of Sanger's method, Maxam and Gilbert method and Next generation sequencing and its applications. Genetic fingerprinting.

Site directed mutagenesis. Protein engineering.


**PCR:** Techniques and Applications.

**UNIT - IV**

**Expression Vectors for *E.coli*:** Constituents, Examples of Promoters – Expression Cassettes - Problems caused in expression of Eukaryotic genes.

**Fusion proteins:** Application of Gene technology – Recombinant Insulin and Recombinant Growth Hormone. Cloning Hbs Ag surface antigen in yeast. Insect cells as host system.



  
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**UNIT - V**

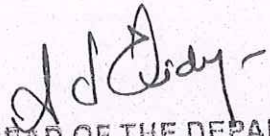
**Application and Ethical Issues of Genetic Engineering**

Applications: Human Genome Project, IVF and Gene therapy.


Ethical Issues: ELSI of biotechnology - Risks, Ethics and Patenting.

**References:**

1. D.Balasubramanian et al., Concepts in Biotechnology, Universal Press, India, 1996.
2. U.Satyanarayana, Biotechnology, 1 Edition, Books and Allied (P) Ltd, India, 1995.
3. T.A.Brown, Gene Cloning – An Introduction, Chapman and Hall, 1995.
4. R.W.Old and S.B. Primrose, Principles of Gene Manipulation, Blackwell Scientific Publications, 1994.
5. Glick. R.Bernard and Pasternak.J.Jack, Molecular Biotechnology, ASM Press, Washington, D.C, 1994.

  
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SEMESTER – VI  
CORE PAPER X - MEDICINAL BIOCHEMISTRY

Course Code: 15UAPCT601

Hours/week : 5

CIA: 25 ESE :75

Credits : 4

**Objectives:**

- On successful completion of the course the students should have:
- Understood the development of the traditional and modern methods used for Drug discovery; of how molecules interact.
- Learnt the fact that the pharmaceutical industry is by far the largest employer of medicine.
- Learnt and developed skills in the use of reaction mechanisms and how knowledge of reaction mechanisms can aid in understanding the mode of action of a drug and the method by which it can be synthesized and developed.

**UNIT - I**

**Basic concepts of Drug and Receptor**

**Basic concept of Drug:** Introduction to drugs, Classification of drugs, Passage of drugs across biological membrane; Absorption and Distribution of drugs; Binding of drugs to Plasma Proteins.

**Drug Receptor:** Types of receptors, Receptor theories, Isolation of receptors, Drug receptor interaction, Binding forces in drug receptor interaction.

**UNIT - II**

**Drug Metabolism and Elimination**

**Drug Metabolism:** Microsomal drug metabolism - Metabolism via Hydroxylation, Conjugation – Glucuronic acid, Deamination, N-Oxidation, Azo and Nitro reduction. Non-microsomal drug metabolism - Non-microsomal oxidation, Oxidative deamination, Purine oxidation, Dehalogenation, Hydrolysis and Sulfate conjugation .

**Elimination of Drugs:** Elimination of drugs from the body with reference to renal system.

**UNIT - III**

**Chemotherapy**

**Antimetabolites:** Anti-metabolites of folate, purines and pyrimidines.

**Antibacterial drugs:** Mode of action and resistance to Sulfonamides, Penicillin, Streptomycin.

**Antiviral drugs:** Classification and mechanism of action of Acyclovir and Zidovudine.

**Antimalarial drugs:** Classification, Life cycle of malarial parasites in man and Mechanism of action of Chloroquine.

**Antifungal drugs:** Classification and mechanism of action of Amphotericin B and Itraconazole



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#### UNIT - IV

##### Drugs acting on Cardio-vascular system and Renal system

Cardio-vascular system: Cardio-vascular disease, Structure and mode of action of Cardiac glycosides, Heparin and Coumarin.

Renal system: Mechanism of action of Diuretics and Antidiuretics.

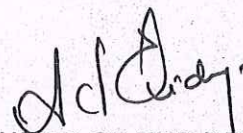
#### UNIT - V

##### Bioactive components and its separation techniques

Drugs from Plant origin, Definition of drug dependence and Drug abuse. Methods of Extraction, Isolation, Separation, Identification, Analysis and Applications of Bioactive components.


#### References:

1. Satoskar R.S.Bhandarkar, S.D and S.S. Ainapure, 14<sup>th</sup> edition, 1995. Pharmacology and pharamacotherapeutics. Popular Prakashnan Bombay.
2. William Foye (1986), 3<sup>rd</sup> edition, Principles of Medicinal chemistry.
3. Patrick.L.Graham (1995), An introduction to Medicinal chemistry, Oxford University Press.
4. Grahame D.G.Smith and Aronson, J.K. Oxford T.B of Clinical Pharmacology and Drug therapy.
5. Harborne . A.J, Phytochemical Methods A Guide to Modern Techniques of Plant Analysis, Chapman and Hall publication.



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SEMESTER – VI

CORE PAPER XI – PLANT BIOCHEMISTRY AND PLANT THERAPEUTICS

Course Code: 15UAPCT602

Hours/Week: 5

CIA: 25 ESE: 75

Credits: 4

**Objectives:**

- To gain knowledge on basic physiological aspects of transpiration, respiration and photosynthesis
- To acquire knowledge on the applied aspects of plant
- To gain a holistic approach on research related to plant genetic manipulation and Plant-Environment interaction.

**UNIT - I**

**Absorption of Water and Transpiration**

**Plant Cell:** Structure and Functions.

**Water absorption by plants:** Mechanism of water absorption and factors affecting the rate of water absorption.

**Transpiration:** Types of transpiration, Mechanism of transpiration, Opening and closing of stomata. Factors affecting the rate of transpiration.

**UNIT - II**

**Carbon Reactions**

**Photosynthesis:** Definition, Photosynthetic apparatus, Photosynthetic pigment – Chlorophyll, Carotenoids and Phycobilins, Mechanism of Photosynthesis.

**Light reaction:** Red drop Emerson enhancement effect, Two pigment systems, Photooxidation of Water. Cyclic and Non – Cyclic Photophosphorylation.

**Dark reaction:** Calvin cycle (C<sub>3</sub> Plants)

Hatch Slack cycle (C<sub>4</sub> Plants) and CAM Plants, Photorespiration (C<sub>2</sub> Plants)

**UNIT - III**

**Cycle of elements**

**Nitrogen cycle:** Ammonification, Nitrification, Nitrate reduction and Denitrification.

**Nitrogen fixation:** Symbiotic and Non Symbiotic nitrogen fixation.

Sulphur cycle, Phosphorous cycle and Carbon cycle.

**Plant Nutrition:** Specific roles of essential elements and their deficiency symptoms in plants.

**Micronutrients:** Manganese, Boron, Copper, Zinc, Molybdenum and Chlorine

**Macronutrients:** Carbon, Hydrogen, Oxygen, Nitrogen, Sulphur, Phosphorous, Calcium, Potassium, Magnesium and Iron.



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#### UNIT - IV

##### Plant growth regulators

Chemistry, Biosynthesis, Mode of action and Practical applications of Auxin, Gibberellin, Cytokinin, Abscic acid and Ethylene.

Photo morphogenesis: Phytochrome and its function.

#### UNIT - V

##### Biochemistry of seed germination

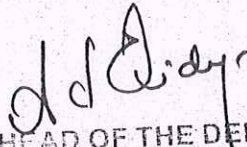
Senescence process in life cycle of plants and its biochemical changes.

##### Secondary metabolites


Nature, Distribution and biological functions of Alkaloids, Flavonoids, Steroids and Terpenes.

#### References:

1. S.K.Verma, A Textbook of Plant physiology and Biochemistry, S. Chand & Company Ltd, First Edition, 1995.
2. Devlin N. Robert and Francis H. Witham, Plant physiology, CBS Publications, 1997.
3. Bob, Buchannan "Biochemistry and Molecular biology of plants" I.K International Pvt. Ltd, 2000.
4. Lea and Lea wood, Plant Biochemistry and Molecular Biology, John wiley and sons, First Edition, 1997.

  
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**SEMESTER – VI**  
**CORE PAPER XII - IMMUNOLOGY AND IMMUNOTECHNIQUES**

Course Code: 15UAPCT603

Hours/week : 4

CIA:25 ESE :75

Credits : 4

**Objectives:**

On successful completion of the course the students should have:

- Understood the foundation for the future subjects in microbiology and Immunology.
- Learnt the basic terminology and techniques in microbiology and immunology.
- Learnt on how much immune system is important to the humans.

**UNIT - I**

**Basic principles of Immunology:** History, Innate and Acquired immunity, Antibody mediated and Cell mediated immune response.

**Lymphoid organs:** Primary and Secondary lymphoid organs.

**Cells of the immune system:** Structure and functions of T cell, B cell and NK cell, Dendritic cell, Macrophage, Neutrophil, Eosinophil and Basophil.

**UNIT - II**

**Antigen and Antibody**

**Antigen:** Properties, Specificity and Cross reactivity, Antigenicity, Immunogenicity, Antigenic determinants, Haptens, Adjuvants, Self antigens (MHC) an outline only.

**Antibodies:** Properties, Classes and subclasses of immunoglobulins: Structure, Specificity and distribution, Clonal selection theory of antibody formation.

Antigen-antibody interaction: Precipitation and Agglutination – Definition and mechanism of formation. Complement system – Complement components and Complement pathways. Cytokines and their functions.

**UNIT - III**

**Immunotechniques**

**Precipitation in Gel:** Oudin procedure, Oahley – Fulthope procedure, Immunodiffusion, Ouchterlony procedure, Immuno electrophoresis and Electro immuno diffusion.

**Agglutination Test:** Slide agglutination and Tube agglutination.

**Principle and applications of Immunotechniques:** RIA, ELISA, Flourescent antibody technique and Monoclonal antibody techniques.

**UNIT - IV**

**Hypersensitivity reactions**

**Allergy and Hypersensitivity** – Type I, II, III and IV and their clinical manifestations.

**Autoimmune Diseases:** Rheumatoid arthritis, Myasthenia gravis.

**Immunity to infective diseases:** Immunity to Bacterial and Viral diseases.



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**UNIT - V**

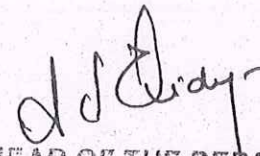
**Transplantation:** Definition of Graft and its types, Mechanism of Allograft rejection, Graft vs Host Diseases, Immuno suppressors.

**Resistance to tumors:** Tumor, antigens, NK Cells, Tumor immuno therapy, Lymphoid tumors.


**Vaccination:** Passive and Active immunization, Recombinant vaccines, DNA vaccines, Benefits and adverse effects of vaccination.

**References:**

1. Immunology – An introduction, Tizzard R Jan, 1995.
2. Immunology – Roitt Ivann, Jonathan Brastoff, David Male, 1993.
3. Text book of Microbiology – Ananthanarayanan. R. and Yayaraman Panikar, 1996.
4. Immunology – Janis Kuby, 3<sup>rd</sup> edition.



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SEMESTER – VI  
ELECTIVE PAPER II – BIOINFORMATICS

Course Code: 15UAPET605

CIA: 25 ESE: 75

Hours/Week: 4

Credits: 4

**Objectives:**

- To enable the students to understand scope of Bioinformatics
- Understanding of popular bioinformatics database
- Learn Fundamentals of Databases and Sequence alignment
- Approaches to drug discovery using bioinformatics techniques

**UNIT - I**

**History, Scope and Importance**

Important contributions - Aims and tasks of Bioinformatics - Applications of Bioinformatics  
Challenges and opportunities - Internet basics – HTML - Introduction to NCBI data model  
Various file formats for biological sequences.

**UNIT - II**

**Databases Tools and their uses**

Importance of databases - Biological databases - Primary sequence databases - Composite sequence databases - Secondary databases - Nucleic acid sequence databases - Protein sequence data bases - Structure databases – Specialized genomic resources analysis packages - Protein structure Visualization tools ( RasMol, Swiss PDB Viewer).

**UNIT - III**

**Sequence Alignment methods**

Sequence analysis of biological data - Significance of sequence alignment - Pairwise sequence alignment methods - Use of Scoring Matrices and Gap Penalties in Sequence Alignments - Multiple Sequence Alignment methods – Tools and application of Multiple Sequence Alignment.

**UNIT - IV**

**Predictive methods using DNA and Protein Sequences**

Gene predictions strategies - Protein prediction strategies - Molecular Visualization Tools - Phylogenetic analysis: Concept of trees - Phylogenetic trees and Multiple Alignments.

**UNIT - V**

**Commercial Bioinformatics**

Survey of Bioinformatics companies in India and Abroad – Economics prospects – Pharmaceutical Bioinformatics – Combinatorial Chemistry – HT screening – In Silico screening - from leads to commercialization: Discovering a drug - Target identification and validation - identifying the lead compound - Optimization of lead compound - Chemical libraries

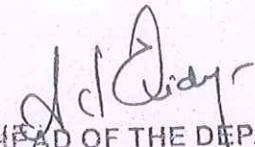


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References:

1. C S V Murthy, "Bioinformatics", Himalaya Publishing House, 1st Edition 2003
2. David W. Mount "Bioinformatics sequence and Genome analysis", Cold spring harbor laboratory press, 2004.
3. S. Ignacimuthu, S.J., "Basic Bioinformatics", Narosa Publishing House, 1995.
4. C.S. Tsai, An Introduction to Computational Biochemistry, WileyLiss, New York, 2002.

  
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SEMESTER – VI  
ELECTIVE PAPER II – NANOMATERIALS AND NANOMEDICINE

Course Code: 15UAPET606  
CIA: 25 ESE: 75

Hours/Week: 4  
Credits: 4

**Objectives:**

- To understand and get familiarized with the fundamentals of Nanoscience and technology
- To give a general introduction to different classes of Nanomaterials and impart basic knowledge on various methods of synthesis and characterization techniques involved in Nanotechnology
- To make the learner familiarize with the applications of nanotechnology in various fields

**UNIT - I**

**Introduction and Definition of Nanotechnology:** Introduction, Definition, Nanoscale, History of Nanotechnology, Future of Nanotechnology, Nano Technology Revolution, An introduction to Silicon based Technology, Applications of Nanotechnology.

**UNIT - II**

**Classification of Nanomaterials:** Quantum Dots, Wells and Wires. Carbon-based Nanomaterials - Nanotubes, Metal based Nanomaterials (Nanogold, Nanosilver and metal oxides).

**Properties of Nano-structured materials:** Size and shape dependent properties, Thermal properties - Melting point, Magnetism, Conductivity and band gap, Metal to insulator transition.

**UNIT - III**

**Synthesis of Nanomaterials:** Top-down (Nanolithography, CVD), Bottom-up (Sol-gel processing, Chemical synthesis). Biological methods of Synthesis: Use of Plant extracts, Bacteria, Fungi, Yeast and other biological particles.

**UNIT - IV**

**Nanotechnology in Biomedical and Pharmaceutical Industry** - Metal nanoparticles and Drug delivery vehicles – Nanoshells. Nanosensors in Diagnosis. Nanorobotics in Surgery.

**UNIT - V**

**Cancer Treatment** - Gold and Silver nanoparticles in Cancer targeting and treatment - Nanoparticles in treatment of Breast cancer. Targeted Drug Delivery using nanoparticles.

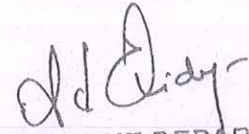


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References:

1. Pradeep.T - Nano: The Essentials Understanding Nanoscience and Nanotechnology (2007), 1 Edition, Tata McGraw - Hill Publishing Company Limited, New Delhi.
2. Lakshman Desai - Nanotechnology (2007), 1 Edition, Paragon International Publishers.
3. Manorama 'Tell Me Why' - Nanotechnology - Technology that will shape the Future.



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## SEMESTER - VI

## ELECTIVE PAPER II - HEALTH AND HYGIENE

Course Code: 15UAPET607

Hours/Week: 4

CIA: 25 ESE: 75

Credits: 4

**Objectives:**

- To provide knowledge and understanding regarding health and nutrition.
- To familiarize the students regarding safety education and health promotive measures for day to day life.

**UNIT - I**

**Health and Hygiene** - Personal hygiene, Definition of health and factors affecting it - Food habits, Cleanliness, Exercise and Sleep.

**Water** - Importance of water, impurities present in water, sources of contamination of water and water purification (Household and natural methods)

**UNIT - II**

**Physical Health** - Introduction to health - Food, meaning of balanced diet, Sources, Common nutritional deficiencies and prevention.

**Personal Health** - Cleanliness of body, Care of Skin, Nails, Eye, Hair, Oral Health, Clothing, Body posture and good habits such as exercises - Importance of avoiding smoking, alcoholism, drugs etc.,

**UNIT-III**

**Population explosion and Family Planning** - Importance, Common methods of family planning for Men and Women.

**Mothers and Children** - Immunisation of Children (importance, Schedule), Care of mothers during Pregnancy and after Delivery. Communicable Diseases - Symptoms and Prevention.

**UNIT - IV**

**Mental Health** - Factors for maintenance of good mental health. (i) Adolescent problems. (ii) First Aid - meaning, importance in daily life. Health destroying habits and addictions - Pan, Supari, Ganja, Tea and Coffee.

**Environment** - Ventilation, Lighting, Simple methods of purification of water, Sanitary latrine, Prevention of Worm infestation (Round worm, Hook worm).

**UNIT - V**

**Infection** - Definitions of Infection, Infective agents, Period of infectivity, Types of diseases and their modes of spread, Channels of infection.

**Disinfectants** - Definition, types and methods of disinfection.

**Infectious diseases** - Diseases spread by insects (Malaria, Dengue), Diseases spread by ingestion (Dysentery, Cholera, Typhoid), Diseases spread by droplet infection (Chicken pox, Measles, Mumps) and Disease spread by Contact (Leprosy, AIDS).

**Immunity** - Definition, types of Immunity and Immunization schedule.

**Common emerging health problems among women:** Cancer of Breast and

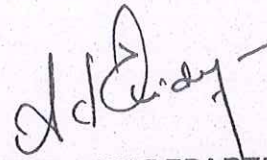


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**References:**

1. Yash pal Bedi (1976) Hygiene and Public Health. Anand Publishing Co., gali No. 1, Nawana Kot Amritsar.
2. V. N. Hhave, (1975) You and Your Health. National Book Trust
3. Bihari Lal Bhatia. (1961) Elementary. Hygiene. Orient Longmans. Ltd. Calcutta -13
4. J.E. Park, (1983) Prententive and Social Medicine, Jabalpur Messrs Banarcidas Bhanou
5. Birendra Nath Ghosh, (1969) Hygiene and Public Health Calcutta Scientific Publishing Co.



**HEAD OF THE DEPARTMENT  
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SEMESTER – VI

ELECTIVE PAPER III – DIAGNOSTIC BIOCHEMISTRY

Course Code: 15UAPET608

Hours/Week: 4

CIA: 25 ESE: 75

Credits: 4

Objectives:

- To understand the various clinical laboratory and significance of various tests and interpretation in diseased conditions.

UNIT - I

Complete hematogram, Complete urine analysis, Complete Motion analysis, Semen Analysis

UNIT - II

**Clinical Test:** Glycosylated hemoglobin (HbA1c), Fructosamine, GTT

**Ketoacidosis:** Nitroprusside test. CSF analysis

UNIT - III

**Enzyme Assay:** Acid phosphatase, CPK, CPK-MB, T-GGT

**Hormone Assay:** T<sub>3</sub>, T<sub>4</sub>, TSH by ELISA method

UNIT - IV

**Serodiagnostic Procedures:** Precipitation test, VDRL test, Widal test (Slide and Tube method), ASO test, RA test, CRP test, Complement fixation test, Skin test – Montaux test.

UNIT - V

**Blood Bank** – Blood grouping (ABO system), Sub groups, Rh factor – Coomb's test, Cross matching and Coagulation studies – Prothrombin time.

**Test for Aminoaciduria:** Test for phenylketonuria-DNPH test, Cystinuria and Homocystinuria – Nitroprusside test.

References:

- Dr.S.Rajan, Manual for Medical Laboratory Technology, Anjanaa Book House, First Edition, 2012.
- Varley,H, Practicl Clinical Biochemistry, IV Edition, 1985.
- Teitz,N, Fundamentals of Clinical Biochemistry, W.B.Saunders Company, 1982.
- Joan Zilva and Pannall P.R., Clinical Chemistry and Diagnosis and treatmewnt, PG Publishing Pvt Ltd.
- Kanai. L. Mukherjee, Swarajit Ghosh, Medical Laboratory Technology, II Edition.



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SEMESTER – VI  
ELECTIVE PAPER III: SPORTS BIOCHEMISTRY

Course Code: 15UAPET609

Hours/week: 4

CIA: 25 ESE: 75

Credits: 4

**Objectives:**

This course will enable students to:

- Understand the scientific background of exercise and sporting activities
- Prescribe and monitor the athletic and fitness programmes
- Assess effectiveness of the training
- To develop capabilities to provide preventive, promotive and therapeutic care in health and diseases

**UNIT - I**

**Sports, Exercise and Games**

Introduction, Principles, Importance, Advantages and Disadvantages of types of exercises including Aerobics, Resistance exercise, Isometric and Isotonic exercise, Gymnastics, Combative and Swimming.

Yogasana and its importance – Padmasana, Vajrasana, Dhunurasana, and Suryanamaskar;

Track and field events – Running and Jumping Team events – Kabaddi.

**UNIT - II**

**Skeletal muscle system and Metabolic systems in Exercise**

Skeletal muscle types - Relation with different types of activities; Strength, Power and Endurance of muscles.

Effects of over training and detection, Muscle fatigue, prevention and recovery.

Muscle metabolic systems in exercise, Recovery of muscle metabolic systems after exercise.

**UNIT - III**

**Cardio respiratory system**

Muscle blood flow and Cardiac output during exercise, Oxygen consumption and Pulmonary ventilation in exercise; Hypoxia and hypercapnia. Importance of heart rate monitoring, over training and detraining.

**UNIT - IV**

**Physical fitness assessment**

Body compositions, Body fat percentage by skin fold method and Somatotyping. BMI - Ideal weight, Assessment of Muscle mass and Bone mass.



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## UNIT - V

### Nutrition for Sports and Exercise

Nutritional considerations for Sports person: Carbohydrates - Energy source for Sports and Exercise. Carbohydrates composition for Pre-exercise during and recovery period.

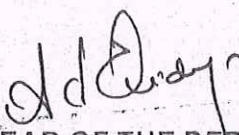
Fat: Role as an energy source: Effect of fasting and fat ingestion

Protein: Protein requirement during exercise, recovery process and Protein supplement.


Vitamins: Role of B-complex Vitamins. Minerals: Role of Potassium and Sodium.

### References:

1. O.P. Sharma, History of Physical Education, First edition, Khel Sahitya Kendra Publications, 2003.
2. Vedantha Maharishi, Simplified Physical Exercise, Vedantha Maharishi Publication.
3. A.C. Guyton, Textbook of Medical Physiology, 9<sup>th</sup> edition, Harcourt Asia pvt ltd, 1996.
4. Essentials of food and Nutrition by M. Swaminathan Vol I – II.

  
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SEMESTER – VI  
SKILL BASED COURSE IV – BIOINFORMATICS PRACTICALS

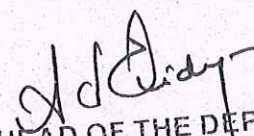
Course Code: 15UAPSP611  
CIA: 30 ESE: 45

Hours/week: 3  
Credits: 3


1. Working with MS-Office Packages One exercise each in Word, Excel Power point and Access
2. Working with HTML Tags and HTML Forms. Creating HTML Pages
3. Biological Databanks - Analysis of Protein and Nucleic acids sequences
4. Data retrieval tools and methods
5. Database file formats
6. Molecular Visualization Tool
7. Gene structure and function prediction (using Gen Scan, GeneMark)
8. Sequence similarity searching (NCBI BLAST)
9. Protein sequence analysis (ExpASY proteomics tools)
10. Multiple sequence alignment (Clustal)
11. Sequence analysis using EMBOSS

**References:**

1. Mani K. and Vijayaraj N., Bioinformatics a Practical Approach.
2. Bioinformatics a practical approach by K.Mani and N.Vijayaraj, Aparna publications, Coimbatore.

  
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SEMESTER – V

ADVANCED LEARNERS COURSE - III  
CANCER BIOLOGY

Course Code: 15UAPAL509  
(Self Study Course)

ESE : 100

Credits : 2

Objectives:

This course will enable students to:

- Explain the mechanisms of DNA damage and how this process is linked to cellular transformation and cancer risk.
- Understand the common cellular and molecular mechanisms that are deregulated in cancer cells.
- Develop an understanding of how a cancer cell develops into a malignant tumor.
- Illustrate how basic research translates into novel therapeutic approaches.
- Encourage the development of critical thinking and analytical skills that enable critical interpretation of primary scientific literature.

UNIT - I

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

UNIT - II

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

UNIT-III

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

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

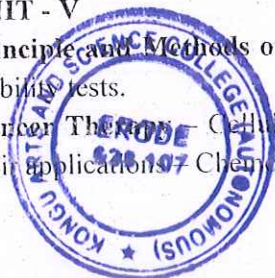
UNIT-IV

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

UNIT - V

**Principle and Methods of Cancer diagnosis:** Biochemical, Genetic, Cytotoxic and cell growth and viability tests.

**Cancer Therapy:** Cellular level - Gene level - Protein level. Principles of Cancer Biomarker and their application - Chemotherapeutics for Cancer, Phytotherapy for Cancer.

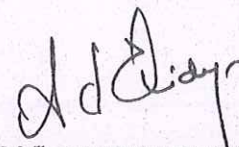


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References:

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



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SEMESTER – V

ADVANCED LEARNERS COURSE – IV  
ENTREPRENEURSHIP DEVELOPMENT IN LIFE SCIENCES AND HEALTHCARE

Course Code: 15UAPAL610  
(Self Study Course)

ESE : 100  
Credit : 2

**Objectives:**

This course will enable students to:

- To introduce the concepts of innovation and entrepreneurship within the life science sector.
- To establish a healthcare or life sciences business by, among other things, working as part of a mentored group to craft and defend a business plan based on an actual technology or service in the space (defined as therapeutics, diagnostics, medical devices, or healthcare IT services).
- Also creates a basis for the rest of the programme regarding the pedagogic model and the learning activities.

**UNIT - I**

Entrepreneurship -- Introduction, Management, Character and Need of entrepreneurs. Factors affecting entrepreneurship, Establishment of a Small business, Identification of sound Enterprise, Project Proposal Designing (Raw material, Technology, Skill and Data management), Infrastructure and Policy support for Entrepreneurship.

**UNIT - II**

Marketing plan, Market survey, Methods of data collection, Forecasting market demand, Sustainability of enterprise, Technical appraisal - factors for personal training. Financial appraisal - estimation of financial requirement, financial viability and Cost benefit analysis, Preparation of balance sheet. Funds - types and approaches. Project formulation, Project description, Physical infrastructure, Plant layout, Pollution control, Communication system, Transportation, Requirement of machinery and equipment, Licensing procedures and tax assessment

**UNIT - III**

**Mushroom cultivation:** Types of Mushroom – Edible and toxic, Preparation of Spawn, Preparation of bed – Sterilization, Straw preparation, Environmental conditions to be monitored.

**Spirulina:** Biology of Spirulina, Growth and culture conditions, Nutritive value of Spirulina, Enhancement of Spirulina nutrients and processing, Commercial Spirulina products, Marketing.

**UNIT IV**

**Vermicompost:** Earthworms used in vermicomposting, Culture conditions and raw materials for compost, Vermowash, Packaging. Panchakavya - Preparation, importance, medicinal uses, marketing.

**Organic Terrace farming:** General Recommendations, Requirements, Significance and Marketing.



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## UNIT V

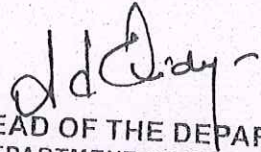
**Aquaculture:** Pearl culture – Types, Pearl enhancement conditions, Harvesting, Economical importance; Fisheries – Shrimp culture, Prawn culture, Ornamental fishes, Nutritive value of fish.

**Sericulture:** Introduction, Biology and Characteristics of Silkworm - Types, Nutrients, Cultural conditions.


**Bee rearing:** Types of Honeybees, Biological properties of Honey, Types of Bee culture and environmental factors.

### References:

1. Small scale Industries and Entrepreneurship by VASANT DESAI, Himalaya Publishing House.
2. Dr. Vishwanath, "A Handbook of Organic Terrace Gardening", May 2008.

  
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# **KONGU ARTS AND SCIENCE COLLEGE**

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

**ERODE – 638 107**

# **ACTIVITIES**



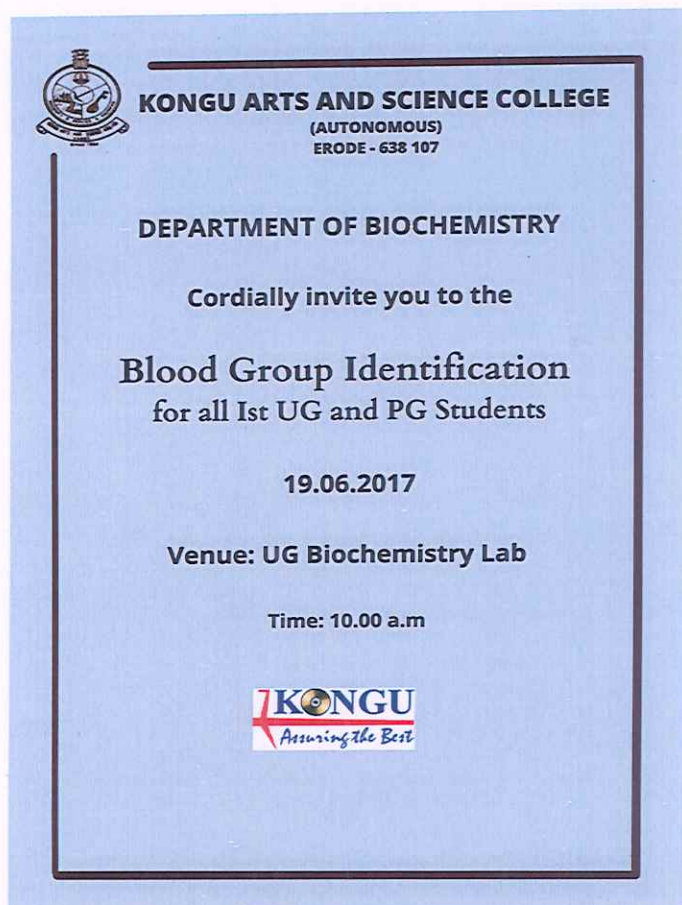


**KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE**  
**DEPARTMENT OF BIOCHEMISTRY**

**Blood Group Identification**

19.06.2017

**REPORT**



**KONGU ARTS AND SCIENCE COLLEGE**  
(AUTONOMOUS)  
ERODE - 638 107

**DEPARTMENT OF BIOCHEMISTRY**

Cordially invite you to the

**Blood Group Identification**  
for all Ist UG and PG Students

**19.06.2017**

**Venue: UG Biochemistry Lab**

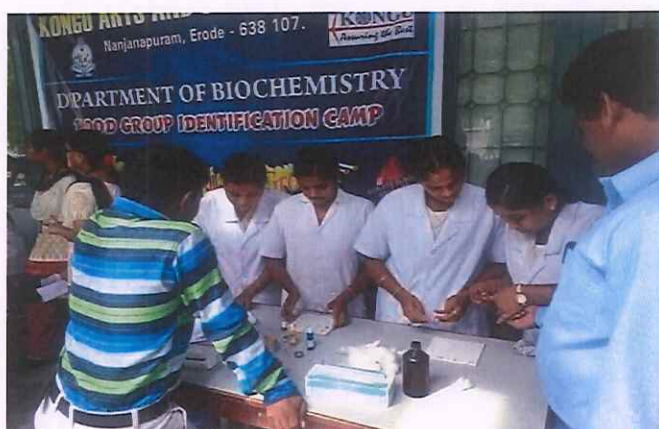
**Time: 10.00 a.m**

**KONGU**  
Assuring the Best

The accurate grouping of blood is very important when it comes to having a blood transfusion. If blood is given to a patient that has a blood type that is incompatible with the blood type of the blood that the patient receives, it can cause intravenous clumping in the patient's blood which can be fatal. The patient's body can start producing antibodies that attack the antigens on the blood cells in the blood that was given to the patient, causing reaction and rejection.

Department of Biochemistry conducted Blood group identification camp for I UG and I PG students on 19.06.2017 at the College auditorium

Nearly, 1100 students blood group were identified and the awareness of blood group identification was emphasized. This helps them to donate or receive blood in case of emergency conditions.



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**KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE**  
**DEPARTMENT OF BIOCHEMISTRY**

**Signing MoU with M/S SpinoS Life Science and Research Private Limited**

12.07.2017

**REPORT**



A memorandum of understanding is a document that describes the broad outlines of an agreement that two or more parties have reached. The purpose of College MoU with Industry can minimize the gap between learning and carrier opportunity. The industry has many new technology requirements, so industry-academic interaction plays a vital role in the placements Support and carrier growth for the students.

To provide industrial exposure to the students and faculty of the Kongu Arts and Science College, Erode, a Memorandum of Understanding (MoU) was signed between the college and M/S SpinoS Life Science and Research Private Limited, Coimbatore. The MoU was signed by Mr. A.Kellango, Correspondent of the college, Dr. N. Raman, Principal and Mr.R. Gowrishankar, Manager M/S SpinoS Life Science and Research Private Limited in the presence of Dr.A.K.Vidya, Professor and Head, Department of Biochemistry on 12.07.2017.



*A.K. Vidya*  
**HEAD OF THE DEPARTMENT**  
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**KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE**  
**DEPARTMENT OF BIOCHEMISTRY**

**Market Research Survey Study for CavinKare Pvt.Ltd, Chennai**

12.07.2017

REPORT



**KONGU ARTS AND SCIENCE COLLEGE**  
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**DEPARTMENT OF BIOCHEMISTRY**  
in association with  
**M/S SpinoS Life Science and Research Pvt. Ltd**

Cordially invite you to the  
**Mou Signing**  
&  
**Market Research Survey Study for**  
**CavinKare Pvt.Ltd, Chennai**




**15.02.2018**  
**Venue: Research Lab**  
**Time: 10.00 a.m.**




A market research survey can help to understand several aspects of the target market. This makes graduates eager and relatively affluent consumers still looking to establish their brand loyalty. Marketing to college students early on gives you a head start against competitors to build trust and loyalty with the affluent, eager and loyal graduate consumer group.

As a part of Mou activity, a Market Research Survey Study for CavinKare Pvt Ltd., Chennai was conducted on 12.07.2017 and 258 girl students from various departments served as participants.



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

Department Association Symbion' Inauguration

08.08.2017

REPORT



**KONGU**  
**ARTS AND SCIENCE COLLEGE**  
(AUTONOMOUS)  
ERODE 638 107

DEPARTMENT OF BIOCHEMISTRY

**INVITATION**

The Management, Correspondent, Principal,  
Faculty members & Students Cordially invite you to the

Inauguration of Biochemistry Association

**SYMBION - 17**

Presidential Address  
**Thiru. A.KILANGO**  
Correspondent

Felicitation  
**Dr. N.RAMAN**  
Principal

Inaugural Address  
**Mr. M. Mohan Kumar**  
Process Trainer  
Healthcare Documentation Services  
US & Australian Medical Transcription iMedX  
Information Services Pvt., Ltd., Coimbatore

Time: 10.00 a.m

Venue: PG Seminar Hall

Date: 08.08.2017



The student organizations exist for the purpose of bringing students together, helping them acclimate to life at the university, connecting them to other students, as well as alumni, and can help students develop transferable skills. Participating in a student organization not only teaches you leadership skills but also helps you broaden and improve those you already have. You'll learn the best way to communicate with both individuals and large groups, and you'll gain emotional intelligence as you develop new relationships.

To inculcate the importance of associations to students, Biochemistry Association (Symbion' 2017) was inaugurated by **Mr.M.Mohan Kumar**, Process Trainer, Health Care Documentation Services, US and Australian Medical Transcription iMedX Information Services Pvt Ltd, Coimbatore on 08.08.2017



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

Guest lecture on "Nutraceutical and Functional Foods"

16.08.2017

REPORT



KONGU ARTS AND SCIENCE COLLEGE  
(AUTONOMOUS)  
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DEPARTMENT OF BIOCHEMISTRY

Cordially invite you to the  
Guest Lecture on  
"Nutraceutical and Functional  
Foods"  
Resource Person



**Dr. Palanivel Ganesan,**  
Assistant Professor, Nanotechnology  
Research Center,  
Department of Applied Life  
Sciences, Konkuk University,  
Global Campus, Korea

16.08.2017

Venue: MB 207

Time: 10.00 a.m.



A nutraceutical is defined as **any substance that is a food or part of a food and provides medical or health benefits, including the prevention and treatment of disease.** Nutraceuticals, functional food ingredients and dietary supplements are important for health promotion and disease risk reduction. Nutraceuticals used in the treatment and prevention of different diseases. Nutrients, herbals and dietary supplements are major components of nutraceuticals for maintaining the health, act against various disease conditions and thus promote the quality of life.

A guest lecture about the importance of **Nutraceutical and Functional Foods** was given by **Dr. Palanivel Ganesan,** Assistant Professor, Nanotechnology Research Center, Department of Applied Life Sciences, Konkuk University, Global Campus, Korea as Resource person on 16.08.2017. About 150 students of Biochemistry students were the beneficiaries.



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**KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE**  
**DEPARTMENT OF BIOCHEMISTRY**

**Blood Donation Camp**

18.08.2017

**REPORT**

**KONGU ARTS AND SCIENCE COLLEGE**  
(AUTONOMOUS)  
ERODE - 638 107

Let us come forward for a **NOBEL CAUSE**


**DEPARTMENT OF BIOCHEMISTRY**  
&  
Lion's Club of Erode - Midtown

Cordially invite you to the

**BLOOD DONATION CAMP**

on August 18th, 2017  
@  
College Auditorium  
Time: 9.30 A.M. (Onwards)


We value your responses.....  
Donate blood and be the reason of smile to many faces

**KONGU**  
*Assuring the Best*


Each day, thousands of people need donated blood and blood products to keep them in good health or allow them to stay alive. The health benefits of donating blood are considerable but of course, the most important part of the process is helping to save lives. Donating blood is good for you, and it's even better for all the people who desperately need the help.

To emphasize the importance of blood donation and blood donation camp was organized at our college on 18.08.2018. Students voluntarily donated blood for a noble cause. The donated blood units were given to government hospitals to help the poor and needy. They save millions of lives and improve the health and quality of life of many patients every day. This extraordinary effort during a time of unprecedented crisis highlights the crucial role of well organized, committed voluntary in ensuring a safe and sufficient blood supply during normal and emergency times. 135 units of blood was donated.



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

**Blood Group Identification Camp for School students**

15.12.2017

REPORT



**KONGU ARTS AND SCIENCE COLLEGE**  
(AUTONOMOUS)  
ERODE - 638 107

**DEPARTMENT OF BIOCHEMISTRY**

Cordially invite you to the

**Blood Group Identification Camp**  
for  
**Sengulam Government School Students,**  
**Anthiyur**

15.12.2017

Place: Sengulam Government School,  
Sengulam, Anthiyur



The accurate grouping of blood is very important when it comes to having a blood transfusion. If blood is given to a patient that has a blood type that is incompatible with the blood type of the blood that the patient receives, it can cause intravenous clumping in the patient's blood which can be fatal. The patient's body can start producing antibodies that attack the antigens on the blood cells in the blood that was given to the patient, causing reaction and rejection

**Blood group identification** for Sengulam Government School, Sengulam, Anthiyur was done by **Mr.G.Karthikeyan**, Assistant Professor in Biochemistry and II B.Sc students of our department on 15.12.2017.

Nearly, 211 students blood group were identified and the awareness of blood group identification was emphasized. This helps them to donate or receive blood in case of emergency conditions. The accurate grouping of blood is very important during blood transfusion.



*[Signature]*  
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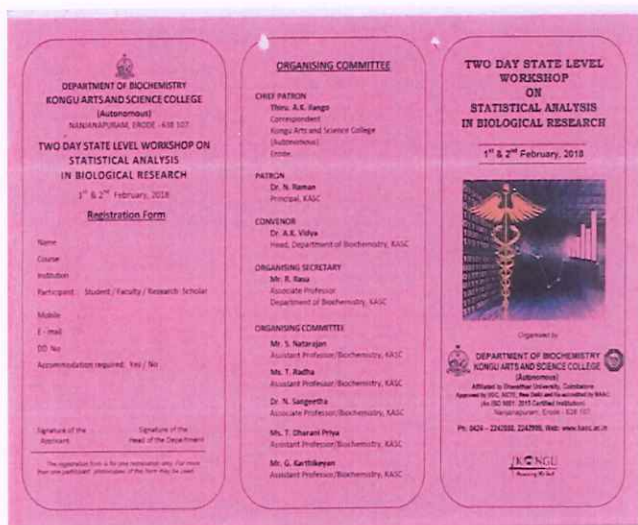


**KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), ERODE**  
**DEPARTMENT OF BIOCHEMISTRY**

**Two-Day Workshop on**  
**“Biostatistical Analysis on Biological Research”**

01.02.2018 & 02.02.2018

**REPORT**



Statistical analysis is the collection and interpretation of data in order to uncover patterns and trends. It is a component of data analytics. Statistical analysis can be used in situations like gathering research interpretations, statistical modeling or designing surveys and studies. Statistics is the study and manipulation of data, including ways to gather, review, analyze, and draw conclusions from data.

To encourage the students to go with statistical analysis a Two-Day Workshop on “Biostatistical Analysis on Biological Research” was organized by our department for the benefit of PG students and Research scholars on 01.02.2018 & 02.02.2018. **Dr. R. Parvathi**, Associate Professor and Head, Department of Mathematics, Vellalar College for Women, Erode and **Dr. G. Sudha**, Associate Professor and Head i/c, Department of Biochemistry, Periyar University, Salem served as Resource person. 54 participants from various colleges attended the workshop

*Dr. A. Ramo*  
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