

**Vels Institute of Science, Technology and Advanced Studies**

**Pallavaram, Chennai 600 117**

**SCHOOL OF LIFE SCIENCES**

**DEPARTMENT OF BIOCHEMISTRY**

**PROGRAM OUTCOMES**

**UNDERGRADUATE (B.Sc)**

**PO1.** Creative and Critical Thinking: To assume, inquire and analyse, apply logical principles, validate assumptions, solve problems, integrate knowledge and widen perspective.

**PO2.** Effective Communication: To gain proficiency in oral, reading, written communication and effective use of electronic media. Gain ability in effective interaction with variety of individuals and groups.

**PO3.** Moral maturity and Social Interaction: Harness cognitive ability, Elicit and appreciate views of others, mediate disagreements, promote interdependence and help reach conclusions in group settings.

**PO4.** Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

**PO5.** Professional and Ethical Behaviour: Recognize different value systems including self, understand the moral dimensions of self-interested decisions, and accept responsibility for them.

**PO6.** Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

**PO7.** Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning.

**PO8.** Degree related learning: Apply the core concepts of math, physics, chemistry and biology to a chosen scientific discipline and Generate and interpret scientific data using quantitative, qualitative and analytical methodologies and techniques.

## **PROGRAM SPECIFIC OUTCOMES (PSOs) - BIOCHEMISTRY**

*Students who graduate with a Bachelor of Science in Biochemistry will*

- PSO1:** Understand the function of biological molecules through the study of their molecular structure.
- PSO2:** Develop an understanding of the chemical and regulatory interrelationship between major cellular synthetic and catabolic pathways.
- PSO3:** Gain insights into the nature of diseases and clinical diagnostic procedures.
- PSO4:** Acquire critical thinking skills/ laboratory techniques so as to enable designing, conducting and interpreting scientific experiments.
- PSO5:** Appreciate proficiency in related disciplines such as molecular biology, endocrinology and immunology.
- PSO6:** Learn to work as a team to solve problems with traditional and modern laboratory tools.
- PSO7:** Identify a plan for higher education or career in diverse fields.

**Vels Institute of Science, Technology and Advanced Studies**  
**SCHOOL OF LIFE SCIENCES**  
**DEPARTMENT OF BIOCHEMISTRY**

**BOARD OF STUDIES**

<b>Sl.No</b>	<b>Name &amp; Address</b>	<b>Designation</b>
1.	<b>Dr. R. Sangeetha</b> Associate Professor and Head Department of Biochemistry, School of Life Sciences, Vels University, Chennai – 600 117.	Chairperson
2.	<b>Dr. A. Geetha,</b> Professor and Head, Department of Biochemistry, Bharathi Women’s College, Chennai – 600 108.	External Expert
3.	<b>Dr. R. Arivazhagan</b> Associate Professor & Head Dept .of Clinical BioChemistry Cancer Institute Adayar, Chennai – 600 020	External Expert
4.	<b>Dr. K.G.Kripa,</b> Associate Professor, Department of Biochemistry, School of Life Sciences, Vels University, Chennai – 600 117.	Internal Member
5.	<b>Dr. V. Vanitha</b> Associate Professor, Department of Biochemistry, School of Life Sciences, Vels University, Chennai – 600 117.	Internal Member
6.	<b>Dr. K.Gayathri,</b> Assistant Professor, Department of Biochemistry, Vels University.	Internal Member
7.	<b>Dr. R. Padmini,</b> Assistant Professor, Department of Biochemistry, Vels University, Chennai – 600 117.	Internal Member
8.	<b>Ms. P.Surya,</b> Application Specialist,	Alumni (M.Sc. Advanced Biochemistry,

	CPC Diagnostics, Gopalapuram, Chennai	2010-2012 Batch)
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**B.Sc.**  
**BIOCHEMISTRY**

**Curriculum and Syllabus**  
(Based on Choice Based Credit System)  
Effective from the Academic year  
**2015-2016**

# B.Sc. BIOCHEMISTRY

## CURRICULUM

**Total Credits - 135**

CATEGORY	SUB CODE	TITLE OF THE PAPER	Hours / Week			CREDIT S
			L	T	P	
<b>FIRST SEMESTER</b>						
CORE	15BBC001	Cell Biology	6	-	-	4
CORE	15BBC002	Practical – I Qualitative Analysis	-	-	6	2
CORE	15BBC003	Practical – II – Microbiology Practicals	-	-	3	2
DSE		Discipline Specific Elective – 1	5	-	-	4
AECC	15LTA001 15LHN001 15LFR001	Language – I (Tamil/French/Hindi)	5	-	-	4
AECC	15LEN001	Foundation English – I	5	-	-	4
		<b>TOTAL</b>	<b>21</b>	<b>-</b>	<b>9</b>	<b>20</b>
<b>SECOND SEMESTER</b>						
CORE	15BBC004	Introduction to Biomolecules	6	-	-	4
CORE	15BBC005	Practical – III Titrimetry	-	-	4	2
CORE	15BBC006	Practical – IV Cell biology Practicals	-	-	3	2
DSE		Discipline Specific Elective – 2	5	-	-	4
AECC	15LTA002 15LHN002 15LFR002	Language – II (Tamil/French/Hindi)	5	-	-	4
AECC	15LEN002	Foundation English – II	5	-	-	4
SEC		Skill Enhancement Course - 1			2	2
		<b>TOTAL</b>	<b>21</b>	<b>-</b>	<b>9</b>	<b>22</b>
<b>THIRD SEMESTER</b>						

CORE	15BBC007	Biochemical Techniques	5	-	-	4
CORE	15BBC008	Practical – V Biochemical Preparations	-	-	3	2
CORE	15BBC009	Practical – VI Separation Techniques	-	-	3	2
DSE		Discipline Specific Elective – 3	5	-	-	4
AECC	15LTA003 15LHN003 15LFR003	Language – III (Tamil/French/Hindi)	5	-	-	4
AECC	15LEN003	English For Communication – I	5	-	-	4
GE		Generic Elective 1	2	-	-	2
SEC		Skill Enhancement Course - 2			2	2
		<b>TOTAL</b>	<b>22</b>	<b>-</b>	<b>8</b>	<b>24</b>
<b>FOURTH SEMESTER</b>						
CORE	15BBC010	Human Physiology	5	-	-	4
CORE	15BBC011	Practical – VII – Hematology	-	-	3	2
CORE	15BBC012	Practical – VIII Nutritional Biochemistry Practicals	-	-	3	2
DSE		Discipline Specific Elective – 4	5	-	-	4
AECC	15LTA004 15LHN004 15LFR004	Language - IV(Tamil/French/Hindi)	5	-	-	4
AECC	15LEN004	English For Communication – II	5	-	-	4
AECC	15EVS201	Environmental Studies	2	-	-	2
GE		Generic Elective 2	2	-	-	2
		<b>TOTAL</b>	<b>24</b>	<b>-</b>	<b>6</b>	<b>24</b>
<b>FIFTH SEMESTER</b>						
CORE	15BBC013	Enzymes & Intermediary Metabolism I	6	-	-	4
CORE	15BBC014	Clinical Biochemistry I	6	-	-	4
CORE	15BBC015	Practical – IX- Enzymology	-	-	6	3

DSE		Discipline Specific Elective – 5	6	-	-	4
DSE		Discipline Specific Elective – 6	6	-	-	4
		Industrial Visit		-	-	1
		<b>TOTAL</b>	<b>24</b>	<b>-</b>	<b>6</b>	<b>20</b>
<b>SIXTH SEMESTER</b>						
CORE	15BBC016	Enzymes & Intermediary Metabolism II	6	-	-	4
CORE	15CBB017	Clinical Biochemistry II	6	-	-	4
CORE	15BBC018	Practical – X Clinical Biochemistry	-	-	6	3
DSE		Discipline Specific Elective – 7	6	-	-	4
DSE		Discipline Specific Elective – 8	6	-	-	4
CORE	15BBC019	Group Project	-	-	-	6
		<b>TOTAL</b>	<b>24</b>	<b>-</b>	<b>6</b>	<b>25</b>
<b>Total Credits</b>						<b>135</b>

## **List of Electives**

### **List of Discipline Specific Electives**

1. 15BBC101 Microbiology
2. 15BBC102 Fundamentals of Computers and Statistics
3. 15BBC103 Bioinformatics
4. 15BBC104 Clinical Nutrition
5. 15BBC105 Essentials of Endocrinology
6. 15BBC106 Basics of Molecular Biology
7. 15BBC107 Immunobiology
8. 15BBC108 Biotechnology
9. 15BBC109 Nutrition and Health
10. 15BBC110 Lifestyle diseases
11. 15BBC111 Stem cell biology
12. 15BBC112 Developmental Biology
13. 15BBC113 Cancer Biology
14. 15BBC114 Plant and Animal Tissue Culture
15. 15BBC115 Neurobiology
16. 15BBC116 Plant Biochemistry

### **List of Generic Electives**

1. 15BBC151 Principles of Genetics
2. 15BBC152 Pathological Basis of Diseases
3. 15BBC153 Natural Resources Management
4. 15BBC154 Intellectual Property Rights
5. 15BBC155 Herbal Technology
6. 15BBC156 Pharmacology



## **List of Skill Enhancing Courses**

1. 15NSS255    NSS
2. 15BBC251    Entrepreneurship Development
3. 15BBC252    Medical Lab Diagnostics
4. 15BBC253    Techniques for Forensic Science
5. 15BBC254    Medical Lab Diagnostics - II

### **CORE COURSES**

**15BBC001**

**CELL BIOLOGY**

**6 0 0 4**

#### **Course objectives**

Cell biology is increasingly important in all life sciences. Many of the advancements in modern science are the result of a better understanding of cellular components and their functions. An understanding of cell biology is an asset in modern science, it provides knowledge about the composition, structure and function of organelles and other cellular components and their biological activities.

#### **Course outcomes**

**After the completion of this course, the student will be able to**

- CO1:** Define clearly what is meant by life and living organisms and explain the mechanisms that underlies the evolution of life on earth.
- CO2:** Describe the structural characteristics of prokaryotic and eukaryotic cells.
- CO3:** Study the basic chemical composition of cell with an emphasis on the structure of protein, carbohydrate, lipids and nucleic acid.
- CO4:** Describe the plasma membrane composition, structure and function.
- CO5:** Describe membrane physiology including transport mechanisms across membranes.
- CO6:** Illustrate the organization of the cell and structure and function of the constituent organelles.
- CO7:** Study the components of cell's cytoskeleton and its involvement in cell movement.
- CO8:** Identify the major cellular events that occur during cell division and cell cycle.
- CO9:** Explain the concept of DNA as genetic material and its organization in the nucleus.
- CO10:** Describe the different ways in which cells communicate, recognize and adhere one another.

**Unit 1 An overall view of cells (12)**

Origin and evolution of cells. Cell theory. Classifications of cells- Structure of Prokaryotic and Eukaryotic cells. Molecular composition of Cells- Water, Carbohydrates, Lipids, Nucleic acids, and Proteins.

**Unit 2 Cell membrane (12)**

Fluid Mosaic Model of membrane structure. Membrane proteins and their properties. Membrane carbohydrates and their role. Transport across membranes-diffusion, active and passive transport.

**Unit 3 Organelles I (12)**

Endoplasmic reticulum - types, structure and functions. Golgi apparatus- structures and functions. Lysosomes- structure and functions, morphology & functions of peroxisomes and glyoxysomes, ribosomes - types, structure and functions.

**Unit 4 Organelles II (12)**

Mitochondria: Structure and function. Chloroplasts structure and functions. Cytoskeleton: Types of filaments and their functions. Microtubules: Chemistry and function

**Unit 5 Cell dynamics (12)**

Nucleus - structure and functions. Chromosome-chromatin structure, the cell cycle. Phases of cell cycle. Meiotic and mitotic cell divisions, cell- cell communications, cell recognition, cell adhesion and cell functions.

**Total : 60 hours**

**Text Books**

1. Devasena.T, Cell Biology. Oxford University Press India; First edition (2012).
2. Rastogi . S.C, Cell Biology. Newage Publishers (2008).

**Reference Books**

1. David L Nelson & Michael M Cox, Lehninger -Principles of biochemistry.W.H. Freeman company New York 4<sup>th</sup> edition 2007.
2. Karp G, Cell and Molecular Biology: Concepts and Experiments. John Wiley & Sons. Inc. 6<sup>th</sup> Edition.2010
3. De Robertis E.D.P & De Robertis E.M.F. Cell and Molecular Biology. Lippincott Williams & Wilkins, Philadelphia. 8th edition ,2006
4. Cooper, G.M. and Hausman, R.E. The Cell: A Molecular Approach. Sinauer Associates, Inc.; 6 edition (February 1, 2013).

**Course objectives**

This course is concerned with basic lab skills. These skills include the accurate use of pipettes, making solutions, and safety measurements along with the identification of biomolecules such as carbohydrates, proteins and aminoacids by suitable tests.

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Identify the given solution as carbohydrate or amino acid.

**CO2:** Identify sugar as aldose and ketose

**CO3:** Classify sugar as monosaccharide, disaccharide and polysaccharide

**CO4:** Demonstrate sugar as reducing and non reducing sugar

**CO5:** Identify pentose and hexose sugar

**CO6:** Study general color reaction of proteins

**CO7:** Distinguish aromatic amino acids and basic amino acid

**CO8:** Determine sulfur containing amino acid

**CO9:** Study general color reaction of proteins

**CO10:** Study properties (Denaturation, precipitation and hydrolysis) of proteins

**List of Experiments**

1. Qualitative analysis of monosaccharides – aldoses.
2. Qualitative analysis of monosaccharides – ketoses.
3. Qualitative analysis of reducing disaccharides.
4. Qualitative analysis of non-reducing disaccharides
5. Qualitative analysis of polysaccharides.
6. Qualitative analysis of pentoses.
7. Qualitative analysis of aromatic amino acids.
8. Qualitative analysis of sulphur containing amino acids.
9. Qualitative analysis of basic amino acids.
10. General colour reactions of protein.
11. Denaturation and precipitation of proteins.
12. Hydrolysis of proteins and colour reactions of hydrolysate.

### **Text Books**

- 1 J. Jayaraman, Laboratory Manual in Biochemistry. New Age International Publishers. 2011.
- 2 S. Sadasivam, A. Manickam, Biochemical Methods. New age publishers. 2009.

### **Reference Books**

- 1 Harold Varley, Practical Clinical Biochemistry, CBS. 6 edition, 2006.
- 2 S. K. Sawhney, Randhir Singh, Introductory Practical Biochemistry. Alpha Science International, Ltd. 2 edition, 2005.

**15BBC003**

**PRACTICAL II - MICROBIOLOGY PRACTICALS**

**0 0 3 2**

### **Course objectives**

This paper aims at providing a basic understanding of microbes, their structure and function. The applications of micro-organisms has also been dealt with.

### **Course outcomes**

**After the completion of this course, the student will be able to**

- CO1:** Gain knowledge about microbiology laboratory practices and biosafety steps to be followed.
- CO2:** Understand the basic principles and applications of instruments employed at microbiology lab (biosafety cabinet, autoclave, incubators and microscopes)
- CO3:** Demonstrates skill in staining techniques (Simple and Gram staining techniques).
- CO4:** Demonstrate the motility of bacteria by Wet mount method.
- CO5:** Learns to demonstrate the motility of bacteria by Hanging drop method.
- CO6:** Gains practical skill in the preparation and sterilization of Liquid and Solid Basal media.
- CO7:** Perform the streaking techniques – simple streaking plate method and quadrant streaking plate method.
- CO8:** Identify different types of bacteria and methods of culturing them.
- CO9:** Develop the skill to identify, explain the function and uses of common culture media.
- CO10:** Demonstrates ability to explain about the macroscopic and microscopic characteristics of microorganisms.

## **List of Experiments**

1. Microbiology Laboratory Practices and Biosafety.
2. To study the principle and applications of important instruments (biological safety of cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter)
3. Simple staining of bacteria
4. Gram staining of bacteria
5. Wet mount Technique for the demonstration of the motility of bacteria
6. Hanging Drop Technique for the demonstration of the motility of bacteria
7. Preparation of liquid Basal media
8. Sterilization of liquid Basal media
9. Preparation of Solid Basal media
10. Sterilization of liquid Basal media
11. Simple Streak plate method
12. Quadrant streak plate method

## **Text Books**

1. Atlas RM. Principles of Microbiology. 2nd edition. W M.T.Brown Publishers. 1997.
2. Pelczar MJ, Chan ECS and Krieg NR. Microbiology. 5th edition. McGraw Hill Book Company. 1993.

**Course objectives**

Biomolecules is to study about the structure and biological function of molecule, that is present in living organisms, including large macromolecules such as proteins, polysaccharides, lipids, and nucleic acids, as well as small molecules such as primary metabolites, secondary metabolites, and natural products.

**Course outcomes**

**After the completion of this course, the student will be able to**

- CO1: Easily understand the basic concepts/functions of solutes, chemical bonding and organic compounds
- CO2: Describe the classification of biomolecules
- CO3: Describe the basic reaction types and mechanisms of bio molecules
- CO4: Understand the structures and functions of biomolecules
- CO5: Analyse and study the chemical and biochemical properties of bio molecules
- CO6: Understand relationships between biological molecules and human health
- CO7: Identify biomolecules structural differences and its properties
- CO8: Gain an understanding the basic principle of chemistry as well as biology
- CO9: Understand the scope of biological chemistry
- CO10: Easily understand the interrelationship of organic compounds and homeostasis in biological organisms

**Unit 1 Carbohydrates and aminoacids****(12)**

Classification of carbohydrates, Occurrence, structure and biological importance of mono, di and polysaccharides-homo and heteropolysaccharides. Properties – Physical, chemical, Mutarotation. Classification and structures of amino acids. Physical and chemical properties of amino acids. Essential and non-essential amino acids. Non protein amino acids.

**Unit 2 Proteins****(12)**

Proteins-Classification based on solubility, shape, composition and function. Denaturation and renaturation of proteins. Structure of peptide bonds. Protein structure-Primary, secondary, tertiary and quaternary structures of protein. Forces stabilizing the structures of proteins. Determination of the amino acid sequence of a polypeptide chain. Ramachandran plot.

**Unit 3 Lipids****(12)**

Definition and classification of lipids. Fatty acids and waxes – classification and structure. Structure and biological function of triacylglycerols. Chemical properties of fats - iodine value, Sap value, acid number, Rancidity, Rm value. Classification, structure and functions of phospholipids. Glycolipids (cerebrosides and gangliosides), Derived lipids.

**Unit 4 Nucleic acids****(12)**

Structure of purine and pyrimidines, nucleosides and nucleotides Composition of RNA and DNA. Watson And Crick model of DNA. Types of DNA. Structure and biological role of different types of RNA. Properties of nucleic acids – denaturation and annealing of DNA. Sequencing of DNA – Maxim and Gilbert, Sanger methods.

**Unit 5 Heterocyclic compounds****(12)**

Structure and biological importance of heterocyclic compounds-pyridine, pyrrole, pyrimidine and purine ring containing compounds. Porphyrin - structure and functions of biologically important compounds containing porphyrin.

**Total : 60 hours****Text Books**

1. J.L.Jain et al. Fundamentals of Biochemistry by S.Chand and Company 4th edition, 1994.
2. M.N.Chatterjea and Ranashinde Text book of Medical biochemistry Jaypee Brothers Medical Publisher (P) Ltd, 6<sup>th</sup> edition 2005.

**Reference Books**

1. Lippincott's illustrated biochemistry – Champe and Harvey; 6<sup>th</sup> edition 2007.
2. D.Voet and J.G. Voet, Biochemistry, John Wiley & Sons, USA 2004.
3. Albert L. Lehninger Principles of Biochemistry CBS Publishers & Distributors, New Delhi, 4th edition 2004.

**Course objectives**

This Lab shall equip the students about complexing and precipitation, acid-base, and oxidation reduction reactions. The main requirements for the reactions used in titrimetric analysis are high speed, the presence of stoichiometric proportions, and the absence of side reactions, which distort the results of analysis.

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Develop observational skills and make discoveries in the laboratory

**CO2:** Understand the fundamentals of acid/base chemistry

**CO3:** Calculate pH

**CO4:** Unravel the energy and speed of chemical reactions

**CO5:** Perform unit conversions and their importance in clinical medicine

**CO6:** Prepare proper graphs (charts) and use them to discover trends and make predictions.

**CO7:** Understand role of Buffer

**CO8:** Understand the fundamentals of acid/base titrations

**CO9:** Understand the theories upon which the principles of the various common analytical procedures are based

**CO10:** To learn to calculate molarity based on titrations

**List of Experiments**

1. Estimation of oxalic acid
2. Estimation of iron
3. Estimation of nitrate
4. Estimation of copper
5. Estimation of hydrogen peroxide
6. Estimation of dichromate
7. Estimation of chromate
8. Estimation of milk calcium
9. Estimation of glycogen
10. Estimation of glucose by Benedict's method
11. Estimation of Glycine by Sorrenson's Formal Titration
12. Estimation of Ascorbic acid



### **Text Books**

1. J. Jayaraman, Laboratory Manual in Biochemistry. New Age International Pvt Ltd Publishers. 2011 (Paperback).
2. S. Sadasivam, A. Manickam, Biochemical Methods. New age publishers. 2009 (paperback).
3. S. K. Sawhney, Randhir Singh, Introductory Practical Biochemistry. Alpha Science International, Ltd. 2 edition, 2005.

### **Reference Books**

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6 edition, 2006.
2. Hans Bisswanger, Practical Enzymology. Wiley VCH. 2nd Edition, 2011.

**15BBC006**

**PRACTICAL IV CELL BIOLOGY**

**0042**

### **Course objectives**

Cell biology practicals is an understanding of cell biology as an asset in modern science. It provides knowledge about the composition, structure and function of organelles and other cellular components and their biological activities.

### **Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Handle animal cells and visualize them

**CO2:** Handle plant cells and visualize them

**CO3:** Visualize different stages of mitosis on onion root tip

**CO4:** Visualize different stages of meiosis

**CO5:** Perform sub-cellular fractionation

**CO6:** Gain Knowledge about structure and function of different cell components

**CO7:** Understand the over-view of composition of blood

**CO8:** Isolate WBC

**CO9:** Accomplish knowledge about osmosis employing osmotic fragility test

**CO10:** Know about the structure and function of mitochondria and chloroplast

### **List of Experiments**

1. Visualization of animal cell by methylene blue
2. Visualization of plant cell by methylene blue.
3. Identification of different stages of mitosis in onion root tip.
4. Identification of different stages of meiosis in grasshopper testis.

5. Micrographs of different cell components (dry lab).
6. Sub-cellular fractionation.
7. Visualization of nuclear fraction by acetocarmine stain.
8. Isolation of mitochondria from rat liver
9. Staining and visualization of mitochondria by Janus green stain.
10. Isolation of WBC
11. Isolation of Platelets
12. Osmotic Fragility Test

### **Text Books**

1. J. Jayaraman, Laboratory Manual in Biochemistry. New Age International Pvt Ltd Publishers. 2011 (Paperback).
2. S. Sadasivam, A. Manickam, Biochemical Methods. New age publishers. 2009 (paperback).
3. S. K. Sawhney, Randhir Singh, Introductory Practical Biochemistry. Alpha Science International, Ltd. 2 edition, 2005.

### **Reference Books**

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6 edition, 2006.
2. Hans Bisswanger, Practical Enzymology. Wiley VCH. 2nd Edition, 2011.

**15BBC007**

**BIOCHEMICAL TECHNIQUES**

**5 0 0 4**

### **Course objectives**

Advanced instrumental techniques are used to understand the theoretical principles involved in Bioinstrumentation which may be used for the determination of nutrients, major ions and trace elements, biological samples together with the analytical techniques. Some of these techniques are particularly useful for the detailed analysis of recent methodologies used in the chemical analysis of biota as discussed in the chapter.

### **Course outcomes**

**After the completion of this course, the student will be able to**

- CO1:** Understand the significance of buffers in living system and its usage in various biochemical techniques.
- CO2:** Accomplish knowledge on Principle, Instrumentation and applications of Electrochemical techniques such as pH electrode and Oxygen electrode.

- CO3:** Accomplish knowledge on Principle, Instrumentation and applications of different types of Centrifugation techniques.
- CO4:** Study the Role of Chromatography in separation of various biomolecules and other biosamples.
- CO5:** Accomplish knowledge on Principle, Instrumentation and applications of different types of Chromatographic techniques.
- CO6:** Accomplish knowledge on Principle, instrumentation and applications of Paper, Agarose and Polyacrylamide gel electrophoresis (Native and SDS).
- CO7:** Understand about the application of Beer-Lambert's law in the various spectroscopic techniques including the principle, Instrumentation and applications of Visible, UV, Fluorescence spectroscopy, Flame photometry, NMR and ESR.
- CO8:** Gain knowledge about radioactivity and its measurement by GM counter and Scintillation counter methods. Biological applications of radioisotopes in various research fields.
- CO9:** Develops the theoretical knowledge and will be capable of planning and carrying out experiments by employing latest biochemical techniques.
- CO10:** With parallel practical training, develops the skill in handling basic biochemical and electrochemical techniques.

**Unit 1 Homogenisation and Centrifugation (12)**

Buffers – pH, pOH, examples of buffers. pH electrode, oxygen electrode, body buffers and their significance. Tissue homogenization: mechanical and non-mechanical methods. Principle and applications of centrifugation techniques- differential, density gradient and Ultra-centrifugation.

**Unit 2 Chromatography (12)**

Introduction to chromatography. Principle and applications of chromatographic techniques- paper and thin layer. Principle, methodology and applications of gel filtration, ion- exchange and affinity chromatography.

**Unit 3 Electrophoresis and Electrochemical Techniques (12)**

Electrophoresis- General principles, factors affecting electrophoresis and types of supporting media. Principles and applications of paper, polyacrylamide (native and SDS), agarose gel electrophoresis and immunoelectrophoresis.

**Unit 4 Spectroscopy (12)**

Colorimetry and Spectrophotometry- Laws of light absorption- Beer-Lambert law. Principle, Instrumentation and applications of UV- visible spectroscopy; Fluorescence spectroscopy; Flame photometry – principles of atomic absorption and flame emission spectroscopy.

## **Unit 5 Radioactivity**

**(12)**

Radioactivity, Radioactive decay, units of radio activity. Detection and measurement of radioactivity- GM counter, scintillation counter. Biological applications of radioisotopes and Radiation

**Total : 60hours**

### **TextBooks**

1. Keith Wilson and John Walker, Principles and techniques of Practical Biochemistry -Seventh edition, Cambridge University Press 2010
2. Asokan P, Analytical biochemisrty Biochemistry, Chinna publication 2009

### **Reference Books**

1. Holme.D.J. and Peck.H., Longman, Analytical Biochemistry, 3<sup>rd</sup> edition, 1998
2. Plummer. D. T. An introduction to practical Biochemistry. Tata McGraw-Hill, 1998
3. Chatwal, G & Anand, S.Instrumental methods of chemical analysis. Himalaya Publishing House.2005
4. K.Sawhney and Randhir Singh, Introductory Practical Biochemistry. Narosa Publications House, 2001

**Course objectives**

Aim of this Lab is to focus on the separation of biomolecules by different chromatographic techniques like Paper, TLC, Column and quantification of those molecules in selected source.

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Easily identify and separate the solutes or bio molecules present in the given sample

**CO2:** Estimate the level of bio molecules by using quantitative methods

**CO3:** Handle laboratory instruments individually

**CO4:** Plan and carryout projects efficiently

**CO5:** Logically understand the reaction mechanism

**CO6:** Develop academic as well as research curiosity

**CO7:** Get knowledge about good laboratory practice

**CO8:** Estimate the level of bio molecules by using qualitative methods

**CO9:** Get an idea about various solvent and its uses

**CO10:** To realize the importance of time management, group work and uses of data collection in practical

**List of Experiments**

1. Preparation of solutions- Normal, Molar, Molal solutions.
2. Preparation of buffers-Tris, Citrate, Acetate and Phosphate Buffers.
3. Preparation of starch from potatoes.
4. Preparation of casein from milk.
5. Preparation of lactalbumin from milk.
6. Preparation of haemoglobin from blood.
7. Preparation of albumin from eggs.
8. Preparation of lecithin from eggs.
9. Isolation of Glycogen from liver tissue.
10. Isolation of chlorophyll from spinach leaves.
11. Isolation of Protein by Ammonium sulphate fractionation.
12. Preparation of cellulose from plant material.

## **Text Books**

1. J. Jayaraman, Laboratory Manual in Biochemistry. New Age International Pvt Ltd Publishers. 2011 (Paperback).
2. S. Sadasivam, A. Manickam, Biochemical Methods. New age publishers. 2009 (paperback).

## **Reference Books**

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6 edition, 2006.
2. Hans Bisswanger, Practical Enzymology. Wiley VCH. 2nd Edition, 2011.

**15BBC009**

**PRACTICAL VI SEPARATION TECHNIQUES**

**0 0 5 2**

### **Course objectives**

Aims to isolate and separation of biomolecules from various sources, analyse the presence of specific molecules in isolated sample by different qualitative tests and estimate those molecules in each source.

### **Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Describe the instrumentation required for the various separation techniques and their associated operating principles.

**CO2:** Understand the significance, quality, and limitations of the results produced by the various separation techniques

**CO3:** Select the operating conditions (mobile phase, temperature, flow rate, program rate, etc.) for the various separation techniques.

**CO4:** Gain Knowledge of phase equilibria in two-component and multi-component systems

**CO5:** Gain Ability to analyze the separation system for multi-component mixtures

**CO6:** Get the Ability to design separation system for the effective solution of intended problem

**CO7:** Acquire the Ability to Select appropriate separation technique for intended problem

**CO8:** Evaluate data and properly determine their meaning to make correct and ethical decisions.

**CO9:** Select the operating conditions (mobile phase, temperature, flow rate, program rate, etc.) for the various separation techniques.

**CO10:** To develop an appreciation for the difficult task of judging the accuracy and precision of experimental data

## List of Experiments

1. Separation of sugars by ascending paper chromatography.
2. Separation of sugars by descending paper chromatography.
3. Separation of sugars by two dimensional chromatography.
4. Separation of amino acids by ascending paper chromatography
5. Separation of amino acids by descending paper chromatography.
6. Separation of aminoacids by two dimensional chromatography.
7. Separation of amino acids by radial paper chromatography.
8. Separation of sugars by thin layer chromatography.
9. Separation of amino acids by thin layer chromatography.
10. Separation of lipids by thin layer chromatography.
11. Separation of plant pigments by column chromatography.
12. Separation of proteins by Gel Filtration Chromatography. (Demonstration)

## Text Books

1. J. Jayaraman, Laboratory Manual in Biochemistry. New Age International Pvt Ltd Publishers. 2011 (Paperback).
2. [S. Sadasivam](#), [A. Manickam](#), Biochemical Methods. New age publishers. 2009 (paperback).

## Reference Books

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6 edition, 2006.
2. S. K. Sawhney, Randhir Singh, Introductory Practical Biochemistry. Alpha Science International, Ltd. 2 edition, 2005.

**15BBC010**

**HUMAN PHYSIOLOGY**

**5 0 0 4**

## Course objectives

The objective is to impart knowledge and understanding of the human body. To understand the inter relationships within and between anatomical and physiological systems of the human body.

## Course outcomes

**After the completion of this course, the student will be able to**

**CO1:** Understand the inter relationships within and between anatomical and physiological systems of the human body

**CO2:** Describe the structure of major human organs and explain their role in the maintenance of healthy individuals.

**CO3:** Explain the interplay between different organ systems and how organs and cells interact to maintain biological equilibria in the face of a variable and changing environment.

**CO4:** Describe the general function of each organ system.

**CO5:** List the levels of organization in the human body and the characteristics of each.

**CO6:** Explain how the activities of organs are integrated for maximum efficiency

**CO7:** Understand in-depth the neurophysiology and respiratory system

**CO8:** Identify how changes in normal physiology lead to disease

**CO9:** Understand in-depth the anatomy and physiology of digestive system

**CO10:** Understand the muscle and cardiovascular physiology

**Unit 1 Blood and Circulatory System (12)**

Blood: composition and function, types and function of blood cells, erythropoiesis, Blood groups- ABO and Rhesus system.

Circulatory system and Heart - Structure and functions of heart and associated blood vessels, Cardiac cycle.

**Unit 2 Digestive System (12)**

General structure of digestive system – Digestion and absorption of food in the mouth, stomach and intestines. Movements of small intestine. Role of pancreas, Liver – Structure and function, defaecation.

**Unit 3 Respiratory system and Muscular system (12)**

Outline of various components of respiratory system. Mechanism and chemistry of respiration..

Muscles-Types of muscles and their functions.Mechanism of muscle contraction. .

**Unit 4 Lymphatic and Excretory system (12)**

Spleen – Structure and function. Structure and function of lymphatic System.

Structure and role of kidney, nephrons. Mechanism of urine formation- Glomerular filtration, tubular secretion and reabsorption.

**Unit 5 Nervous System (12)**

Brief outline of nervous system-brain, spinal cord, nerve fibres. Transmission of nerve impulse and neurotransmitters.

**Total : 60 hours**



## **TextBooks**

1. Guyton AC. Text book of Medical Physiology, 8th Edition. Prism books (pvt), Bangalore, India. TATA McGraw-hill publishing Company,1991.
2. C.C. Chatterjee, Human Physiology (Vol. I & Vol. II), Medical Allied Agency, Calcutta, 11th edition, 1985.

## **ReferenceBooks**

1. Ganong (Williams) Review of medical physiology 25<sup>th</sup> edition. 2015.McGraw-Hill.
2. Ross and Wilson. Anatomy and physiology In health and illness. 12<sup>th</sup> ed, 2014. Elsevier.

**15BBC008**

**PRACTICAL – VII – HEMATOLOGY**

**0 0 3 2**

## **Course objectives**

To get knowledge and hands on training in hematological studies. The student will be able to gain immense knowledge related to blood analysis which is an important facet of clinical Biochemistry.

## **Course outcomes**

**After the completion of this course, the student will be able to**

- CO1:** Possess Skill to withdraw blood from patients.
- CO2:** Separate plasma/serum from given blood sample
- CO3:** Explore knowledge on preparation of blood smear
- CO4:** Demonstrate different types of blood grouping.
- CO5:** To prepare packed cell volume.
- CO6:** Discuss sedimentation of erythrocytes by different methods.
- CO7:** Calculate RBC in normal and patient's blood.
- CO8:** Differentiate different types of WBC.
- CO9:** Perform estimation of haemoglobin by different methods.
- CO10:** Calculate WBC in normal and patient's blood.

## **List of Experiments**

1. Estimation of Hemoglobin by Drabkins Method
2. Estimation of Hemoglobin by Sahli's Method
3. RBC Count
4. WBC count-Total Count
5. WBC count-Differential Count
6. Platelet Count
7. ESR

8. Preparation of blood smears,
9. Blood Grouping
10. Packed cell Volume
11. Bleeding time
12. Clotting time

### **Text Books**

1. J. Jayaraman, Laboratory Manual in Biochemistry. New Age International Pvt Ltd Publishers. 2011 (Paperback).
2. S. Sadasivam, A. Manickam, Biochemical Methods. New age publishers. 2009 (paperback).
3. S. K. Sawhney, Randhir Singh, Introductory Practical Biochemistry. Alpha Science International, Ltd. 2 edition, 2005.

### **Reference Books**

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6 edition, 2006.
2. Hans Bisswanger, Practical Enzymology. Wiley VCH. 2nd Edition, 2011.
3. Robert Eisenthal, Enzyme Assays: A Practical Approach (Practical Approach Series). Oxford University Press, U.S.A. 2 edition, 2002.

**15BBC012                      PRACTICALS VIII      Nutritional Biochemistry                      0 0 3 2**

### **Course objectives**

The goal of this course is to develop laboratory skills required for modern biochemical and molecular studies of nutrition and its role in health and disease. This includes the quantitative analysis and interpretation of results. It is also useful to develop core skills that prepare students for a career in laboratory-based research in the biomedical sciences.

### **Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Understand the biological structure and active food ingredient present in different foods

**CO2:** Plan and execute practicals

**CO3:** Confidently demonstrate practical skills

**CO4:** Understand the methods of reagent preparation and its uses

**CO5:** Know how to calculate BMR and BMI values, interpret and evaluate

**CO6:** Understand the good laboratory practice

**CO7:** Develop academic as well as research curiosity

**CO8:** Efficiently Carryout projects in higher studies

**CO9:** Logically understand the reaction principle

**CO10:** Understand the nutritional values of different foods

### **List of Experiments**

1. Determination of ash content of food sample
2. Determination of moisture content of food sample
3. Determination of carbohydrate by anthrone method
4. Determination of protein by Lowry method
5. Determination of lipid from plant source
6. Estimation of amino acids by Ninhydrin method.
7. Estimation of inorganic phosphorous
8. Determination of iron content from dates
9. Estimation of Vitamin A from plant source
10. Estimation of Vitamin E from plant source
11. Estimation of Vitamin C from plant source
12. Estimation of nucleic acids-DNA/ RNA from tubers

### **Text Books**

1. J. Jayaraman, Laboratory Manual in Biochemistry. New Age International Pvt Ltd Publishers. 2011 (Paperback).
2. S. Sadasivam, A. Manickam, Biochemical Methods. New age publishers. 2009 (paperback).
3. S. K. Sawhney, Randhir Singh, Introductory Practical Biochemistry. Alpha Science International, Ltd. 2 edition, 2005.

### **Reference Books**

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6 edition, 2006.
2. Hans Bisswanger, Practical Enzymology. Wiley VCH. 2nd Edition, 2011.
3. Robert Eisenthal, Enzyme Assays: A Practical Approach (Practical Approach Series). Oxford University Press, U.S.A. 2 edition, 2002.

**Course objectives**

The course was structured to enlighten the importance the enzymes in biological system and to understanding of the kinetics of enzyme catalyzed reactions and use of immobilized enzymes.

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Discuss the basic structure and functions of enzymes.

**CO2:** Describe the chemical nature of enzymes and their function in biochemical reactions.

**CO3:** Explain how enzyme activity is (a) regulated, and (b) affected by temperature, pH, and concentration.

**CO4:** Analyse kinetic data and understand the principles of enzyme kinetics.

**CO5:** Write down the key pathways of metabolism.

**CO6:** List stages in the catabolism of food molecules and describe what occurs during each stage.

**CO7:** Describe terms like glycolysis, gluconeogenesis, glyoxylate cycle, glucogenic amino acids

**CO8:** Explain and give examples of the strategies of metabolism, emphasizing the role of ATP coupled reactions, and coenzymes that exist in oxidized and reduced form.

**CO9:** Describe what happens during carbohydrate digestion, glycolysis, glycogenesis, and glycogenolysis.

**CO10:** Describe what happens in the citric acid cycle, the electron transport chain and oxidative phosphorylation. Explain the role of each process in energy production.

**CO11:** Describe mechanisms of control of these metabolic pathways.

**Unit 1 Introduction to Enzymes****(12)**

Introduction - Definition, Enzyme units, Functions of enzymes. Classification of enzymes, Isoenzymes. Enzyme specificity, Active site, Mode of Enzyme action - Lock and key theory and induced fit theory, Factors affecting enzyme activity - pH, temperature, enzyme concentration.

**Unit 2 Enzyme Kinetics****(12)**

Derivation of Michaelis - Menton Equation. Enzyme inhibition - Competitive, non- competitive and uncompetitive inhibitions (with reference to Example and graphical representation).

**Unit 3 Carbohydrate metabolism I (12)**

Fate of dietary carbohydrates. Glycolysis with energetic & regulation, Cori cycle, Futile cycles in carbohydrate metabolism. Metabolism of Glycogen, TCA cycle - Energetics and its regulation.

**Unit 4 Carbohydrate metabolism II (12)**

Pentose phosphate pathway and its significance. Uronic acid pathway. Gluconeogenesis pathway and significance. Glyoxylate cycle.

**Unit 5 Biological Oxidation (12)**

Introduction - free energy - free energy of hydrolysis of ATP and other organophosphates.

Role of High energy compounds - Electron transport chain- Components and reactions of ETC.

Role of ETC - Oxidative Phosphorylation - Chemiosmotic hypothesis. P/O ratio, uncouplers of oxidative phosphorylation.

**Total : 60 hours**

**Text Books**

1. T Palmer & P L Bonner, Enzymes - Biochemistry, Biotechnology, Clinical Chemistry, 2007, Elsevier Store, Second Edition.

**Reference Books**

1. Donald Voet and Judith Voet, Fundamentals of Biochemistry, 2006, 2<sup>nd</sup> edition 2006, Wiley Asia student edition
2. Robert K Murray , Daryl Granner and Victor W Rodwell, Harper's illustrated biochemistry, 2006, 27<sup>th</sup> edition Mc Graw Hill international edition
3. M.N.Chatterjea and Ranashinde, Text book of Medical biochemistry, 2005, 6<sup>th</sup> edition Jaypee Brothers Medical Publisher (P) Ltd.
4. Champe and Harvey, Lippincott's illustrated biochemistry, 2007, 4<sup>th</sup> edition

**15BBC015**

**CLINICAL BIOCHEMISTRY - I**

**5 0 0 4**

**Course objectives**

The course aims to provide an advanced understanding of the biochemical mechanisms and pathophysiological processes responsible for common biochemical disorders. The course provides an overview of normal and abnormal metabolic functions, the impact of disorders on metabolic processes, an overall picture about the molecular basis of diseases and novel strategies to prevent the diseases.

## **Course outcomes**

**After the completion of this course, the student will be able to**

- CO1:** Understand the units and abbreviations used in expressing concentrations of standard solutions.
- CO2:** Elaborate on the role of health and its affliction by various diseases/disorders.
- CO3:** Detail on the various biological specimens including the process of collection, preservation and storage.
- CO4:** Explain the blood clotting pathways –both intrinsic and extrinsic.
- CO5:** Enumerate of the different types of anemias based on aetiology.
- CO6:** Detail account on the blood clotting disorders.
- CO7:** Understand the etiology, types, clinical manifestations and treatment of Diabetes mellitus.
- CO8:** Discuss on the significance of blood glucose and its regulation.
- CO9:** Enumerate of the various disorders of carbohydrate metabolic pathways.
- CO10:** Understand on the etiology, types, clinical manifestations, diagnosis and treatment of various aminoacidurias.
- CO11:** Detail the nucleic acid metabolism disorders.
- CO12:** Elaborate on the role of Serum lipids including triglycerides, cholesterol and phospholipids in diseases.
- CO13:** Detail the clinical role of serum cholesterol and state the Clinical features of atherosclerosis.

## **Unit 1 Basic concepts of clinical Biochemistry (12)**

A brief review of Units and abbreviations used in expressing concentrations and standard solutions. Specimen collection and processing (blood ,urine and feaces), anti-coagulants and preservatives for blood and urine. Transport of specimens.

## **Unit 2 Disorders of the blood (12)**

Hematology - Anemia and its types – anemias related to shape and size of RBC, anemias due to nutritional deficiencies, anemias due to excessive destruction of RBC. Disorders of Blood clotting pathway. Hemophilias.

**Unit 3 Diseases related to carbohydrate metabolism (12)**

Blood glucose regulation, hypo and hyperglycemia. Diabetes mellitus-types, Diagnosis, clinical manifestations and metabolic alterations. Glycosuria, galactosemia and fructosuria. Glycogen storage diseases. Lactose intolerance.

**Unit 4 Diseases related to aminoacids and nucleic acid metabolism (12)**

Etiology, clinical manifestation, diagnosis and treatment of phenyl ketonuria, cystinuria, alkaptonuria, albinism and tyrosinemia. Hypo and hyperuricemia, Gout.

**Unit 5 Diseases related to lipid metabolism (12)**

Serum lipids in diseases with special reference to cholesterol, lipidosis, triglyceridemia. hypo and hypercholesterolemia. Clinical features of atherosclerosis and fatty liver.

**Total : 60 hours**

**Text Books**

1. M.N. Chatterjee & Ranashinde, Text Book of Medical Biochemistry. Jaypee Brothers Medical Publisher (P) Ltd. 6<sup>th</sup> edition (2006).
2. Nanda Maheshwari, Clinical Biochemistry. JPB. First edition, 2008.
3. Nessar Ahmed, Clinical Biochemistry (Fundamentals of Biomedical Science). Oxford University Press. 1st Edition, 2011.

**Reference Books**

1. Carl A. Burtis, Edward R. Ashwood and David E. Bruns (eds), Tietz Textbook of Clinical Chemistry and Molecular Diagnosis. 5th edition, 2012.
2. Thomas M. Devlin, Biochemistry with clinical correlation. John Wiley & Sons. 7th Ed, 2010.
3. Allan Gaw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J. O'Reilly, Clinical Biochemistry, 5<sup>th</sup> edition, 2013.
4. Graham Basten, Introduction to Clinical Biochemistry, Interpreting Blood Results. Book Boon. 2<sup>nd</sup> edition, 2011.
5. Marshall & Lapsle & Day & Ayling, Clinical Biochemistry, Metabolic and Clinical Aspects. 3rd Edition, 2014

**Course objectives**

The course introduces students to various practical aspects of enzymology, to integrate the practical aspects of enzymology with the kinetic theories and stimulates the students interest in learning the structure, function and kinetics of enzyme and their correlation in disease conditions.

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Isolate enzymes from biological sources.

**CO2:** Discern optimal conditions of enzyme activity.

**CO3:** Determine the Optimum pH and temperature of Acid Phosphatase

**CO4:** Assay the specific activity of Acid Phosphatase.

**CO5:** Determine the Optimum pH and specific activity of Alkaline Phosphatase

**CO6:** Determine the Optimum pH of Salivary Amylase.

**CO7:** Assay the specific activity of Salivary Amylase.

**CO8:** Estimate the enzyme activity of Creatine kinase.

**CO9:** Assay the enzyme activity of Lactate Dehydrogenase

**CO10:** Estimate the enzyme activity of Adenosine Tri Phosphatase

**CO11:** Assay the enzyme activity of Serum Glutamate Oxaloacetate Transaminase

**CO12:** Determine the enzyme activity of Serum Glutamate Pyruvate Transaminase.

**List of Experiments**

1. Determination of Optimum pH of Acid Phosphatase
2. Determination of Optimum temperature of Acid Phosphatase.
3. Determination of specific activity of Acid Phosphatase.
4. Determination of Optimum pH of Alkaline Phosphatase
5. Determination of specific activity of Alkaline Phosphatase
6. Determination of Optimum pH of Salivary Amylase.
7. Determination of specific activity of Salivary Amylase.
8. Determination of enzyme activity of Creatine kinase.
9. Determination of enzyme activity of Lactate Dehydrogenase
10. Determination of enzyme activity of Adenosine Tri Phosphatase
11. Determination of enzyme activity of Serum Glutamate Oxaloacetate Transaminase
12. Determination of enzyme activity of Serum Glutamate Pyruvate Transaminase



### **Text Books**

1. J. Jayaraman, Laboratory Manual in Biochemistry. New Age International Pvt Ltd Publishers. 2011 (Paperback).
2. S. Sadasivam, A. Manickam, Biochemical Methods. New age publishers. 2009 (paperback).

### **Reference Books**

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6 edition, 2006.
2. Hans Bisswanger, Practical Enzymology. Wiley VCH. 2nd Edition, 2011.
3. Robert Eisenthal, Enzyme Assays: A Practical Approach (Practical Approach Series). Oxford University Press, U.S.A. 2 edition, 2002.

**15BBC016**

**ENZYMES & INTERMEDIARY METABOLISM – II**

**5 0 0 4**

### **Course objectives**

The course was structured to enlighten the importance the enzymes in biological system and to understanding of the kinetics of enzyme catalyzed reactions and use of immobilized enzymes.

### **Course outcomes**

**After the completion of this course, the student will be able to**

- CO1:** Give deep insights about the digestion of proteins, catabolism of amino acids and the urea cycle & become familiar with the concept of metabolic maps
- CO2:** Describe ketogenesis, fatty acid oxidation and synthesis
- CO3:** Compare and contrast the structure and function of cholesterol and cholesterol esters.
- CO4:** Compare and contrast the life cycle of the various lipoprotein particles with respect to their composition, metabolism and transport.
- CO5:** Distinguish the disease states associated with Inborn Errors of Metabolism, including (A) the deficient enzyme, (B) relation of the deficiency to the buildup of secondary metabolites, and (C) clinically relevant information related to the disease state.
- CO6:** Describe the biosynthesis of the purine and pyrimidine nucleotides with emphasis on the key regulated steps.
- CO7:** Explain the purine salvage pathways and discuss the central role of hypoxanthine phosphoribosyltransferase (HPRT) under physiological (such as steady-state purine nucleotide synthesis) and pathophysiological (such as gout in partial and complete HPRT deficiencies) conditions.
- CO8:** Explain the salvage pathways for uracil and thymine and their relevance to pharmacotherapy.

**CO9:** Discuss the central role of hypoxanthine phosphoribosyltransferase (HPRT) under physiological (such as steady-state purine nucleotide synthesis) and pathophysiological (such as gout in partial and complete HPRT deficiencies) conditions.

**CO10:** Explain the salvage pathways for uracil and thymine and their relevance to pharmacotherapy.

**Unit 1 Enzymes (12)**

Coenzymes, metalloenzymes, multienzyme complexes, Isoenzymes. Enzyme regulation: General mechanism of enzyme regulation, feedback inhibition and feedforward stimulation. Covalent modification of enzymes. Allosteric enzymes. Regulation of enzymic activity.

**Unit 2 Metabolism of Lipids I (12)**

Fate of absorbed dietary lipids. Oxidation of fatty acids - Beta oxidation, alpha oxidation and omega oxidation. Metabolism of Ketone bodies - Formation, Utilization, Excretion and significance.

**Unit 3 Biosynthesis of lipids (12)**

Biosynthesis of fatty acid. Metabolism of Triglyceride, Phospholipids and cholesterol. Biosynthesis of saturated and unsaturated fatty acids.

**Unit 4 Metabolism of proteins (12)**

Introduction, fate of dietary proteins, catabolism of amino acids - transamination, oxidative and non-oxidative deamination, decarboxylation- urea cycle and its regulation.

**Unit 5 Metabolism of nucleic acids (12)**

Introduction, fate of dietary nucleic acids, catabolism of purine and biosynthesis of purine nucleotides- denovo synthesis and salvage pathways. Regulation of purine biosynthesis. Catabolism of pyrimidines and biosynthesis of pyrimidine nucleotides. De novo synthesis and salvage pathways, regulation of pyrimidine synthesis.

**Total : 60 hours**

**Text Books**

1. Donald Voet and Judith Voet, Fundamentals of Biochemistry, 2006, 2<sup>nd</sup> edn, Wiley Asia.

**Reference Books**

1. Robert K Murray , Daryl Granner and Victor W Rodwell, Harper's illustrated biochemistry, 2006, 27<sup>th</sup> edition, Mc Graw Hill international edition
2. M.N.Chatterjea and Ranashinde, Text book of Medical biochemistry, 2005, 6<sup>TH</sup> edition, Jaypee Brothers Medical Publisher (P) Ltd.

3. David L Nelson and Michael M Cox, Principles of biochemistry 2007, 4<sup>TH</sup> edition. W.H. Freeman company New York

**15BBC017**

**CLINICAL BIOCHEMISTRY-II**

**5 0 0 4**

### **Course objectives**

The course aims to provide an advanced understanding of the biochemical mechanisms and pathophysiological processes responsible for common biochemical disorders. The course provides an overview of normal and abnormal metabolic functions, the impact of disorders on metabolic processes, the molecular basis of diseases and novel strategies to prevent the diseases.

### **Course outcomes**

**After the completion of this course, the student will be able to**

- CO1:** Give an overview of normal and abnormal metabolic functions, how they impact metabolic processes
- CO2:** Furnish details on liver structure and functions
- CO3:** Understand the pathophysiological processes responsible for common biochemical disorders such as jaundice, Pancreatitis, Fatty liver etc
- CO4:** Differentiate three types of jaundice and their systematic analysis
- CO5:** Elucidate of liver function tests based on metabolism
- CO6:** Understand the molecular basis of diseases and novel strategies to prevent the diseases.
- CO7:** Understand the processes for formation of urine
- CO8:** Gain a perception on the various renal Clearance tests, including the concentration and dilution tests
- CO9:** Understand of the need for Gastric function tests, Collection of gastric contents, their examination and its utility in diagnosis.
- CO10:** Detail the Clinical application of enzymes in diagnosis, differentiation of functional and non-functional plasma enzymes.
- CO11:** Discuss Isozymes and understanding their role in diagnosis.
- CO12:** Understand the enzyme patterns in diseases of various organs such as pancreas, liver, bones, heart and muscle.

### **Unit 1 Liver Function tests**

**(12)**

Liver structure and functions. Metabolism of bilirubin. Jaundice-types, clinical features and tests based on bile pigments level in blood and urine. Differentiation of three types of jaundice. Prothrombin Time. Liver function tests.

**Unit 2 Renal function tests** (12)

Formation of urine-Glomerular filtration and tubular reabsorption. Clearance tests-urea, creatinine, inulin, PAH test, concentration and dilution tests.

**Unit 3 Gastric function tests** (12)

Collection of gastric contents, Examination of gastric residium, FTM.Stimulation tests. Tubeless gastric analysis.

**Unit 4 Clinical enzymology** (12)

Definition of functional and non-functional plasma enzymes. Isozymes and diagnostic tests, enzyme patterns in acute pancreatitis, liver damages, bone disorders, myocardial infarction and muscle wasting.

**Unit 5 Diagnosis of tumors** (12)

Definition of tumor markers, Markers produced by various tissues, classification and clinical applications. Imaging techniques to diagnose cancer – CT, MRI, PET, SPECT.

**Total : 60 hours**

**Text Books**

1. M.N. Chatterjee & Ranashinde, Text Book of Medical Biochemistry. Jaypee Brothers Medical Publisher (P) Ltd. 6<sup>th</sup> edition (2006).

**Reference Books**

1. Carl A. Burtis, Edward R. Ashwood and David E. Bruns (eds), Tietz Textbook of Clinical Chemistry and Molecular Diagnosis. 5th edition, 2012.
2. Thomas M. Devlin, Biochemistry with clinical correlation. John Wiley & Sons. 7th Ed, 2010.
3. Marshall & Lapsle & Day & Ayling, Clinical Biochemistry, Metabolic and Clinical Aspects. 3rd Edition, 2014

**Course objectives**

To offer a mix of theoretical knowledge delivered in lecture format combined with assessment of clinical reasoning skills and practical knowledge of techniques and also to provide students a sound knowledge of the clinical principles underlying the application of clinical biochemistry investigations in human disease.

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Gain knowledge of biological samples and their collection procedures

**CO2:** Perform biochemical laboratory analysis in blood samples

**CO3:** Analyze biochemicals in urine samples

**CO4:** Distinguish serum, plasma and whole blood emphasizing the role of anticoagulants

**CO5:** Assess presence and absence of normal and abnormal constituents in urine by performing qualitative urine analysis

**CO6:** Analyze glucose in blood

**CO7:** Determine urea in blood

**CO8:** Analyze protein, total protein and A/G ratio in blood

**CO9:** Determine analytes such as creatinine, uric acid, cholesterol and triglycerides in serum

**CO10:** Evaluate and interpret the generated results after analysis in order to determine the likely diagnosis.

**List of Experiments**

1. Estimation of protein by Lowry method.
2. Estimation of protein by biuret method
3. Estimation of blood glucose by Glucose oxidase method.
4. Estimation of serum bilirubin by Malloy & Evelyn method.
5. Estimation of total protein and A: G ratio.
6. Estimation of blood urea by diacetyl monoxime method.
7. Estimation of serum creatinine by Jaffe's method.
8. Estimation of serum uric acid by phosphotungstate method.
9. Estimation of serum cholesterol by Zaks method.
10. Estimation of serum triglycerides
11. Estimation of serum phospholipids
12. Qualitative Analysis of Urine for the presence of normal and abnormal constituents.

### **Text Books**

1. J. Jayaraman, Laboratory Manual in Biochemistry. New Age International Pvt Ltd Publishers. 2011 (Paperback).
2. S. Sadasivam, A. Manickam, Biochemical Methods. New age publishers. 2009 (paperback).
3. S. K. Sawhney, Randhir Singh, Introductory Practical Biochemistry. Alpha Science International, Ltd. 2 edition, 2005.

### **Reference Books**

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6 edition, 2006.
2. Hans Bisswanger, Practical Enzymology. Wiley VCH. 2nd Edition, 2011.

**15BBC019**

**GROUP PROJECT**

**0 0 0 6**

This paper would focus on the project work / dissertation to be carried out by the students in the supervision of the teachers in the colleges. The topic of the project would be selected by each student in consultation with the teacher (Advisor). This would train the student to retrieve the literature and collate the information sufficient to make a presentation, the collated literature would also prepare the base for initiating the research. The student would carryout experiments to achieve the planned objectives, collation and analysis of data, presentation of the result in the form of a Dissertation. The grading would be based on continuous evaluation that would include punctuality, hard work, record keeping, intellectual inputs, data presentation, interpretation etc.

## DISCIPLINE SPECIFIC ELECTIVES

15BBC101

MICROBIOLOGY

5 0 0 4

### Course objectives

This paper aims at providing a basic understanding of microbes, their structure and function. The applications of micro-organisms has also been dealt with.

### Course outcomes

**After the completion of this course, the student will be able to**

- CO1:** Acquaint with the emergence of Microbiology and the contribution of various microbiologists to this field.
- CO2:** Explain about the scope of Microbiology and its relationship with Biochemistry.
- CO3:** Acquires knowledge about the principles and working of various types of microscopic techniques.
- CO4:** Demonstrate various staining techniques to identify gram positive and negative bacteria.
- CO5:** Understand about the Prokaryotic and Eukaryotic cell arrangement and organization and about the various functions of different Intracellular organelles present in it.
- CO6:** Explain about different types of microbial culture media, preparation and isolation methods.
- CO7:** Explain about preservation and maintenance of microbial cultures.
- CO8:** Demonstrate various sterilization techniques employed in microbiological experiments.
- CO9:** Widen the awareness about personal hygiene to be carried inside a microbiology lab and available safety measures.
- CO10:** Understands the significance of microorganisms that are used as model systems to study basic biology, genetics, metabolism and ecology.

### **Unit 1 History and scope of microbiology (12)**

Contributions of eminent scientists- Antony Van Leeuwenhoek, Louis Pasteur, Robert Koch - scope of microbiology.

### **Unit 2 Microscopy and staining (12)**

Principles – types - light, dark field, fluorescence, phase contrast microscopy – Electron Microscopy - Staining- principle – types- simple and differential staining.

### **Unit 3 Prokaryotic and eukaryotic cell organization (12)**

Prokaryotic cell- size, shape, and arrangement- bacterial cell wall components –gram positive and gram negative– cell membrane- pili – flagella- fimbriae- capsule- Eukaryotic cells –Fungal cell structure- hyphae-cell wall

### **Unit 4 Microbial cultures and preservations (12)**

Culture media – types - enrichment cultures - pure culture- isolation methods - preservation and maintenance - low temperature, deep freezing, cryopreservation.

### **Unit 5 Sterilization techniques (12)**

Aseptic maintenance- physical methods – dry heat, moist heat, radiation, filtration method – sunlight drying - chemical methods and their applications – alcohols – dyes - phenols-metallic salts-gases, Antiseptics and personal hygiene

#### **Text Books**

1. Pelczar M.J. Chan ECS, King NR, McGraw – Hill, Inc. NY. Microbiology – Concepts and Applications. Tata Mac. Graw Hill. 6<sup>th</sup> ed, 2001.
2. Ananthanarayan R and Paniker C.K.J. A Textbook of Microbiology. 6<sup>th</sup> edition. Orient Longman Ltd. 2000.

#### **Reference Books**

1. Pelzar, Microbiology, Tata Mac. Graw Hill., 5<sup>th</sup> edition,2000
2. Ingraham J.L. and C.A. Ingraham. Introduction to microbiology, Brooks/Cole, Thomson Learning, USA. 2<sup>nd</sup> edition, 2000.
3. Atlas R.M. and Parks L.C. Hand Book of microbiological media, CRC press, 2<sup>nd</sup> edition, 1997.

## **15BBC102 FUNDAMENTALS OF COMPUTERS AND STATISTICS 5 0 0 4**

### **Course objectives**

The course was designed in such a way to get hands on training in the Biochemical methods in the aspect of doing research and to impart the knowledge of Statistics to the students.

### **Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Demonstrate basics of computer components.

**CO2:** Read more about types of software, memory and files.

**CO3:** Develop Skill in different types of programming languages, their uses and applications.



**CO4:** Demonstrate about the applications and uses of different types of internet, Email and browsing.

**CO5:** Be aware on uses of web page, web browser and search engine.

**CO6:** Clearly substantiate the different types of statistical tools like mean, median, mode,

**CO7:** Understand standard deviation and standard error.

**CO8:** Correlate two or more samples with ANOVA.

**CO9:** Understand Correlation

**CO10:** Understand regression

**CO11:** Demonstrate probability and hypothesis for sample selection.

### **Unit 1 Computer Components and Programming (12)**

Components of Computers: Hardware – software – Types of S/W – Input and output Devices – CPU – ALU – Memory – Types of Memory – Files – Types of files.

Programming: Introduction to Programming languages – types of Programming languages – Uses – DBMS – Advantages – RDBMS – Multimedia – Uses.

### **Unit 2 Internet (12)**

Introduction to Internet – uses of Internet – types of Internet – Intranet – Extranet – ISP – Types of Email, Chatting, Browsing. WWW – Webpage, Web browser, Web server – uses – advantages – Search engines.

### **Unit 3 Introduction to statistics (12)**

Diagrammatic and graphical representation – measures of central tendency : mean, median , mode – measures of dispersion : quartile deviation , mean deviation , standard deviation.

### **Unit 4 Correlation Analysis (12)**

Correlation analysis : Scatter diagram method, Karl Pearson's method, Spearman's rank correlation method- regression analysis : regression equation of Y on X and X on Y - simple problems.

### **Unit 5 Test of Hypothesis (12)**

Test of Hypothesis-, T test, F test ,  $\chi^2$  test- ANOVA: one way, two way anova.

**Total : 60 hours**

### **TextBooks**

1. Levin and Rubin, Statistics for Management, Prentice hall of India.7<sup>th</sup> Edition, 1998.
2. N. Gurumani, Research Methodology for Biological Science, MJP Publisher, 2006.

## Reference Books

1. Anderson. J., et al, Thesis and assignment writing, Wiley eastern Pvt. Ltd. Delhi, 1970.
2. Alexis Lcon and Mathew's icon, Fundamentals of Information Technology, Wikas Publisher, 1999.
3. C. R. Kothari, Research Methodology: Methods and Techniques, New Age International(P) Limited, India, 2005. 2nd Edition.

**15BBC103**

**BIOINFORMATICS**

**5 0 0 4**

### Course objectives

The course aims to provide students with a practical and hands-on experience with common bioinformatics tools and databases.

### Course outcomes

**After the completion of this course, the student will be able to**

**CO1:** Understand the basics of Bioinformatics and its relation with Molecular Biology.

**CO2:** Understand the aims, tasks, scope and applications of Bioinformatics.

**CO3:** Discern about Internet and Web browsers services.

**CO4:** Work on biological databases (Nucleic acid databases - NCBI, EMBL & DDBJ; Protein databases & genome databases-SGD, TIGR and ACeDB)

**CO5:** Differentiate about the various derived and structural databases PRODOM, PRINTS, Pfam, Prosite, CATH, SCOP & Bibliographic databases.

**CO6:** Develop the ability to analyse sequences, alignments and dynamic programming including BLAST and FASTA Alogarithm.

**CO7:** View primary, secondary and tertiary structures of proteins by using bioinformatics tools like Rasmol, SPDBv, Chime, Cn3D &PyMol.

**CO8:** Develop practical skill in applying bioinformatics to analyse biological data in the field of research.

**CO9:** Demonstrates skill to explain and apply the most appropriate dynamic programming for alignments of differentbiosequences.

**CO10:** Develops the skill in analysing and predicting secondary structure elements and in modeling of protein structures from the sequences provided.

**Unit 1 Introduction to bioinformatics and data generation (12)**

What is bioinformatics and its relation with molecular biology. Important contributions - sequencing development - aims and tasks of Bioinformatics - applications of Bioinformatics - challenges and opportunities - Computers and programs – internet - world wide web – browsers - EMB net – NCBI

**Unit 2 Biological Database I (12)**

General Introduction of Biological Databases and its Importance: Nucleic acid databases (NCBI, DDBJ, and EMBL). Protein databases (Primary, Composite, and Secondary). Specialized Genome databases: (SGD, TIGR, and ACeDB).

**Unit 3 Biological Database II (12)**

Derived databases (Prosite, Pfam, PRODOM, PRINTS). Structure databases (CATH, SCOP, and PDBsum) and bibliographic databases

**Unit 4 Sequence Alignment (12)**

Introduction to Sequences, alignments and Dynamic Programming; Local alignment and Global alignment (algorithm and example), Pairwise alignment (BLAST and FASTA Algorithm) and multiple sequence alignment (Clustal W algorithm)

**Unit 5 Anatomy of proteins and Visualization (12)**

Primary, Secondary and tertiary structure of proteins and 3D structure viewers (Rasmol, SPDBV, Chime, Cn3D, PyMol)

**Total : 60 hours**

**Text Books**

1. Mount David. Bioinformatics: sequence and genome analysis, 2<sup>nd</sup> edn. 2000, Cold Spring Harbor Laboratory.

**Reference Books**

1. Stephen Misener, Stephen A. Krawetz. Methods and Protocols (Methods in Molecular Biology) 1999, Humana Press.
2. Jonathan Pevsner. Bioinformatics and Functional Genomics 2nd Edition 2009, Wiley Blackwell.

**Course objectives**

To get a knowledge of diet and nutrition for normal persons, patients and special cases. Students should also aware about the categories and significance of various forms of foods.

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Understand the nutritional values of food

**CO2:** Know growth and development, common problem and complication related to foods

**CO3:** Acquire knowledge about nutritional sources, daily requirements, functions, deficiency diseases.

**CO4:** Have ability to teach and instruct types of food groups and food pyramid described by ICMR, SDA.

**CO5:** Educate others about how to overcome economical and clinical burden of malnutrition

**CO6:** Easily assess nutritional status of the person by anthropometric measurements and indices

**CO7:** Compare and contrast the efficiency of natural and artificial foods

**CO8:** Get an idea about therapeutic uses on nutrition

**CO9:** Understand the importance of RDA

**CO10:** Apply the essence of nutrition in day to day life

**Unit 1 Basic concepts of Nutrition****(12)**

Introduction and history of nutrition, relation between good nutrition and health, Concepts of malnutrition (Kwashiorkar and marasmus) and over nutrition with examples, Methods of assessing nutritional status, Anthropometric measurements and indices – linear measurement, height, weight, head, chest and mid upper arm circumference.

**Unit 2 Food****(12)**

Food Groups: Definition and Functions of food – physiological functions of foods , ICMR Five food Groups and its significance, Food Pyramid.

**Unit 3 Energy****(12)**

Definition, energy value of food, Basal metabolism, Energy cost of physical activities, BMR unit, Factors affecting BMR, RQ, SDA, Thermic effect of food, Estimation of total energy needs, Energy balance.

**Unit 4 Nutrition Deficiency Disorders (12)**

Clinical signs of nutritional deficiency disorders, Methods of assessing nutritional deficiency disorder – Biophysical method , Biochemical test, Indirect method – Vital statistics, Assessment of socio economic status, diet survey,

**Unit 5 Macro and Micromolecules (12)**

Definition, classification and food sources of carbohydrate, protein, lipid, fibre. Minerals and Vitamins - Functions, food sources, requirements and effects of deficiency. Water – Distribution in body, functions, requirement, Dehydration - Causes, effects and prevention,

**Total : 60 hours**

**TextBooks**

1. Swaminathan, Advanced Textbooks of food and Nutrition, Vol 1, 2, BAPPCO Press, 2005
2. Viswanath Sardesai, Introduction to Clinical nutrition, 3<sup>rd</sup> edition, 2011

**Reference Books**

1. Geissler C, Powers H. Human Nutrition. Edinburgh: Elsevier Churchill Livingstone, 2010.
2. Roach, J.O. and Benyon, S, Crash course - Metabolism and Nutrition, London: Mosby, 2003
3. Payner and barker, Advancing Dietetics and Clinical Nutrition, 1<sup>st</sup> edition, 2010.

**15BBC105**

**ESSENTIALS OF ENDOCRINOLOGY**

**5 0 0 4**

**Course objectives**

This paper ascertains that the biochemists get an accurate information about various hormones, functions, mechanism of action, and related disorders.

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Describe the different classes and structures of hormones.

**CO2:** Explain various roles of endocrine system in maintaining homeostasis, integrating growth, development and reproduction.

**CO3:** Discuss the synthesise, secretion and transport of amino acid derived, peptide and steroid hormones.

**CO4:** Describe the structure of various endocrine glands including pituitary, hypothalamus, thyroid, pancreas, Gastro intestinal tract, male and female reproductive organs, their secretion and related disorders,

**CO5:** Explain how regulation of hormone secretion, including principles of negative and

positive feedback mechanisms.

**CO6:** Illuminate knowledge on second messengers and their mechanism of action.

**CO7:** Explore mechanism of action of steroid, amino acid derived hormones on their receptors.

**CO8:** Discuss hormone related clinical disorders, their symptoms and treatment.

**CO9:** Learned more about signaling pathways and secondary messengers.

**CO10:** Study about Pathophysiology of all endocrine glands.

### **Unit 1 Basic Concept of Hormones (12)**

Hormones– Definition, Classification of hormones – Peptide hormones and Steroid hormones. Circulation and transport in blood. Feedback Regulation of hormones.. Mechanism of hormone action – receptors, second messengers. The hypothalamus and its hormones,

### **Unit 2 Pituitary hormones (12)**

Pituitary gland –Adenohypophysis and adenohypophysial hormones,their regulation. Structure of Neurohypophysis and functions of neurohypophysial hormones, their regulation. Pathophysiology.

### **Unit 3 Thyroid hormones (12)**

Thyroid gland – structure and thyroid hormones. Synthesis of T3 and T4.Functions , Transport and regulation of thyroid hormones. Pathophysiology. Parathyroid gland: physiological roles and pathophysiology of parathyroid hormones.

### **Unit 4 Pancreatic hormones (12)**

Pancreatic hormones - insulin, glucagon, somatostatin - physiological role and related disorders. Gastrointestinal hormones - Types and functions.

### **Unit 5 Adrenal hormones (12)**

Adrenal gland-structure, cortical and medullary hormones-physiological role and related disorders. Sex Hormones: Male sex hormone – androgens (testosterone) and female sex hormone (estrogen and progesterone) – role in menstrual cycle, and pregnancy.

**Total : 60 hours**

### **Text Books**

1. Prakash.S.Lohar, Endocrinology, MJP Publishers, 2005
2. R.Radheshyam, Textbook of Endocrinology, Neha Publishers, 2012.

## Reference Books

1. Hadley ME, The vertebrate endocrine system, in. Endocrinology, 4th Ed (Prentice Hall, NJ) 1996.
2. C. Guyton, MD and John E. Hall, Textbook of Medical Physiology, 11th Edition, 2006
3. Larsen: Williams Textbook of Endocrinology, 10<sup>th</sup> ed. , 2003 Elsevier

**15MBBC106**

**BASICS OF MOLECULAR BIOLOGY**

**5 0 0 4**

### Course objectives

Molecular biology deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development. It is a large and ever-changing discipline. This course will emphasize the molecular mechanisms of DNA replication, repair, transcription, protein synthesis, and gene regulation in different organisms.

### Course outcomes

**After the completion of this course, the student will be able to**

**CO1:** Demonstrate knowledge of how biochemistry, genetics and molecular biology are used to elucidate both the function of cells and their organization into tissues.

**CO2:** Integrate advanced concepts in molecular biology and related fields

**CO3:** Develop analytical and critical-thinking skills

**CO4:** Molecular Biology gives you in-depth knowledge of biological and/or medicinal processes through the investigation of the underlying molecular mechanism

**CO5:** Gain an understanding of chemical and molecular processes that occur in and between cells.

**CO6:** Understand the synthesis of DNA

**CO7:** Understand the synthesis of RNA

**CO8:** Understand the synthesis of protein

**CO9:** Provides insight into the most significant molecular and cell-based methods used today in the field of biology.

**CO10:** Understand safe laboratory practices, perform basic molecular biology techniques, generate hypotheses and evaluate data

### Unit 1 DNA as the vehicle of inheritance

**(12)**

Experimental evidence -Griffith, McLeod, McCarty and Avery, Hershey-Chase experiments. Definition of Gene, organization of genes. Coding and non-coding DNA in prokaryotes and Eukaryotes - unique, moderately repetitive and highly repetitive DNA sequence, Satellite DNA. Cot value.

## **Unit 2 DNA Replication (12)**

DNA replication in prokaryotes - mode of replication, Semiconservative modes of replication. An overview of replication - replication eye, replication forks, semi discontinuous replication, Okazaki fragments, RNA primers. Enzymes of replication- DNA polymerases I, II, III, Topoisomerases, Helicases binding proteins and ligases. Inhibitors of replication. (12 hrs)

## **Unit 3 DNA Mutation and Repair (12)**

DNA Mutation - definition, types of mutation, causes of mutation – chemical and physical agents.

DNA Repair - types of damages, repair by direct reversal of damage, excision repair, recombination repair, SOS repair.

## **Unit 4 Transcription (12)**

Transcription - Prokaryotic & Eukaryotic RNA polymerases - Enzyme structure, role of sigma factor, promoter, closed and open promoter complexes. Initiation, elongation and termination of prokaryotic RNA synthesis. Genetic Code - Basic features of genetic code. Deciphering of Genetic code. Wobble Hypothesis.

## **Unit 5 Translation (12)**

Protein biosynthesis - activation of amino acids, initiation, elongation and termination in prokaryotes. Post translation modifications. Inhibitors of translation.

Regulation of gene expression in prokaryotes. Operon concept - Positive and negative regulation of lac operon.

**Total : 60 hours**

### **Text Books**

1. De Robertis, Cell and molecular biology. Dhanpat Rai Publisher, 8<sup>th</sup> Edition, 2001.
2. Nalini Chandar, Susan Viselli, Lippincott Illustrated Reviews: Cell and Molecular Biology. LWW; North American Edition ( 2010).
3. Robert Franklin Weaver, Molecular Biology. Mc-Graw Hill science, 5<sup>th</sup> edition, 2011.

### **Reference Books**

1. Bruce Alberts, Alexander Johnson, Julian Lewis, Molecular biology of the cell. Garland Science, 6<sup>th</sup> edition (2014).
2. Benjamin Lewin, Genes IX. Jones & Bartlett Learning; 9 edition ( 2007).
3. Harvey Lodish, Arnold Berk & Chris A. Kaiser, Molecular Cell Biology. W. H. Freeman; 6th edition ( 2007).
4. James D. Watson, Tania A. Baker, Stephen P. Bell, Molecular Biology of the Gene. Benjamin Cummings, 7th Edition ( 2013).
5. Gerald karp, Cell and Molecular Biology: Concepts and Experiments, Wiley; 7th Ed. (2013).



**Course objectives**

The paper ascertains that the Biochemists have strong ideas about immunity, antigens, antibodies against them, mechanism of action of immune system .

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Learn about various classes of immunity

**CO2:** Understand the cell mediated immunity

**CO3:** Understand the humoral immunity.

**CO4:** Gain knowledge on various types of antigens and their antigenic structure.

**CO5:** Illustrate knowledge on structure of various antibodies and their production.

**CO6:** Understand various types of autoimmune disorder – Rheumatoid arthritis, Sickle cell anemia.

**CO7:** Explore definition of hypersensitive reaction and its types including Type I, II, III, IV and V.

**CO8:** Gain knowledge about vaccine synthesis and their types.

**CO9:** Learn basic types of immunodeficiency disorder – primary and secondary disorder, AIDS.

**CO10:** Learn more about various tests adopted for transplantation and mechanism involved in accept and rejection of graft by host.

**Unit 1 Immunity****(12)**

Immunity and its types. Innate Immunity, acquired immunity, active and passive immunity. Humoral and cellular immunity. Complement pathway.

**Unit 2 Immunoglobins****(12)**

Immunoglobins - structure and function, types of immunoglobulins. Antigens – factors determining antigenicity, haptens. Cells involved in antibody formation, differentiation of lymphocyte, clonal selection theory, cooperation of T-cell with B-cell, secretion of antibody.

**Unit 3 Antigen Antibody interactions****(12)**

Antigen Antibody interactions – precipitation, agglutination, complement fixation reaction, tissue typing, ELISA, RIA, immunofluorescence. Monoclonal antibody - preparation and application in biology.

**Unit 4 Hypersensitivity** (12)

Hypersensitivity reactions – type I, II, III, IV. Immunological tolerances and autoimmune diseases. Vaccines – active and passive immunization, commonly used vaccines - toxoid vaccines, killed vaccines, live attenuated vaccines, bacterial polysaccharide vaccines.

**Unit 5 Transplantation and Cancer Immunology** (12)

Transplantation immunology – clinical manifestations, bone marrow and organ transplants. Cancer immunology – tumor antigens, immune response to tumors, immunotherapy. AIDS – structure of HIV, destruction of T cells, immunological syndrome of AIDS, AIDS vaccine.

**Total : 60 hours**

**Text Book**

1. Roitt, Brostoff, Mal, Immunology, 6<sup>th</sup> edition, 2001

**Reference Books**

1. Panicker , Microbiology, orient Longman , Hyderabad, 6<sup>th</sup> edition, 2005.
2. M.J.Pelzar, Microbiology, Tata mac hran, Hill New Delhi, 5<sup>th</sup> edition, 2005.
3. Donald.M.Weir, Immunology, John Stewart, 7<sup>th</sup> edition, 1993
4. P.M.Lydyard, A.Whelan, M.W. Fanger, Immunology, 2003
5. Jacqueline Sharon, Williams & Williens, Immunology,1998

**15BBC108**

**BIOTECHNOLOGY**

**5 0 0 4**

**Course objectives**

The content of the syllabus consist of basic biotechnology and its application such as new tools , products developed by biotechnologists such as cell culture, transgenic animals, Genetic engineering are useful in research, agriculture, industry and the clinic. It also helps to understand the Basic principles involved in Intellectual properties rights , scope and importance of marketing and its systems.

**Course outcomes**

**After the completion of this course, the student will be able to**

- CO1:** Understand the theoretical nature of the science involved in medically related biotechnology research and practice
- CO2:** Understand basic biochemistry, immunology, molecular biology and genetics and their associated laboratory techniques
- CO3:** Understand the importance of cells to genetic engineering.
- CO4:** Explain the process of cell division in both somatic and germ cells.

**CO5:** Explain the theory and practice of recombinant DNA technology.

**CO6:** Explain key concepts of transgenic plant and animal technologies.

**CO7:** Understand how insulin is produced using bacterial cells and importance to gene technology.

**CO8:** Understand restriction enzymes, DNA ligation, transformation, gene libraries, gene cloning and expression, hybridization, mutagenesis, DNA sequencing and PCR.

**CO9:** Understand the basic cell and tissue culture their associated laboratory techniques

**CO10:** Discuss the different applications of biotechnology

**Unit 1 Biotechnological Tools (12)**

Biotechnology: Definition and scope, types and branches of biotechnology. Recombinant DNA technology – Basic techniques – cutting and joining of DNA molecules, Methods of gene transfer - transfection, electroporation, Selection and screening of recombinants. Insertional inactivation. Role of enzymes - Restriction endo nucleases, DNA ligases, Reverse transcriptase, DNA polymerase. Use of Linkers and Adapters, homopolymer tailing.

**Unit 2 Cloning Vectors and Techniques (12)**

Cloning vectors – Plasmids, M 13 phage, cosmids, Yeast artificial vectors(YAC). Plasmid Copy number.. PCR – principle, types and applications. Techniques of cloning - Southern, Northern and Western blotting techniques, DNA hybridization techniques.

**Unit 3 Animal biotechnology (12)**

Animal biotechnology – Cell and organ culture. Gene transfer methods into animal cells, production of medically important biomolecules – Insulin, growth hormone, monoclonal antibodies and interferons.

**Unit 4 Plant biotechnology (12)**

Plant biotechnology – Gene transfer in plants – physical, chemical and biological methods. Genetic engineering of plants for pest resistance, herbicide resistance, stress tolerance and nitrogen fixation.

**Unit 5 Nanotechnology (12)**

Nanotechnology – Introduction and application of nanotechnology in tissue engineering, nucleic acid, enzymes, cancer and organ transplantation

**Total : 60 hours**

### **Text Books**

1. Sathyanarayana, Biotechnology, Books and allied Publishers, 3<sup>rd</sup> edition, 2006
2. RC Dubey, Text book of Biotechnology , S. Chand & Co, 2009

### **Reference Books**

1. Brown TA “Gene cloning: An introduction” Nelson Thornes, 3<sup>rd</sup> edition, 1995
2. William.J. Thieman, Michael A. Pallidino. Introduction to biotechnology. Pearson Publication. 2<sup>nd</sup> edition, 2013
3. SS Purohit. Biotechnology Fundamentals and applications. Agrobios Publication. 4<sup>th</sup> edition. 2007
4. SB Primrose & R Twyman. Principles of gene manipulation and genomics. Blackwell publishing. 7<sup>th</sup> edition. 2006.
5. PK Gupta, Biotechnology and genomics. Rastogi Publication. 2<sup>nd</sup> reprint. 2006.
6. T. Strachan and A.P. Read, Human Molecular Genetics, BIOS Scientific Publications 2nd Edition ; October 2003.

**15BBC109**

**NUTRITION AND HEALTH**

**5 0 0 4**

### **Course objectives**

To get a knowledge of diet and nutrition for normal persons, patients and special cases. Students should also aware about the categories and significance of various forms of foods.

### **Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Enumerate the knowledge and understanding of the fundamentals of food and nutrition

**CO2:** Demonstrate an in-depth knowledge of the roles and functions of principal nutrients

**CO3:** Create an awareness of functional foods

**CO4:** Describe the detailed knowledge of the nutrient content of most primary food sources

**CO5:** Assess the concept of nutrient recommendations

**CO6:** Discuss the processes involved in digestion, absorption, metabolism and utilization of each of the macronutrients

**CO7:** Assess the role and utilization of major vitamins and minerals

**CO8:** Discuss the relationship between calories of food, weight and obesity

**CO9:** Describe the health effects of macronutrients and micronutrients

**CO10:** Discuss the role of phytochemicals in disease prevention

**Unit 1 Overview of nutrition (12)**

An overview of nutrition, food choices, the nutrients, Nutrition assessment, diet and health, planning a healthy diet, digestion absorption and transport of food, regulation of digestion and absorption

**Unit 2 Macronutrients (12)**

The carbohydrates, sugars, Starch and fibers, Glucose in the body, Health effects and recommended intakes of sugars, starch and fibers. Alternatives to sugar, lipids in the body, Recommended intake of lipids. Alternative to fat. Proteins-energy malnutrition, Health effects of protein, Vegetarian diets

**Unit 3 Energy (12)**

Energy balance and body composition, The calories of foods provide, body weight, body composition and health, weight, management, overweight-and underweight, Causes of obesity, Treatments of obesity.

**Unit 4 Micronutrients (12)**

An overview of Vitamins, water and major minerals, Trace minerals, Antioxidant nutrients and phytochemicals in disease prevention.

**Unit 5 Minerals (12)**

Calcium roles in the body, calcium deficiency. Iron deficiency, Iron toxicity, Osteoporosis and calcium, Zinc deficiency, zinc toxicity, Functional foods

**Total: 60hours**

**TextBooks**

1. Swaminathan, Advanced Textbooks of food and Nutrition, Vol 1, 2 ed, BAPPCO Press, 2005
2. Viswanath Sardesai, Introduction to Clinical nutrition, 3<sup>rd</sup> edition, 2011

**Reference Books**

1. Geissler C, Powers H. Human Nutrition. Edinburgh: Elsevier Churchill Livingstone, 2010.
2. Roach, J.O. and Benyon, S, Crash course - Metabolism and Nutrition, London: Mosby, (2003
3. Edited by Jim Mann & A. Stewart Truswell, Essentials of human nutrition, 3<sup>rd</sup> oxford university, 2008

**Course objectives**

The objective is to make a connection between knowledge of anatomy and physiology and real-world situations, including healthy lifestyle decisions and homeostatic imbalances.

**Course outcomes****After the completion of this course, the student will be able to**

**CO1:** Understand basic terminologies about the human anatomy and physiology

**CO2:** Have an in-depth knowledge about nutrition in different stages of life

**CO3:** Have an over-view of nutritional medications and therapeutic interventions

**CO4:** Have the knowledge about gastro-intestinal tract and associated disorders

**CO5:** Have Indepth knowledge about cardiovascular system and associated disorders

**CO6:** Know about structure/ function of kidney and associated disorders

**CO7:** Know about development and consequences of cancer.

**CO8:** Know the current treatment and nutritional therapies that are available for cancer

**CO9:** Have the knowledge about development and consequences of HIV infection.

**CO10:** Know the current treatment and nutritional therapies that are available for AIDS

**Unit 1 Nutrition in various stages of life****(12)**

Life Cycle nutrition, pregnancy and lactation, Nutrition during pregnancy and lactation. Maternal health, Practices incompatible with pregnancy, Fetal alcohol syndrome.

Nutrition in infancy, childhood Nutrition and adolescence The early development of chronic diseases, Nutrition in adulthood and later years. Illness and nutrition status, Nutrition Medications and complementary therapies Nutrition intervention

**Unit 2 Nutrition in GI disorders****(12)**

Nutrition and disorders of the gastro intestinal tract, parenteral nutrition . Nutrition in Severe stress, Nutrition and diabetes mellitus, Complication of diabetes mellitus, Treatment of diabetes, Medical Nutrition therapy for diabetes, Mastering diabetes control.

**Unit 3 Nutrition for cardio disorders****(12)**

Nutrition and disorders of the heart blood vessels and lungs. Atherosclerosis, hypertension, prevention and treatment of heart disease, Diet strategies, Drug therapy, Acute respiratory failure, The metabolic syndrome.

**Unit 4 Nutrition in Renal disorders (12)**

Nutrition and Renal disease, kidney stones and treatment, the nephrotic syndrome, Renal failure, kidney transplants and diet, Dialysis and Nutrition, Nutrition and liver disorders, Fatty liver and hepatitis, Cirrhosis, Gall stones, Nutrition,

**Unit 5 Nutrition in Cancer and HIV (12)**

Cancer and HIV infection, How cancer develops, Consequence of cancer, Treatment for cancer, Medical Nutrition therapy. How HIV develops, Consequences of HIV infection. Medical Nutrition Therapy. Ethical issues in Nutrition care

**Total : 60 hours**

**Text Books**

1. Carl A. Burtis and Edward R. Ashwood . Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 5<sup>th</sup> edition, 2012. Saunders Publication.
2. M N Chatterjee and Rana shinde. Textbook of Medical Biochemistry, 8<sup>th</sup> ed, 2011. Jaypee Publishers.

**Reference books**

1. Thomas M. Devlin. Biochemistry with Clinical Correlation, 7<sup>th</sup> edition, John Wiley & Sons
2. Harold Varley, Practical Clinical Biochemistry, fourth edition, 2005. CBS Publisher

**15BBC111**

**STEM CELL BIOLOGY**

**5 0 0 4**

**Course objectives**

This paper aims to provide thorough information on the basic properties of stem cells and the regulation at molecular level. It also describes the application of stem cell technology in the therapy of different diseases.

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Know about various stem cells, their characteristics and their niches

**CO2:** Understand the importance of growth factors

**CO3:** Understand the basis of media composition for growth of stem cells

**CO4:** Discern the molecular concepts of stem cell self-renewal and tissue and organ development.

**CO5:** Demonstrate the routine methods used in stem cell biology.

**CO6:** Know the different types of stem cells, how they are derived and the extent of their plasticity.

**CO7:** Know how tumor stem cells give rise to metastases and treatment-resistant remnant cells that cause relapse, and how this impacts on the development of future cancer treatment strategies

**CO8:** Demonstrate how epigenetic mechanisms encompassing various DNA modifications and histone dynamics that are involved in regulating the potentiality and differentiation of stem cells

**CO9:** How microRNAs are involved in regulating stem cell differentiation

**CO10:** Discern out the application of stem cell in therapies

**Unit 1 Introduction to Stem Cells (12)**

Definition, Classification and Sources. Embryonic Stem Cells. adult, haematopoietic, fetal, cord blood, placenta, bone marrow, primordial germ cells, cancer stem cells, induced pluripotent stem cells.

**Unit 2 Stem cell characterizations (12)**

Isolation & characterizations, markers & their identification, growth factor requirements and their maintenance in culture. Feeder and feeder free cultures. Cell cycle regulators in stem cells. Molecular basis of stem cell renewal and differentiation, Metaplasia and transdifferentiation. Molecular basis of pluripotency and stem cell niche

**Unit 3 Genetic and Epigenetic Gene Regulation in Stem Cells (12)**

Chromatin modification and transcriptional regulation, chromatin modifying factors, epigenetic regulation – expression of receptors, chromosomal inactivation, imprinting mechanism in *Drosophila*, *C. elegans* and mammals. Hypoxic condition and gene expression (pre implantation stage), stem cell communications – gap junctions, cell fusion, HOX genes, upstream transcriptional factors, embryonic genes.

**Unit 4 Application of Stem Cells (12)**

Overview of embryonic and adult stem cells for therapy Neurodegenerative diseases; Parkinson's, Alzheimer, Spinal Cord Injuries and other brain Syndromes; Tissue system Failures; Diabetes; Cardiomyopathy; Kidney failure; Liver failure; Cancer; Hemophilia etc.

**Unit 5 Regulations and Ethics (12)**

Human Embryonic Stem Cells and Society, Human stem cells research: Ethical consideration; Stem cell religion consideration; Stem cell based therapies: Pre clinical regulatory consideration and Patient advocacy.

**Total : 60 hours**



## **Text Books**

1. Kiessling, A.A. Human Embryonic Stem cells. Jones & Barlett Publishers. (2<sup>nd</sup> Ed.)2006
- 2.Lanza, R . Essentials of Stem Cell Biology. Academic Press. (1<sup>st</sup> Ed.) 2005.

## **Reference Books**

1. Turksen, K. Adult Stem Cells. Humana Press, Inc., 1<sup>st</sup> Ed, 2004
2. Thomson, J et al. Handbook of Stem Cells: Embryonic/ Adult and Fetal Stem cells (Vol. 1 & 2). Academic Press., 1<sup>st</sup> Ed, 2004.
3. Institute of Medicine (Corporate author). Stem cells and the future of regenerative medicine. National Academy Press. 1<sup>st</sup> Ed. 2002.

**15BBC112**

**DEVELOPMENTAL BIOLOGY**

**5 0 0 4**

## **Course objectives**

The course considers primarily the embryological development with an emphasis on histogenesis and histology. The course deals with the process of differentiation to many different types of cells and tissues which function in an integrated way as each new organism develops. The course also provides some of the events and processes which occur during animal growth and development, as the animal develops from an egg and a sperm into an adult organism.

## **Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Know about the basic concepts of developmental biology

**CO2:** Know how fertilization and cleavage occur

**CO3:** Discern out the process and consequence of gastrulation

**CO4:** Know about the process of differentiation to many different types of cells and tissues

**CO5:** Have understanding of the basic concepts of organogenesis

**CO6:** Have understanding of the basic concepts of Morphogenesis

**CO7:** Have understanding of the basic concepts of regeneration

**CO8:** Have understanding of the basic concepts of aging

**CO9:** Have knowledge about gene expression and regulation

**CO10:** Have fundamental knowledge of animal embryonic development--that is how an egg develops into an adult.

## **Unit 1 Overview**

**(12)**

Developmental Biology - an overview: Introduction of animal development: Development among unicellular eukaryotes –Acetabularis, Naegleria. The origins of sexual reproduction.

Fertilization: structure of gametes, recognition of sperm and egg –action at distance and contact of gametes.

**Unit 2 Embryonic development in animals (12)**

Early Embryonic Development in animals: Blastula formation, Types of Cleavage, Gastrulation and formation of germ layers in animals.

**Unit 3 Organogenesis (12)**

Organogenesis in animals – an overview: Tissue organization and stem cells; development of nervous system, mesodermal and endodermal organs. Organogenesis –vulva formation in *Caenorhabditis elegans*;

**Unit 4 Embryonic development in plants (12)**

Early Embryonic Development in plants: Gametogenesis, Fertilization, Embryo sac development and double fertilization in plants

**Unit 5 Cell death (12)**

Cell death and regeneration: Concept of regeneration; programmed cell death; aging and senescence.

**Total : 60 hours**

**Text Books**

1. T. Subramoniam, Molecular developmental biology. 2nd Edition, 2011.
2. Manju Yadav, Molecular Developmental Biology. Discovery Publishing Pvt.Ltd. 2008.
3. Abhilash jain, Advanced developmental biology. 2010.

**Reference Books**

1. Scott F. Gilbert, Susan Singer, Developmental Biology. Sinauer Associates Inc.; 8th ed. 2005
2. Jonathan M. W. Slack, Essential Developmental Biology. Wiley-Blackwell. 3rd Ed, 2012.
3. Fred Wilt and Sarah Hake, Principles of Developmental Biology. First edition, 2003.

**15BBC113**

**CANCER BIOLOGY**

**5 0 0 4**

**Course objectives**

This curriculum is designed to provide students a broad understanding of the molecular, genetic, cell biological and pathobiological aspects of cancer. Students will also learn about the current state of clinical diagnosis, treatment of human cancers, and hurdles to overcome to realize its potential.

## **Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Have better understanding of terminologies of ‘Molecular Biology’

**CO2:** Have basic understanding of ‘Genetics’

**CO3:** Gain knowledge on cell cycle as well as apoptosis

**CO4:** Have knowledge about cancer, its development and types

**CO5:** Have knowledge about genes with reference to cancer formation and mechanism

**CO6:** Have basic understanding of carcinogens and carcinogenesis

**CO7:** Have elementary knowledge about tumor markers

**CO8:** Know about the role of tumor suppressor genes

**CO9:** Understand the signaling of cancerous cells

**CO10:** Have basic understanding of diagnostic tools for cancer and therapies available

### **Unit 1 Introduction (12)**

Growth characteristics of cancers cells; neoplasia, anaplasia, metaplasia and hyperplasia, types of cancer benign, malignant, metastatic cancers. Carcinomas, sarcomas, adenomas, haemopoietic cancers. Characteristics of cancer cells, changes in cell membrane structure and functions.

### **Unit 2 Oncogenes (12)**

Provirus, provirus, oncogenes and proto oncogenes. Mechanism of carcinogenic transformation by oncogenes, viral oncogenes. Tumor suppressor genes - properties, mechanism of tumor suppressor genes in cancer induction with special reference to P53 gene.

### **Unit 3 Carcinogenesis (12)**

Principles of carcinogenesis- chemical carcinogenesis, stages in chemical carcinogenesis - Initiation, promotion and progression. Physical carcinogenesis – X-ray radiation . Viral carcinogenesis. Free radicals and antioxidants in cancer.

### **Unit 4 Tumour markers (12)**

Tumour markers- types of tumour markers. Apoptosis in cancer Cell death by apoptosis role of caspases . Death signaling pathways mitochondrial and death receptor pathways.

### **Unit 5 Diagnosis and Treatment (12)**

Cancer screening diagnosis and treatment. RIA and ELISA.Strategies of anticancer drug therapy chemotherapy , gene therapy, Immunotherapy and radiotherapy.

**Total : 60 hours**

## **Text Books**

1. Vincent.T, Devita, Cancer-Principles & practice of oncology, 3<sup>rd</sup> edition, 2014.
2. Momna Hejmadi, Introduction to Cancer Biology. 2<sup>nd</sup> edition.

## **Reference Books**

1. Kinnell Parchment G. Mc. R. E, Perantoni. The Biological Basis of Cancer, Cambridge University Press, 2<sup>nd</sup> Edition, , 2006
2. Lauren Pecorino, Molecular Biology of Cancer: Mechanisms, Targets, and Therapeutics Oxford University Press; 3 edition, 2012.

**15BBC114**

**PLANT AND ANIMAL TISSUE CULTURE**

**5 0 0 4**

### **Course objectives**

The course provide deep insights about the basic and recent techniques involved in plant and animal cell culture and its potential application

### **Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Discern out the basics of plant tissue culture,

**CO2:** Understand the roles of media components of plant tissue culture media, e.g. minerals, growth factors, hormones,

**CO3:** Explain the common cell culture techniques e.g. callus culture, protoplast culture

**CO4:** Understand the basics of embryo culture

**CO5:** Demonstrate the processes of protoplast fusion and somatic hybridization and its uses

**CO6:** Explain how micropropagation is performed, including morphogenesis

**CO7:** Explain the process of somatic embryogenesis in plants

**CO8:** Discern out the applications of plant tissue culture

**CO9:** Explain the cell lines used in animal tissue culture and their origins and uses

**CO10:** Discern out the applications of animal tissue culture.

### **Unit 1 Basics of animal cell culture**

**(12)**

Animal Cell Culture : Historical Background, Importance and progress in Animal Cell Culture Technology, Biology of Animal Cell; Laboratory setup and equipments, aseptic technique, different cell culture media and supplements, Importance of Serum and Serum Free Media, preparation and sterilization of cell culture media and supplements. Conventional plant breeding, tissue culture media, Sterilization and agents of sterilization, initiation and maintenance of callus and suspension cultures.

**Unit 2 Cell culture techniques (12)**

Different tissue culture techniques; Disaggregation of tissue and primary culture; Types of primary culture; Chicken embryo fibroblast culture; Chicken liver and kidney culture; Secondary culture; Trypsinization; Cell separation ; Continuous cell lines; and Anchorage independent cells and cultures; Organ culture.

**Unit 3 Plant tissue culture (12)**

Protoplast isolation, culture and fusion; Organogenesis, somatic embryogenesis. Transfer and establishment of whole plants in soil. Shoot tip culture, and production of virus free plants, embryo culture and embryo rescue. Selection of hybrid cells and regeneration of hybrid plants; Symmetric and asymmetric hybrids, cybrids, anther, pollen and ovary culture for production of haploid plants and homozygous lines. Somaclonal variation. Cryopreservation and DNA banking for germplasm conservation.

**Unit 4 Gene transfer methods (12)**

Measurement of viability and cytotoxicity; characterization of cultured cell; cell cloning and selection; Cell synchronization; Transfection and transformation of cell; Plant transformation technology- Basis of tumor formation; Hairy root; Features of Ti and Ri plasmids; Use of Ti and Ri as Vectors; Binary vectors; Methods of nuclear transformation; viral vectors; vector less or direct DNA transfer Particle bombardment, electroporation, micro injection;

**Unit 5 Applications (12)**

Commercial scale production of animal cells, stem cells & their application; Over view of embryonic and adult stem cells for therapy; Neuro degenerative disease; Parkinsons, Alzheimer, Spinal cord injuries and other brain syndromes; Tissue system failures; Diabetes; Cardiomyopathy; Kidney failure; Liver failure, Cancer, Hemophilia, Application of cell culture technology in production of human and animal vaccines and pharmaceutical proteins.

**Total : 60 hours**

**Text Books**

1. Bhojwani, Sant Saran, Dantu, Prem Kumar. Plant Tissue Culture: An Introductory Text. Springer 2013
2. Adrian Slater, Nigel Scott, and Mark Fowler. Plant Biotechnology. The Genetic Manipulation of Plants 2<sup>nd</sup> edition, 2008. Oxford University Press.
3. SS Purohit. Biotechnology Fundamentals and applications. 4<sup>th</sup> ed. Agrobios Publication. 2007

**Reference Books**

1. Biotechnology and genomics. PK Gupta. Rastogi Publication. 2<sup>nd</sup> reprint. 2006
2. Roberta H. Smith. Plant Tissue Culture. 3<sup>rd</sup> Edition. 2013. Academic press.

**Course objectives**

This paper aims to provide a Basic understanding of the nervous system, Structure and functional relationship and integration of the nervous tissue networking and Insights into neurotransmission

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Have basic understanding of the human nervous system

**CO2:** Acquaint with basics of the anatomy of the central nervous system

**CO3:** Understand the anatomy of the peripheral nervous system

**CO4:** Knowledge of integration central nervous system with the peripheral nervous system

**CO5:** Explain structure and function of different types of cells of the nervous system

**CO6:** In-depth understanding of neuronal signaling

**CO7:** Explain about different types of neurotransmitters and mechanism of action

**CO8:** Explain synapse and mechanism of synaptic transmission

**CO9:** Explain sensory and motor function as well as learning and memory formation

**CO10:** Discern out the different types of neurodegenerative disorders

**Unit 1 Nervous System (12)**

Neuron - Neurocellular anatomy, neural membrane, classification of neuron, nerve fibers, axonal transport, neural growth, neuroglia, nervous system, blood brain barrier, cerebrospinal fluid

**Unit 2 Signalling (12)**

Neuronal signaling - Membrane potentials, ion channels, recording neuronal signals, ionic basis of resting potential and action potential, propagation of action potential.

**Unit 3 Synapse (12)**

Synaptic transmission - Synapse, Electrical synapse transmission, chemical synaptic transmission, Synaptic transmitter release, synaptic potentials, synaptic delay, synaptic plasticity, molecular mechanism of synaptic transmission, myoneural junction

**Unit 4 Neurotransmitters (12)**

Neurotransmitters - Chemistry, synthesis, storage, release, receptors and function- acetyl choline, catecholamines, serotonin, histamine, glutamate, aspartate, GABA, glycine, neuropeptides, nitric oxide

## Unit 5 Disorders

(12)

Neural processing and neurodegenerative disorders- Learning and memory, neurochemical basis of drug abuse, neurodegenerative disorders, Parkinson's disorder, Alzheimer's disorder, Amyotrophic Lateral Sclerosis, Senile Dementia

**Total : 60 hours**

### Text Books

1. Arthur C. Guyton and John E Hall, Text book of medical physiology 11<sup>th</sup> Edition; 2006
2. Bruce Alberts, Alexander Johnson, Juliana Lewis, Martin Raff, Keith Roberts and Peter Walter, Molecular biology of the cell, 4<sup>th</sup> Edition; 2004
3. David Nelson and Michael Cox, Lehninger Principles of Biochemistry, 4<sup>th</sup> edition; 2005

### Reference Books

1. Gordon Shepherd, Neurobiology, 3<sup>rd</sup> Edition; 1994
2. Mark F Bear, Barry W Connors and Michael A Paradiso, Neuroscience: Exploring the brain, 4<sup>th</sup> Edition; 2015

**15BBC116**

**PLANT BIOCHEMISTRY**

**5 0 0 4**

### Course objectives

This paper provides insights into the primary metabolic pathways occurring in plants, the types of plant metabolites and the industrial potential of those metabolites and the role of hormones in plant growth.

### Course outcomes

**After the completion of this course, the student will be able to**

- CO1:** Develop an understanding of basic structural arrangement of plant cell and organization of chloroplast membrane, Thylakoid membrane and about the electron transport chain.
- CO2:** Explain about the important Photosynthetic reactions (C<sub>3</sub>,C<sub>4</sub> & CAM) Photorespiration taking place inside plant cells and their metabolic significance.
- CO3:** Explain about nitrogen fixation in Plants with the picture of bacteria, enzymes and 'NIF' genes involved and its importance in sustainability of agriculture.
- CO4:** Give details about the role of plant growth regulators (both natural & synthetic) in the development of crops and its response following stress.
- CO5:** Explain about various chemical classes of secondary metabolites, its source and importance.

**CO6:** Develop an understanding of industrial usage and applications of secondary metabolites.

**CO7:** Explain the metabolic functions of plants and thus can interpret with plant associated diseases.

**CO8:** Understands the role and application of biochemistry in Plant studies.

**CO9:** Demonstrates ability to explain relation between Photosynthesis, growth hormones and Plant growth.

**CO10:** Understands about the existence of naturally available and metabolically important growth regulators and secondary metabolites and its potential in crop development.

### **Unit 1 Photosynthesis (12)**

Ultra Structure and organization of chloroplast membranes, lipid composition of chloroplast membranes, electron transport chain. Thylakoid membrane protein complexes Calvin cycle: Biochemistry of RuBp Carboxylase or oxygenase, Hatch and slack pathway, CAM plants; productivity of C<sub>4</sub> plants.

### **Unit 2 Nitrogen Metabolism (12)**

Nitrogen fixation, nitrogenase complex, electron transport chain and mechanism of action of nitrogenase. Structure of 'NIF' genes and its regulation, Hydrogen uptake and bacterial hydrogenases, Nitrate Metabolism: Enzymes of nitrate metabolism, Ammonium assimilation enzymes: glutamine synthetase, glutamate synthase and GDH.

### **Unit 3 Plant Hormones (12)**

Plant growth regulators: Auxins; gibberellins, cytokines, abscisic acid and ethylene - biosynthesis and their metabolic functions, synthetic growth hormones, inhibitors. Stress response in Plants.

### **Unit 4 Secondary metabolites (12)**

Major chemical classes of secondary metabolites: A brief account of the following classes: Alkaloids, terpenoids, flavonoids, Phenolics and phenolic acids, steroids, coumarins, quinines, acetylenes, cyanogenic glycosides, amines and nonprotein amino acids, gums, mucilages, resins etc. (Structures not necessary. Give examples of the compounds and the plants in which present and their importance).



## **Unit 5 Uses of secondary metabolites**

**(12)**

Importance of secondary metabolites: Uses of secondary metabolites to man: as drugs, precursors of drugs in pharmaceutical industry, as natural pesticides/insecticides; other uses of secondary metabolites.

**Total : 60 hours**

### **Text Books**

1. Plant Metabolism by H.D Kumar and H.N Singh. Publisher. Macmillan, ISBN-10: 0333256387: ISBN-13:978-0333256381.1<sup>st</sup> Ed, 1980.
2. Biotechnology: Secondary Metabolites by K.G Ramawat, (2000) Publisher: Science Publishers, U.S. ISBN-10: 1578080576 ISBN-13: 978-1578080571, 1<sup>st</sup> Ed., 2000.

### **Reference Books**

1. Plant Biochemistry by P.M Dey and J.B. Harborne (Editors) (1997) Publisher: Academic Press
2. ISBN-10:0122146743, ISBN-13:978-0122146749, 1<sup>st</sup> Ed, 1997.
3. Plant Metabolism by Prof David T. Dennis, Prof David H. Turpin, Dr Daniel D. Lefebvre and Dr David B. Layzell(Editors) publisher: Longman; ISBN-10: 0582259061, ISBN-13:978-582259065, 1<sup>st</sup> Ed, 1997.
4. Plant Biochemistry by Hans-Walter Heldt Professor Em publisher: AcademicISBN-10: 0120883910 ISBN- 13: 978-0120883912, 3<sup>rd</sup> Ed, 2004.
5. The Principals of Plant Biochemistry by Muriel Wheldale Onslow, Publisher: Cambridge University Press, 1<sup>st</sup> Ed., 1991.

## **BIOCHEMISTRY**

**(For B.Sc. Microbiology & B.Sc. Biotechnology)**

### **Course objectives**

The course aims to provide a basic understanding of the chemical nature of biological macromolecules, the functions of dietary and endogenous carbohydrate, lipid, and protein, and also to learn the experimental approach and procedures involved in biochemical techniques.

#### **Unit 1 Carbohydrates (12)**

Carbohydrates – Classification, structure of mono, oligo and polysaccharides. Glycolysis, TCA cycle and HMP shunt.

#### **Unit 2 Protein (12)**

Protein – Classification, amino acid – structure and classification. Biological role of proteins and structural organization of protein. Transamination, deamination and urea cycle.

#### **Unit 3 Lipids (12)**

Lipids – Classification, Saturated and Unsaturated fatty acids. Structure and biological functions of lipids. Structure and functions of cholesterol.

#### **Unit 4 Nucleic acid (12)**

Nucleic acids – Nitrogenous bases, Nucleosides and Nucleotides. Structure, function and types of DNA and RNA.

#### **Unit 5 Techniques (12)**

Chromatography – paper, thin layer. gel filtration and affinity. Centrifugation – differential centrifugation. Electrophoresis – SDS-PAGE, Agarose gel electrophoresis

**Total : 60 hours**

### **Text Books**

1. M.N. Chatterjee & Ranashinde Text Book of Medical Biochemistry. Jaypee Brothers Medical Publisher (P) Ltd. 6<sup>th</sup> edition (2006).
2. J.L. Jain, Fundamentals of Biochemistry. Reprint Edn. Chand Publications. 2007 edition .
3. U. Sathyanarayana, Biochemistry. Books and Allied P Ltd, 3<sup>rd</sup> edition (2006).

## Reference Books

1. David L Nelson & Michael M Cox, Lehninger -Principles of biochemistry.W.H. Freeman company New York 4<sup>th</sup> edition 2007.
2. Keith Wilson & John Walker, Principles and techniques of Biochemistry and Molecular Biology. Cambridge University Press, 7<sup>th</sup> edition 2010.

## BIOCHEMISTRY PRACTICALS

(For B.Sc Bioinformatics, B.Sc Microbiology, B.Sc Biotechnology)

**Objective** - This course is concerned with basic lab skills. These skills include the accurate use of pipettes, making solutions, and safety measurements along with the identification of biomolecules such as carbohydrates, proteins and aminoacids by suitable tests.

1. Qualitative analysis of monosaccharides – Aldose.
2. Qualitative analysis of monosaccharides – Ketose.
3. Qualitative analysis of disaccharides.
4. Qualitative analysis of polysaccharides.
5. Qualitative analysis of aromatic amino acids.
6. Qualitative analysis of sulphur containing amino acids.
7. Qualitative analysis of basic amino acids.
8. Estimation of glycine by Sorrenson's Formal Titration.
9. Estimation of ascorbic acid by 2,3 Dichlorophenol Indophenol.
10. Estimation of glucose by Ortho Toluidine method.
11. Estimation of protein by Lowry's method.
12. Separation of amino acids by thin layer chromatography.

## Text Books

1. J. Jayaraman, Laboratory Manual in Biochemistry. New Age International Pvt Ltd Publishers. 2011 (Paperback).
2. S. Sadasivam, A. Manickam, Biochemical Methods. New age publishers. 2009 (paperback).
3. S. K. Sawhney, Randhir Singh, Introductory Practical Biochemistry. Alpha Science International, Ltd. 2 edition, 2005.

## Reference Books

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6 edition, 2006.
2. Hans Bisswanger, Practical Enzymology. Wiley VCH. 2nd Edition, 2011.
3. Robert Eisenthal, Enzyme Assays: A Practical Approach (Practical Approach Series). Oxford University Press, U.S.A. 2 edition, 2002.

## GENERIC ELECTIVES

15BBC151

PRINCIPLES OF GENETICS

2002

### Course objectives

Genetics having its roots in mathematics thanks to Mendel, appeals to students as one of the analytical branches of biology even in senior school. Basic concepts that are essential to understand inheritance will be taught, starting from the abstract factors to physical basis of inheritance. The course aims to communicate the pivotal role of Mendelian concepts in the development of the science of genetics and also the fact that nature is full of examples that deviate from Mendelian laws starting from linkage groups.

### Course outcomes

**After the completion of this course, the student will be able to**

- CO1:** Display a broad understanding of core molecular genetics concepts including molecular biology, genetics, cell biology, physiology, and evolution.
- CO2:** Demonstrate working knowledge in a defined skill set of molecular biology and biotechnology protocols, including PCR, genetic mapping, gene isolation and cloning, DNA sequencing, and sequence analysis
- CO3:** Explain Punnett's square
- CO4:** Use popular computational software packages for DNA sequence analysis as they apply to plant and animal improvement programs or microbial genomics.
- CO5:** Explain key concepts of genome organization and manipulation in depth, for example genetic map construction, sequencing methods and strategies, genome annotation, comparative genomics, global gene expression profiling, metagenomics, and transgenic plant and animal technologies.
- CO6:** Independently assemble bacterial genomes and parse metagenomic sequencing data
- CO7:** Have comprehensive and detailed understanding of genetic methodology
- CO8:** Know how quantification of heritable traits happen in families and populations
- CO9:** Have deep insight into cellular and molecular mechanisms happening during reproduction
- CO10:** Demonstrate various genetic diseases

**Unit 1 Concept of genetic inheritance (5)**

Concept of alleles, haploid and diploid status, phenotype and genotype: Mendel's laws of inheritance, dominant and recessive inheritance, test, back and reciprocal crosses with two examples each.

**Unit 2 Physical basis of inheritance (5)**

Chromosomal theory of inheritance, concept of linkage and crossing over, cytological proof of crossing over, genetic mapping: two and three point cross over. Allelic interactions- dominance relationships- complete, incomplete and co-dominance, gene-gene interaction.

**Unit 3 Extra nuclear inheritance (4)**

Criteria for extra nuclear inheritance, plastid inheritance in *Mirabilis jalapa*, maternal effect snail shell coiling, cytoplasmic inheritance (mitochondria and chloroplast).

**Unit 4 Analysis of genetic inheritance in human (5)**

Gathering family history, pedigree symbols and construction of pedigrees. Patterns of inheritance for monogenic traits and risk assessment with examples for autosomal inheritance-dominant, recessive, sex-linked inheritance, sex-limited and sex-influenced traits, mitochondrial inheritance.

**Unit 5 Karyotyping (5)**

Karyotyping- banding pattern and nomenclature (G and Q banding), common syndromes due to numerical chromosome changes, common syndromes due to structural alterations (translocations, duplications, deletions)

**Total : 24 hours**

**Text Books**

1. Principles of Genetics, 6th edition (2011), Snustad DP and Simmons MJ, John Wiley and Sons, Inc; ISBN-13: 978-0470903599
2. Human Molecular Genetics, 3rd edition (2003) by Tom Strachan and Andrew Read; Garland Science Publishers, ISBN -13: 978-0815341826.

**Reference Books**

1. William S. Klug, Michael R. Cummings, Charlotte A. Spencer, Michael A. Palladino; Pearson Education, ISBN-13: 978-0321724120. Concepts of Genetics, 10th edition, (2011).
2. Gardner EJ, Simmons MJ, Snustad DP. Principles of Genetics, 8th edition (2005), John Wiley and Sons, Inc. ; ISBN-13: 978-9971513467.
3. Griffith AJF, Miller JH, Suzuki DT, Lewontin RC, Gelbert WM., An introduction to Genetic Analysis, W. H. Freeman and Co. New York. ISBN-13: 978-429229432. 10th edition (2010),
4. Principles of Genetics, 6th edition (1998), Robert H. Tamarin Publisher: William C Brown Pub; ISBN-13: 978-0697354624.

**Course objectives**

The syllabi of Pathology compliments and supplements the necessary knowledge students have gained in Physiology. Consequently it incorporates topics like cellular adaptations, inflammation, neoplasia, cellular ageing and other infectious diseases. Pathology also provides the necessary inputs for the other disciplines like Pharmacology, social and preventive medicine, medicinal biochemistry etc.

**Course outcomes****After the completion of this course, the student will be able to**

- CO1:** Appreciate a thorough knowledge on the cellular adaptations and the response of tissues to neoplasia.
- CO2:** Understand the pathological changes during cellular ageing and other infectious diseases.
- CO3:** Gain an insight into the history of pathology covering all the basic definitions and common terms.
- CO4:** Detail on the survival mechanism in diseases, an insight into microscopic and cellular pathology.
- CO5:** Give an overview of cellular adaptation including Hyperplasia, Hypertrophy, Atrophy, and Metaplasia.
- CO6:** Elaborate on the causes and mechanisms of cell injury- reversible and irreversible injury, and also on Necrosis and Apoptosis.
- CO7:** Understand the basic concepts related to acute and chronic inflammation.
- CO8:** Discuss the vascular changes and cellular events that happen during inflammation.
- CO9:** Explain the morphological effects of an inflammation response.
- CO10:** Understand the basic mechanism of tissue regeneration, and repair by healing, scar formation and fibrosis.
- CO11:** Provide a detailed overview on Edema, hyperemia, congestion, hemorrhage, hemostasis and thrombosis, Embolism, Infarction and shock with suitable examples.

**Unit 1 Introduction****(5)**

History of pathology, Basic definitions and common terms used in pathology, Survival mechanism and disease, microscopic and cellular pathology, scope and techniques used.

**Unit 2 Cell Injury and responses of cells: Cellular Adaptations, and Cell Death****(5)**

An overview of cellular adaptation: Hyperplasia, Hypertrophy, Atrophy, Metaplasia; Causes and mechanisms of cell injury, reversible and irreversible injury, Necrosis, Apoptosis, Types of apoptosis, Intracellular accumulations, Cellular ageing

**Unit 3 Role of Inflammation in disease (5)**

Basic concepts with suitable examples of general features of acute and chronic inflammation: Vascular Changes, cellular events, important chemical mediators of inflammation, Morphological effects inflammation response, Granulomatus Inflammation.

**Unit 4 Role of Tissue repair Healing and Fibrosis (4)**

Basic mechanism of tissue regeneration, and repair by healing, scar formation and fibrosis

**Unit 5 Common Hemodynamic Disorders in diseases (5)**

An overview of Edema, hyperemia, congestion, hemorrhage, hemostasis and thrombosis, Embolism, Infarction and shock with suitable examples

**Total : 24 hours**

**Text Books**

1. Robbins and Cotran. Pathologic Basis of Disease, 8th edition (2009), Vinay Kumar, Abul. K. Abbas, Jon C. Aster, Nelson Fausto; Saunders Publishers, ISBN-13: 978-1416031215
2. Robbins, Basic Pathology, 9th edition (2012), Kumar, Abbas, Fausto and Mitchell; Saunders Publication, ISBN-13: 978-1437717815

**Reference Books**

1. J.,Ed. Underwood and J. C. E. Underwood General And Systematic Pathology, 2nd edition (1996); Churchill Livingstone, ISBN-13: 978-0443052828
2. Ramnik. Sood Medical Laboratory Technology Methods and Interpretations, 6th edition (2009),; Jaypee Brothers Medical Publishers, ISBN-13: 978-8184484496.

**15BBC153**

**NATURAL RESOURCE MANAGEMENT**

**2 0 0 2**

**Course objectives**

The paper details the types of natural resources and also tries to create an awareness on the exploitation of natural resources and the practices for the goal of sustainability.

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Discuss about natural resources and its application

**CO2:** Develops an understanding about the utilization of land resources in a constructive way (Agricultural, Pastoral, horticultural & silvicultural).

**CO3:** Explain about various water resources, threats faced and possible management strategies.

**CO4:** Understands Biodiversity and become aware of existing threats and about various management strategies adopted to protect biodiversity.

**CO5:** Demonstrates ability for critical thinking to analyse, assess deal with problems

associated with the field of biodiversity.

**CO6:** Develops awareness about Forests and Cover and its associated risk factors of forest depletion.

**CO7:** Discuss about various Bioprospecting programmes and related government ordinances (IPR, CBD & National Biodiversity Action Plan).

**CO8:** Understands about the contemporary Practises followed in biodiversity EIA (Environmental impact assessment), GIS (Geographic information system) and Footprinting and its importance in Ecological studies.

**CO9:** Demonstrates reasoning ability and decision making processes to explore complex environmental issues and analyse problems in respect to biodiversity threats.

**CO10:** Develops an expanded attitude in creating awareness in global society and are capable of dealing with environmental issues.

**Unit 1 Natural resources (5)**

Definition and types. Sustainable utilization - Concept, approaches (economic, ecological and socio-cultural). Renewable and non-renewable sources of energy

**Unit 2 Land and Water (5)**

Utilization (agricultural, pastoral, horticultural, silvicultural); Soil degradation and Management. Fresh water (rivers, lakes, groundwater, aquifers, watershed); Marine; Estuarine; Wetlands; Threats and management strategies.

**Unit 3 Biological Resources (5)**

Biodiversity-definition and types; Significance; Threats; Management strategies; Bioprospecting; IPR; CBD; National Biodiversity Action Plan).

**Unit 4 Forests (5)**

Definition, Cover and its significance (with special reference to India); Major and minor Forest products; Depletion; Management.

**Unit 5 Contemporary practices in resource management (4)**

EIA, GIS, Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon footprint, Resource Accounting; Waste management.

**Total : 24 hours**

**Text Books**

1. Vasudevan, N Essentials of Environmental Science (2006). Narosa Publishing House, (New Delhi).



## Reference Books

1. Singh, J. S., Singh, S.P. and Gupta, S. Ecology, Environment and Resource Conservation (2006) Anamaya Publications, (New Delhi).
2. Rogers, P.P., Jalal, K.F. and Boyd, J.A. An Introduction to Sustainable Development (2008). Prentice Hall of India Private Limited, (New Delhi).

**15BBC154**

**INTELLECTUAL PROPERTY RIGHTS**

**2002**

### Course objectives

The course aims at introducing the students to the much needed awareness on intellectual property rights and its types.

### Course outcomes

**After the completion of this course, the student will be able to**

- CO1:** Understand the basics of the four primary forms of intellectual property rights.
- CO2:** Compare and contrast the different forms of intellectual property protection in terms of their key differences and similarities.
- CO3:** Unravel the holistic understanding of the complexities involved in the process of attributing intellectual property rights to people.
- CO4:** Explain the legalities of intellectual property to avoid plagiarism and other IPR related crimes like copyright infringements, etc
- CO5:** Assess and critique some basic theoretical justifications for each form of intellectual property protection.
- CO6:** Analyze the effects of intellectual property rights on society as a whole.
- CO7:** Solve legal problems and provide effective legal advice to clients concerning their intellectual property rights and obligations
- CO8:** Understand the various rationales proffered for the granting of intellectual property Rights
- CO9:** Grasp and analyse intellectual property issues raised in novel problems
- CO10:** Get a holistic understanding of the complexities involved in the process of attributing intellectual property rights to people. Learn the legalities of intellectual property to avoid plagiarism

**Unit 1: Introduction to intellectual property right (IPR) (5)**

Concept and kinds. Economic importance. IPR in India and world: Genesis and scope, some important examples. IPR and WTO (TRIPS, WIPO).

**Unit 2 : Patents and Copyrights (5)**

Objectives, Rights, Patent Act 1970 and its amendments. Procedure of obtaining patents, Working of patents. Infringement.

Introduction, Works protected under copyright law, Rights, Transfer of Copyright, Infringement.

**Unit 3: Trademarks and Geographical Indications (5)**

Trademarks Objectives, Types, Rights, Protection of goodwill, Infringement, Passing off, Defences, Domain name.

Geographical Indications: Objectives, Justification, International Position, Multilateral Treaties, National Level, Indian Position.

Industrial Designs: Objectives, Rights, Assignments, Infringements, Defences of Design Infringement

**Unit 4 :Protection of Traditional Knowledge (5)**

Objective, Concept of Traditional Knowledge, Holders, Issues concerning, Bio-Prospecting and Bio-Piracy, Alternative ways, Protectability, needfor a Sui-Generis regime, Traditional Knowledge on the International Arena, at WTO, at National level, Traditional Knowledge Digital Library.

**Unit 5: Protection of Plant Varieties (4)**

Plant Varieties Protection-Objectives, Justification, International Position, Plant varieties protection in India. Rights of farmers, Breeders and Researchers. National gene bank, Benefit sharing. Protection of Plant Varieties and Farmers' Rights Act, 2001.

**Total : 24 hours**

**.Text Books**

1. N.S. Gopalakrishnan & T.G. Agitha, (2009) Principles of Intellectual Property Eastern Book Company, Lucknow.
2. Kerly's Law of Trade Marks and Trade Names (14<sup>th</sup> Ed) Thomson, Sweet & Maxweel.

## Reference Books

1. Ajit Parulekar and Sarita D' Souza, (2006) Indian Patents Law – Legal & Business Implications; Macmillan India Ltd.
2. B.L. Wadehra (2000) Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India.
3. P. Narayanan (2010) Law of Copyright and Industrial Designs; Eastern law House, Delhi.

15BBC155

HERBAL TECHNOLOGY

2002

### Course objectives

Herbal technology gives a brief discussion on the alternative medicines practiced in India. The importance of medicinal plants can be well understood.

### Course outcomes

**After the completion of this course, the student will be able to**

**CO1:** Discuss the recognition of medicinal plants,

**CO2:** Identify adulteration and contamination in medicinal plants

**CO3:** Explore the role of herbs in Siddha medicine.

**CO4:** Understand various methods involved in recognition, collection of medicinal plants.

**CO5:** Understand various methods involved in preservation of medicinal plants

**CO6:** Describe the medicinal value of easily available medicinal plants.

**CO7:** Illuminate the knowledge of various tests used to determine the active ingredient.

**CO8:** Discuss various methods of conservation of medicinal plants in medicinal plant banks.

**CO9:** Understand how to manage quality of medicinal plant products and derivatives.

**CO10:** Know various preliminary tests adopted to continue research in herbal medicine.

### Unit 1 Introduction

(5)

Herbal medicines: history and scope - definition of medical terms - role of medicinal plants in Siddha systems of medicine; cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants.

### Unit 2 Pharmacognosy

(5)

Pharmacognosy - systematic position medicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka.

**Unit 3 Phytochemistry****(5)**

Phytochemistry - active principles and methods of their testing - identification and utilization of the medicinal herbs; *Catharanthus roseus* (cardiotonic), *Withania somnifera* (drugs acting on nervous system), *Clerodendron phlomoides* (anti-rheumatic) and *Centella asiatica* (memory booster).

**Unit 4 Analytical pharmacognosy****(5)**

Analytical pharmacognosy: Drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds).

**Unit 5 Conservation of herbs****(4)**

Medicinal plant banks micro propagation of important species (*Withania somnifera*, neem and tulsi)- Herbal foods-future of pharmacognosy.

**Total : 24 hours****Text Books**

1. Glossary of Indian medicinal plants, R.N.Chopra, S.L.Nayar and I.C.Chopra, 1956. C.S.I.R, New Delhi.
2. The indigenous drugs of India, Kanny, Lall, Dey and Raj Bahadur, 1984. International Book Distributors.

**Reference Books**

1. Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
2. Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994. Oxford IBH publishing Co.
3. Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi.
4. Principles of Ayurveda, Anne Green, 2000. Thomsons, London.

**15BBC156****PHARMACOLOGY****2002****Course objectives**

Pharmacology is the science concerned with the study of drugs and how they can best be used in the treatment of disease in both humans and animals. The course starts with the general considerations and lead to understanding of various drugs acting on different body systems. It is a very important biomedical discipline and plays a vital role in helping to safeguard our health.

## **Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Explain the relationship between dose and biological response.

**CO2:** Explain the role of absorption, distribution, metabolism and excretion in drug disposition.

**CO3:** Describe how drugs affect the body, i.e., how they cause their effects (Pharmacodynamics).

**CO4:** The various routes of drug administration and the concept of drug bioavailability.

**CO5:** Explain how the body handles drugs (Pharmacokinetics; Biotransformation).

**CO6:** Explain the mechanisms of drug action of well-known drug examples.

**CO7:** List the major drugs and drug classes currently used in medical practice.

**CO8:** List the mechanisms underlying differences between distinct individual's dose-responses to the same drug (both pharmacokinetic and pharmacodynamic).

**CO9:** Explain the relationship between desired and undesirable effects of drugs as a function of dose.

**CO10:** Describe how the administration of multiple drugs can affect each individual drug's effect(s) (i.e., drug interactions).

### **Unit 1 General Pharmacology (5)**

Nature and Source of drugs, Routes of drug administration and their advantages, receptor and receptor subtypes.

### **Unit 2 Pharmacokinetics (5)**

Drug absorption, distribution, metabolism, and excretion, bioavailability, First Pass metabolism, excretion and kinetics of elimination, Bioavailability, Biological half life of drug and its significance, Drug-drug interactions.

### **Unit 3 Pharmacodynamics (5)**

Principles and mechanism of drug action, Factors affecting drug action. General considerations, pharmacological classification, mechanism of action and uses of following classes of drugs acting on various systems.

### **Unit IV: Drugs acting on CNS (5)**

(a) Mechanism of General anaesthesia, Stages of anaesthesia, General anaesthetics (Nitric oxide, halothane), (b) Principles of hypnosis and sedatives: sedative and hypnotics drugs (Phenobarbitone, diazepam), (c) Opioid analgesics (Morphine) (d) CNS stimulants (strychnine, amphetamine).

**Unit V: Anti-inflammatory, Hormones and hormone antagonists****(4)**

Drug therapy of inflammation, NSAID and other drugs (aspirin, celecoxib). Insulin and oral hypoglycaemic agent (tolbutamide, rosiglitazone), thyroid and anti-thyroid drugs (eltroxin, carbimazole), estrogen and progestins (progesterone, hydroxyprogesteronecaproate).

**Total : 24 hours****Text Books**

1. Essentials of Medical Pharmacology, 7th edition (2010), K.D. Tripathi, Jaypee Brothers.

**Reference Books**

1. H.P. Rang, M.M. Dale, J.M. Ritter and P.K. Moore Pharmacology, 7<sup>th</sup> edn (2011), , Churchill Livingstone.
2. S.K. Kulkarni, Vallabh Prakashan Hand book of Experimental Pharmacology, 4<sup>th</sup> ed (2012)

**ABILITY ENHANCEMENT COMPULSORY COURSES****SEMESTER I****15LTA001****தமிழ் மொழி, இலக்கிய வரலாறு – அறிமுகம்****5 0 0 4**

நோக்கம்: தமிழ்மொழி மற்றும் இலக்கியத்தின் வரலாற்றை அறிமுகம் செய்யும் நோக்கில் இப்பாடம் வடிவமைக்கப்பட்டுள்ளது. தமிழ்மொழியின் வரலாற்றை அறிவியல் கண்ணோட்டத்துடனும் மொழிக்குடும்பங்களின் அடிப்படையிலும் விளக்குகிறது. சங்க இலக்கியம் தொடங்கி, இக்கால இலக்கியம் வரையிலான தமிழிலக்கிய வரலாற்றை இலக்கிய வரலாறு அறிமுகப்படுத்துகின்றது. அரசு வேலை வாய்ப்பிற்கான போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையிலும் இப்பாடம் அமைந்துள்ளது.

**அலகு 1 தமிழ் மொழி வரலாறு****13 மணி நேரம்**

மொழிக்குடும்பம் - இந்திய மொழிக்குடும்பங்கள் - இந்திய ஆட்சி மொழிகள் - திராவிட மொழிக்குடும்பங்கள் - திராவிட மொழிகளின் வகைகள் - திராவிட மொழிகளின் சிறப்புகள் - திராவிட மொழிகளின் வழங்கிடங்கள் - திராவிட மொழிகளுள் தமிழின் இடம் - தமிழ்மொழியின் சிறப்புகள் - தமிழ் பிறமொழித் தொடர்புகள்.

**அலகு 2 சங்க இலக்கியம்****12 மணி நேரம்**

சங்க இலக்கியம் - எட்டுத்தொகை - நற்றிணை - குறுந்தொகை - ஐங்குறுநூறு - பதிற்றுப்பத்து - பரிபாடல் - கலித்தொகை - அகநானூறு - புறநானூறு - பத்துப்பாட்டு -

திருமுருகாற்றுப்படை - சிறுபாணாற்றுப்படை - பெரும்பாணாற்றுப்படை - பொருநராற்றுப்படை - மலைபடுகடாம் - குறிஞ்சிப்பாட்டு, முல்லைப்பாட்டு, பட்டினப்பாலை - நெடுநல்வாடை - மதுரைக்காஞ்சி.

**அலகு 3 அற இலக்கியங்களும் காப்பியங்களும்**

**11 மணி நேரம்**

களப்பிரர் காலம் விளக்கம் - நீதி இலக்கியத்தின் சமூகத்தேவை - பதினெண்கீழ்க்கணக்கு நூல்கள் அறிமுகம் - திருக்குறள், நாலடியார்.

காப்பியங்கள் - ஐம்பெருங்காப்பியங்கள் மற்றும் ஐஞ்சிறுங்காப்பியங்கள் அறிமுகம் - காப்பிய இலக்கணம் - சிலப்பதிகாரம் - மணிமேகலை - சீவகசிந்தாமணி - வளையாபதி - குண்டலகேசி.

**அலகு 4 பக்தி இலக்கியங்களும் சிற்றிலக்கியங்களும்**

**11 மணி நேரம்**

தமிழகப் பக்தி இயக்கங்கள் - பக்தி இலக்கியங்கள் - சைவ இலக்கியம் - நாயன்மார்கள் அறுபத்து மூவர் - சமயக்குரவர் நால்வர் - வைணவ இலக்கியம் - பன்னிரு ஆழ்வார்கள் - முதல் மூன்று ஆழ்வார்கள்.

சிற்றிலக்கியக் காலம் - சிற்றிலக்கியங்கள் - வகைகள் - பரணி - கலிங்கத்துப்பரணி - குறவஞ்சி - குற்றாலக் குறவஞ்சி - பிள்ளைத்தமிழ் - மீனாட்சியம்மைப் பிள்ளைத்தமிழ் - தூது - தமிழ்விடு தூது - கலம்பகம் - நந்திக்கலம்பகம் - பள்ளு - முக்கூடற்பள்ளு.

**அலகு 5 இக்கால இலக்கியங்கள்**

**13 மணி நேரம்**

நவீன காலம் - நவீன இலக்கியம் - உள்ளடக்கம் - புதுக்கவிதை - தோற்றமும் வளர்ச்சியும் - நாவல் - முதல் மூன்று நாவல்கள் - நாவலின் வகைகள் - பொழுது போக்கு நாவல்கள் - வரலாற்று நாவல்கள் - சமூக நாவல்கள் - இக்கால நாவல்கள் - மொழிபெயர்ப்பு நாவல்கள் - சிறுகதை - வகைகளும் வளர்ச்சியும் - நாடகம் - காலந்தோறும் நாடகங்கள் - புராண இதிகாச நாடகங்கள் - சமூக நாடகங்கள் - வரலாற்று நாடகங்கள் - மொழிபெயர்ப்பு நாடகங்கள் - நகைச்சுவை நாடகங்கள்.

**பாட நூல்கள்**

1. அகத்தியலிங்கம். ச., “திராவிடமொழிகள் தொகுதி 1”, மணிவாசகர் பதிப்பகம், முதற்பதிப்பு, 1978.
2. சக்திவேல். ச., “தமிழ்மொழி வரலாறு”, மணிவாசகர் பதிப்பகம், முதற்பதிப்பு 1998.

3. பூவண்ணன், “ தமிழ் இலக்கிய வரலாறு”, சைவசித்தாந்த நூற்பதிப்புக் கழகம், முதற்பதிப்பு, 1998.
4. வரதராசன். மு., ”இலக்கிய வரலாறு”,சாகித்ய அகாடெமி, ஒன்பதாம் பதிப்பு, 1994.
5. விமலானந்தம். மது.ச., “இலக்கிய வரலாறு”, பாரி நிலையம், மறுபதிப்பு, 2008.

**15LHN001**

**HINDI I**

**5 0 0 4**

**Objective**

To train the students in the use of Karyalayin Basha.To enable the students to develop the communication skill in Hindi language .

**Unit 1 Gadya aur Karyalayin Basha (12)**

Mamata, -Yogyatha evam vyavasay kaa Chunaav Paribashik shabdavalil prashasanik vakyansh,padanam,

**Unit 2 Gadya aur Sarkari Patra (12)**

Rajneethi kaa Bhantwara, , Samanya sarkari patra,gyapan,karyalay gyapan

**Unit 3 Gadya aur Sarkari Patra (12)**

Computer nayi krantee kee dastak, , Karyalay aadesh,Ardha sarkari patra paripatra,Adhisoochana

**Unit 4 Gadya aur Samanya Patra (12)**

Raspriya, Samanya patra- chutti patra,sampadak ke naam patra, shikayati patra, pustak vikretha ke naam patra

**Unit 5 Vyavasaayik patra (12)**

Bankon mein bach khaata kholne ke liye – chek buk ke liye, run lene hetu, chek buk gum ho jane hetu, kitaabon kaa krayadesh

**Total : 60 hours**

**Text Book**

1. N.Lavanya . Gadya Aur Prayojanmulak Hindi , Mayura Publishers, edition 2008



**Objective**

To introduce French Language , To enable the students to understand and to acquire the basic knowledge of French Language with the elementary grammar.

**Unit 1 Introduction****(12)**

Introduction - Alphabet – Comment prononcer, écrire et lire les mots- Base : Les prénoms personnel de 1<sup>er</sup>, 2<sup>ème</sup> et 3<sup>ème</sup> personnes – Conjugaisons les verbes être et avoir en forme affirmative, négative et interrogative

**Unit 2 Leçons 1- 3****(12)**

Leçons 1.Premiers mots en français,- 2. Les hommes sont difficiles,- 3 Vive la liberté- Réponses aux questions tirés de la leçon - Grammaire : Les adjectives masculines ou féminines – Les articles définis et indéfinis - Singuliers et pluriels

**Unit 3 Leçons 4- 6****(12)**

Leçons 4. L’heure, C’est l ;heure,- 5. Elle va revoir sa Normandie,- 6 .Mettez –vous d’accord groupe de nom - Réponses aux questions tirés de la leçon - Grammaire : A placer et accorder l’adjectif en groupe de nom- Préposition de lieu –A écrire les nombres et l’heure en français

**Unit 4 Leçons 7- 9****(12)**

Leçons7. Trois visage de l’aventure,- 8. A moi, Auvergne,- 9. Recit de voyage - Réponses aux questions tirés de la leçon - Grammaire : Adjectif possessif – Les Phrases au Présent de l’indicatif - Les phrases avec les verbes pronominaux au présent

**Unit 5 Composition****(12)**

A écrire une lettre à un ami l’invitant à une célébration différente ex : mariage – A faire le dialogue - A lire le passage et répondre aux questions

**Total : 60 hours****Text Books**

Jacky Girarder & Jean Marie Gridlig, « Méthode de Français Panorama », Clé Internationale , Goyal Publication, New Delhi., Edition 2004

**Reference Books**

- 1.Dondo Mathurin, “Modern French Course”, Oxford University Press, New Delhi, Edn 1997
2. Nitya Vijayakumar, “Get Ready French Grammar – Elementary”, Goyal Publications, New Delhi. Edn 2010

**Course objectives**

To enable the students to develop their communication skills effectively, to make students familiar with the English Language, to enrich vocabulary in English and to develop communicative competent

**Unit 1 Detailed Poems I 12**

1. On His Blindness - John Milton
2. The Village Schoolmaster - Oliver Goldsmith
3. The Daffodils - William Wordsworth

**Unit 2 Detailed Poems II 12**

4. Night and Death - Joseph Blanco White
5. The Ballad of Father Gilligan - W.B. Yeats

**Unit 3 Prose 12**

1. Martin Luther King Jr. - Coretta s King
2. Albert Schweitzer - Norman Wymar
3. Stanley Finds Livingstone - Lawrence Wilson
4. Srinivasa Ramanujan - C.P. Snow
5. My Days - R.K. Narayan

**Unit 4 Grammar 12**

1. Articles
2. Prepositions
3. Tenses
4. Wh - Questions
5. Synonyms and Antonyms
6. One Word Substitution

**Unit 5 Composition 12**

7. Reading Comprehension
8. Filling up Forms
9. Railway Reservation/ Cancellation Forms
10. Bank-Chalan
11. Convocation Form
12. Money Order Form

**Text Books**

1. Mahadevan, Usha. *Empower with English, Sun Beams - I*. Emerald Pub: Chennai. 2012. Print.

**SEMESTER II**

**15LTA002**

**தமிழிலக்கியம்**

**5 0 0 4**

**நோக்கம்**

சங்க காலம் தொடங்கி தற்காலம் வரையிலும் தமிழில் உள்ள படைப்பிலக்கியங்களை இப்பாடம் அறிமுகம் செய்கின்றது. தமிழ் இலக்கியத்தில் தேர்ந்தெடுக்கப்பட்ட மிக முக்கியமான செய்யுட்கள், கவிதைகள், கதைகள், உரைநடை ஆகியவற்றைக்கொண்டு இப்பாடம் கட்டமைக்கப்பட்டுள்ளது. மாணாக்கரிடம் இலக்கியத் தேடலை உருவாக்குவதும், தற்சார்புடைய அறிவை மேம்படுத்துவதும் இப்பாடத்தின் நோக்கமாகும்.

**அலகு 1 செவ்வியல் இலக்கியங்கள்**

**12 மணி நேரம்**

திருக்குறள்- அன்புடைமை, ஒழுக்கமுடைமை, பெரியாரைத்துணைக்கோடல் – மூன்று அதிகாரங்கள் முழுமையும்.

புறநானூறு- பாடல் எண்: 18, 55, 182, 183, 192 –ஐந்து பாடல்கள்.

குறுந்தொகை- பாடல் எண்: 2, 167, 27, 202, 184 - ஐந்து பாடல்கள்.

**அலகு 2 காப்பியங்கள்**

**12 மணி நேரம்**

சிலப்பதிகாரம்- கனாத்திறம் உரைத்தக் காதை முழுவதும்.

மணிமேகலை- பவத்திறம் அறுக எனப் பாவை நோற்ற காதை முழுவதும்.

கம்பராமாயணம் - மந்தரைச் சூழ்ச்சிப்படலம் (தேர்ந்தெடுக்கப்பட்ட ஒன்பது பாடல்கள்).

**அலகு 3 கவிதையும் புதுக்கவிதையும்**

**11 மணிநேரம்**

பாரதிதாசனின் 'தமிழியக்கம்' - (i) நெஞ்சு பதைக்கும் நிலை - (ii) இருப்பதைவிட இறப்பது நன்று - இரண்டு கவிதைகள்.

ஈரோடு தமிழன்பனின், "அந்த நந்தனை எரித்த நெருப்பின் மிச்சம்" என்னும் தொகுதியில் இடம்பெற்றுள்ள 'விடிகிறது' என்னும் புதுக்கவிதை.

**அலகு 4 சிறுகதைகள்****12 மணி நேரம்**

தி. ஜானகிராமனின் 'சக்தி வைத்தியம்'

கி. ராஜநாராயணனின் 'கதவு' - இரண்டு கதைகள்

**அலகு 5 உரைநடை****13 மணி நேரம்**

வைரமுத்து எழுதிய 'சிற்பியே உன்னைச் செதுக்குகிறேன்' முழுவதும்

மொத்தம்: 60 மணி நேரம்

**பாட நூல்கள்**

1. இரவிச்சந்திரன். சு. (ப.ஆ), "செய்யுள் திரட்டு", வேல்ஸ் பல்கலைக்கழகம், முதற்பதிப்பு, 2008.

2. வைரமுத்து. இரா., "சிற்பியே உன்னைச் செதுக்குகிறேன்", திருமகள் நிலையம், பதினேழாம் பதிப்பு, 2007.

**பார்வை நூல்கள்**

1. பாலச்சந்திரன்.சு., "இலக்கியத் திறனாய்வு", நியூ செஞ்சுரி புக் ஹவுஸ், பத்தாம் பதிப்பு, 2007.

2. மாதையன்.பெ., "தமிழ்ச் செவ்வியல் படைப்புகள்", நியூ செஞ்சுரி புக் ஹவுஸ், முதல் பதிப்பு, 2009.

3. வரதராசன்.மு., "குறள் காட்டும் காதலர்", பாரி நிலையம், மறுபதிப்பு, 2005.

**15LHN002****HINDI II****5 0 0 4****Objective**

To enable the students to have the knowledge in contemporary literature of the modern era. It also provides an idea how translation to be effected.

**Unit 1 Kahani Aur Ekanki (12)**

Poos Kee Raat., - Duzhazar

**Unit 2 Ekanki aur Kahani (12)**

Vaapasi, Akeli, . Akbhari vigyapan

**Unit 3 Kahani Aur Anuvad (12)**

Sharandatha - Anuvad anuched angreji se hindi me karne ke liye.

**Unit 4 Ekanki aur Anuvad (12)**

Raat ke Raahi Main Bhi Maanav hoon Anuvad anuched angreji se hindi me karne ke liye.

**Unit 5 Kahani ,Ekanki Aur Anuvad (12)**

Parda - Yeh Meri Janma Bhoomi Hai -anuvad anuched angreji se hindi me karne ke liye.

**Total : 60 hours**

**Text Books**

1. N.Lavanya, Sankalan Kahani evam Ekankied Mayura Publishers, edition 2010

**15LFR002**

**FRENCH II**

**5 0 0 4**

**Objective**

To fortify the grammar and vocabulary skills of the students and Enable the students have an idea of the French Culture and Civilization.

**Unit 1 - Leçons 10 – 11 (12)**

Leçons : 10. Les affaires marchent,- 11. Un après midi à problèmes- Réponse aux questions tirés de la leçon - Grammaire : Présent progressif, passé récent ou future proche - Complément d'objet directe - Complément d'objet indirecte .

**Unit 2 - Leçons 12 – 13 (12)**

Leçons : 12. Tout est bien qui fini bien,- 13. Aux armes citoyens – Réponses aux questions tirés de la leçon - Grammaire : Les pronoms « en ou y » rapporter des paroles - Les pronoms relatifs que, qui, ou où .

**Unit 3 - Leçons 14 – 15 (12)**

Leçons 14. Qui ne risqué rien n'a rien,- 15. La fortune sourit aux audacieux – Réponses aux questions tirés de la leçon - Grammaire : Comparaison – Les phrases au passé composé

**Unit 4 - Leçons 16 – 18 (12)**

Leçons16 La publicite et nos rêves 17 La france le monde 18 Campagne publicitaire Réponses aux questions tirés de la leçon - Grammaire :- Les hrases à l' Imparfait - Les phrases au Future

**Unit 5 - Composition : (12)**

A écrire une lettre de regret// refus à un ami concernant l'invitation d'une célébration reçue- A écrire un essaie sur un sujet générale - A lire le passage et répondre aux questions

**Total : 60 hours**

**Text Books**

Jacky Girarder & Jean Marie Gridlig, « Méthode de Français Panorama », Clé Internationale , Goyal Publication, New Delhi., Edition 2004

**Reference Books**

1. Dondo Mathurin, “ Modern French Course”, Oxford University Press, New Delhi., Edition 1997
2. Paul Chinnappane “ Grammaire Française Facile” , Saraswathi House Pvt Ltd, New Delhi, Edition 2010

**15LEN002****FOUNDATION ENGLISH II****6 0 0 4****Course Objective: -**

To enable the students to develop their communication skills effectively. To make students familiar with the English Language. To enrich vocabulary in English. To develop communicative competency.

**Unit 1 Prose-I****12**

1. On Saying ‘Please’ - A.G. Gardiner
2. Women, Not the Weaker Sex - M.K. Gandhi
3. The Sky is the Limit - Kalpana Chawla

**Unit 2 Prose-II****12**

4. Polluting the World - Edgar I. Baker
5. Dimensions of Creativity - Dr. A. P. J. Abdul Kalam
6. The Message of Visva - Bharati

**Unit 3 Short Stories****12**

1. Open Window - H. H. Munro (Saki)
2. The Lion’s Share - Arnold Bennett
3. The Sparrows - K.A. Abbas
4. The Cop and The Anthem - O- Henry
5. The Necklace - Guyde Maupassant

**Unit 4 Fundamental Grammar Skills****12**

1. Question Tags
2. Concord
3. Reported Speech
4. Idiom and Phrases

**Unit 5 Advanced Grammar Skills****12**

5. Conditional Clauses
6. Cause and Effect

7. Simple, Complex, Compound

8. Framming Questions

**Total : 60 hours**

### **Text Books**

1. Rao, Shoba B. Empower with English, Sun Beams - II. Emerald Pub: Chennai. 2012. Print.

## **SEMESTER III**

**15LTA003**

**பயன்பாட்டுத் தமிழ்**

**5 0 0 4**

### **நோக்கம்**

தற்கால அன்றாடத்தேவைக்குரிய வகையில் தமிழ்மொழியைச் செம்மையாகப் பயன்படுத்த வேண்டும் என்னும் நோக்கில் இப்பாடம் உருவாக்கப்பட்டுள்ளது. மாணாக்கரின் வேலைவாய்ப்பு நேர்காணல்கள் மற்றும் குழு உரையாடல்களை எதிர்கொள்வதற்கேற்ற பேச்சுத்திறன் மேம்பாடு, செய்தித்தாள்களை நுட்பமாக அணுகும்விதம், சிறந்த கடிதங்களை எழுதுவதற்கான பயிற்சி போன்ற பயன்பாடு சார்ந்த மொழிப்பயிற்சியை இப்பாடம் அளிக்கின்றது.

### **அலகு 1 மொழி**

**11 மணி நேரம்**

பிழை நீக்கி எழுதுதல் - ஒற்றுப்பிழை நீக்கி எழுதுதல் - தொடர்பிழை நீக்கி எழுதுதல் - ஒற்று மிகும் இடங்கள் - ஒற்று மிகா இடங்கள் - பிற மொழிச் சொற்களை நீக்கி எழுதுதல் - பயிற்சிகள்.

### **அலகு 2 பேச்சு**

**13 மணி நேரம்**

பேச்சுத்திறன் - விளக்கம் - பேச்சுத்திறனின் அடிப்படைகள் - வகைகள் - மேடைப்பேச்சு - உரையாடல் - குழுவாக உரையாடல் - பயிற்சிகள்.

தலைவர்களின் மேடைப் பேச்சுகள் - பெரியார் - அண்ணா - கலைஞர்.

### **அலகு 3 எழுதுதிறன்**

**12 மணி நேரம்**

கலைச்சொல்லாக்கம் - தேவைகள் - கலைச்சொற்களின் பண்புகள் - கலைச்சொல்லாக்கத்தில் தவிர்க்க வேண்டியவை - அறிவியல் கலைச்சொற்கள்.

கடிதம் - வகைகள் - அலுவலகக் கடிதங்கள் - பயிற்சி - அறிஞர்களின் கடிதங்கள் - கடிதங்களின் வழி கற்பித்தல் - சில அறிஞர்களின் கடிதங்கள் - நேரு...,

### **அலகு 4 மொழிபெயர்ப்பு**

**13 மணி நேரம்**

மொழிபெயர்ப்பு அடிப்படைக் கோட்பாடுகள் - மொழிபெயர்ப்பு முறைகள் - மொழிபெயர்ப்பாளரின் தகுதிகள்.

மொழிபெயர்ப்பு வகைகள் - சொல்லுக்குச் சொல் மொழிபெயர்த்தல் - தழுவல் - கட்டற்ற மொழிபெயர்ப்பு - மொழியாக்கப்படைப்பு - இயந்திர மொழிபெயர்ப்பு - கருத்துப்பெயர்ப்பு - மொழிபெயர்ப்பு நடை - மொழிபெயர்ப்பு சிக்கல்களும் தீர்வுகளும்.

பயிற்சி: அலுவலகக் கடிதங்களை மொழிபெயர்த்தல் (ஆங்கிலத்திலிருந்து தமிழுக்கு).

**அலகு 5 இதழியல் பயிற்சி**

**11 மணி நேரம்**

இதழ்களுக்குத் தலையங்கம் எழுதுதல் - நூல் மதிப்புரை எழுதுதல் - சாதனையாளரை நேர்காணல் - நிகழ்ச்சியைச் செய்தியாக மாற்றுதல்.

**பாட நூல்கள்**

1. ஈஸ்வரன்.ச., சபாபதி.இரா., “இதழியல்”, பாவை பப்ளிகேஷன்ஸ், முதற்பதிப்பு, 2004.
2. ஈஸ்வரன்.ச., “மொழிபெயர்ப்பியல்”, பாவை பப்ளிகேஷன்ஸ், முதற்பதிப்பு, 2005.
3. எட்கர் தார்ப், ஷோவிக் தார்ப், “நேர்முகத் தேர்வில் வெற்றிபெற”, கிழக்குப் பதிப்பகம், இரண்டாம் பதிப்பு, 2009.
4. சுப்பிரமணியன்.பா.ரா., ஞானசுந்தரம்.வ., (ப.ஆ)“தமிழ்நடைக் கையேடு”, இந்தியமொழிகளின் நடுவண் நிறுவனம், மைசூர் மொழி அறக்கட்டளை மற்றும் தஞ்சைத்தமிழ்ப் பல்கலைக்கழகம் - வெளியீடு, நான்காம் மீள்பதிப்பு, 2010.
5. சுப்புரெட்டியார்.ந., “தமிழ் பயிற்றும் முறை”, மெய்யப்பன் பதிப்பகம், ஐந்தாம் பதிப்பு, 2006.

**15LHN003**

**HINDI III**

**5 0 0 4**

**Objective**

To help the students to have in depth knowledge of Literature. It makes the students to acquire more about the medieval period through the literary works.

**Unit 1-Prachin Kavya Hindi Sahitya ka Itihas**

**(12)**

Kabir- Hindi bash aka vikas – Hindi sahitya kaa aavirbahv

**Unit 2 - Prachin Kavya Hindi Sahitya ka Itihas**

**(12)**

Surdaas, Tulsidass. Hindi sahitya kaa kaal vibhajan, aadikal, kaa Parichay



**Unit3- Prachin Kavya Hindi Sahitya ka Itihas (12)**

Rahim, aadikaal kaa namkran, paristhitiyan, racha evam rachnaakar

**Unit 4 - Bhakti Kaal, Reethi kaa (12)**

Bhakti kal kaa vibhajan paristhitiyan- racha evam rachnaakar - Reethikal ke prakaar, rachna evam rachnakar

**Unit 5 -Prachin Kavya evam rachnakaron kaa parichay (12)**

Bihari - Chandbardayee, Ameerkhusaro, Kabir, Surdas, Tulsidas Jaayasi, Kesahv das Bhushan,

**Total : 60 hours**

**Text Books**

1. N.Lavanya, Prachin evam Aadhunik Kavya Sankalan ed , Mayura Publishers, edition 2011

**Reference Book**

1. Nagendra, Hindi Sahitya kaa Itihas, Raj kamal Prakashan, 1997

**15LFR003**

**FRENCH III**

**5 0 0 4**

**Objective**

To strengthen the Grammar and Composition in French language and To train the students to enhance his skill in French language for communication

**Unit 1 Leçon 16 & 29 (12)**

Leçon 16 - La famille Vincent (Page 44) - Grammaire : Passé composé'

Leçon 29 - Vers l'hôtel (page 80) Grammaire : Impératif, A mettre les phrases du singulier au pluriel

**Unit 2 Leçon 40 & 44 (12)**

Leçon 40 - L'épicerie, les légumes et les fruits (page 112) – Grammaire : Présent de l'indicatif

Leçon 44 - La poste (page 124) – Grammaire : A mettre les phrases à l'imparfait

**Unit 3 Leçon 51 & 58** (12)

Leçon 51 - Le café et tabac (page 142) - Grammaire : A changer les phrases en Interrogatif

Leçon 58 - La Chasse et la pêche (160) - Grammaire : Le plus que parfait

**Unit 4 Leçon 61** (12)

Leçon 61 Un mariage à la campagne (page 170) - Grammaire –A changer au participe présent

**Unit 5 Composition** (12)

Composition : A écrire une lettre à un ami l'invitant à une celebration differente ex : mariage –

A faire un essaie sur un sujet générale - A lire le passage et répondre aux questions

**Total : 60 hours**

**Text Books**

Les leçons ont été choisi et tiré de I & II degré de G .MAUGER « Cours de Langue et de Civilisation Française » The Millenium, Publication Hachette, Edition 2002

**Reference Books**

1. Dondo Mathurin, “ Modern French Course”, Oxford University Press, New Delhi., Edition 1997

2. Paul Chinnapan, « Saraswati Grammaire Française facile », Saraswathi House Pvt. Ltd., New Delhi., Edition 2010

3. Larouse, “Larouse French Grammar”, Goyal Publication, New Delhi., Edition 1995

**15LEN 003**

**Foundation English –III**

**5 0 0 4**

**Objective**

To Train The Students In The Use Of The English Language In Varied Literary And Non Literary Context, To Teach Them Soft Skills And Strength Their Foundation In Grammar And Composition, To Elevate Their Comprehension Skills.

**Unit 1 Prose I**

**12**

1. Spoon Feeding - W. R. Inge
2. Reading For Pleasure - L. A. G. Strong
3. The Challenge Of Our Time - E. M. Forster

**Unit 2 Prose II**

**12**

4. Human Values In Education - V. K. Gokak
5. Human Rights - Sivagami Paramasivam

**Unit 3 Short Stories** **12**

1. Comrades - Nanine Gordimer
2. Games At Twilight - Anita Desai
3. The Gateman's Gift - R.K. Narayan

**Unit 4 Primary Composition Exercises** **12**

1. Letter Writing
2. Comprehension

**Unit 5 Advancedcomposition Exercises** **12**

3. Precis-Writing
4. Resume Writing
5. Report Writing

**Total : 60 hours**

**Text Books**

1. Subramanian, S. Dr. Words of Wisdom. An Anthology of Modern Prose. Anu Chitra Pub., Chennai. 2003. P.
2. Subramanian, A, E. Gifts to Posterity. An Anthology of Modern Short Stories. Anu Chitra Pub., Chennai. 2003.

**SEMESTER IV**

**15LTA004**

**தமிழர் நாகரிகமும் பண்பாடும்**

**5004**

**நோக்கம்**

பண்டைத் தமிழரின் வாழ்வியல் நெறிகள் இயல்பானதும் இயற்கையோடு இணங்கிச் செல்வதுமாகும்; மிகவும் பழமையானதும் பண்பட்டதுமாகும். அன்பான அக வாழ்க்கையைக்கூட செம்மையாகத் திட்டமிட்டுள்ளனர். பொழுதுபோக்கு, போர்முறைகள், கலை, சமயம், அரசியல், அறிவியல் என அனைத்திலும் தமிழர் சிறந்து விளங்குவதை விளக்கும் பாடமாக இது அமைந்துள்ளது. அரசு வேலை வாய்ப்பிற்கான போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையிலும் இப்பாடம் அமைந்துள்ளது.

**அலகு 1 நாகரிகம், பண்பாடு****12 மணி நேரம்**

சொற்பொருள் விளக்கம் - பண்டைத் தமிழர் வாழ்வியல் - அகம் - களவு - கற்பு - குடும்பம் - விருந்தோம்பல் - உறவு முறைகள் - சடங்குகள் - நம்பிக்கைகள் - பொழுதுபோக்கு - புறம் - போர் முறைகள் - நடுகல் வழிபாடு - கொடைப்பண்பு.

**அலகு 2 கலைகள்****12 மணி நேரம்**

சிற்பம் - ஓவியம் - இசை - கூத்து - ஒப்பனை - ஆடை அணிகலன்கள்.

**அலகு 3 சமயம்****12 மணி நேரம்**

சைவம் - வைணவம் - சமணம், பௌத்தம் வெளிப்படுத்தும் பண்பாடு.

**அலகு 4 அரசியல்****12 மணி நேரம்**

அரசு அமைப்பு - ஆட்சி முறை - உள்நாட்டு வணிகம் - வெளிநாட்டு வணிகம் - வரி வகைகள் - நாணயங்கள் - நீதி முறை.

**அலகு 5 அறிவியல்****12 மணி நேரம்**

கல்வி - வேளாண்மை - வானியல் அறிவு - மருத்துவம் - கட்டிடக்கலை.

**பாட நூல்கள்**

1. கே.கே. பிள்ளை, “தமிழக வரலாறு: மக்களும் பண்பாடும்”, உலகத் தமிழாராய்ச்சி நிறுவனம், மீள்பதிப்பு, 2009.
2. பக்தவச்சல பாரதி, “தமிழர் மானிடவியல்”, அடையாளம், இரண்டாம் பதிப்பு, 2008.
3. தட்சிணாமூர்த்தி. அ., “தமிழர் நாகரிகமும் பண்பாடும்”, யாழ் வெளியீடு, மறுபதிப்பு, 2011.
4. தேவநேயப்பாவாணர். ஞா., “பழந்தமிழர் நாகரிகமும் பண்பாடும்”, தமிழ்மண் பதிப்பகம், சென்னை.
5. வானமாமலை.நா., “தமிழர் வரலாறும் பண்பாடும்”, நியூ செஞ்சுரி புக் ஹவுஸ், ஆறாம் பதிப்பு, 2007.

**15LHN004****HINDI IV****5 0 0 4****Objective**

To enable the students to acquire knowledge in journalism so as to enhance his skill in effective communication pertaining to Hindi language .

**Unit 1 -Aadhunik kavitha Aur Rachnaakar (12)**

Mythili Sharan Gupt - Apna Sansar, Aadhunik Rachnakar Hazaari prasad Diwedi,  
Mahaveer Prasad Diwedi,

**Unit 2- Aadhunik kavitha Aur Rachnaakar (12)**

Jayashankar Prasad Kamayani - Chinta, Aadhunik Hindi Rachanakar Premchand, Jainendra

**Unit 3 - Aadhunik kavitha Aur Patrakaritha (12)**

Mahadeviverma, Murjaya PhoolBhavani Prasad Mishra Patrakarita – paribhasha,, arth, prakar,  
swaroop

**Unit 4- Aadhunik kavitha , Patrakaritha aur Rachnakar (12)**

Mukthibodh Tum Logoan se door,Shamsher Bhadur Singh – Bharat kee aarathi,  
Vigyapan- sampadan kala,-Nirala, -Pant- Mohan Rakesh

**Unit 5 -Aadhunik kavitha , Patrakaritha aur Rachnakar (12)**

Prabhakar Machve Nimna Mdhya varg, **Patrakaritha-** samachar sankalan - Peeth patrakarita,  
Rachnakaar - Fanishwaranath renu -Mannu bhandari,Bhagawaticharan Verma, Yashpal

**Total : 60 hours**

**Text Books**

1. N.Lavanya, Prachin evam Aadhunik Kavya Sankalan ed Mayura Publishers, edition 2011

**Reference Book**

- 1..Patrakaritha Ek Paricahy by Dr.Madhu Dhawan, Bodh Prakashan, edition 1997

**15LFR004**

**FRENCH IV**

**5 0 0 4**

**Objective**

To enable the students to strengthen their knowledge of grammar/composition , To make the students to develop their skills of communication in French language

**Unit 1 Leçon 20 & 46 : (12)**

Leçon 20 - Une grande Nouvelle (page 56) – Grammaire : A mettre les phrases au Future

Leçon 46. - Le métro ; l'autobus (page 130 ) - Grammaire : A former ou à changer l'adjectif masculin ou féminin à l'adverbe - A trouver les noms qui correspondent aux verbes

**Unit 2 Leçon 48 & 63** (12)

Leçon 48. - A la Préfecture de police (page 132) - Grammaire : Les Pronoms relatifs

Leçon 63 - Les sports (page 174) Grammaire : Le conditionnel présent

**Unit 3 Leçon 56 & 57** (12)

Leçon 56 - A Biarritz, la plage (page 156) - Grammaire : Le future antérieure

Leçon 57 - Dans les Pyrénées (page 158) - Grammaire : Le future antérieure suite)

**Unit 4 Leçon 65** (12)

Leçons 65 - A fin des vacances (page 178) Grammaire : A changer les phrases du pluriel- au singulier - Le présent du subjonctif

**Unit 5** (12)

Composition : A écrire une lettre de regret / refus à un ami concernant l'invitation d'une célébration reçue- A écrire un essai sur un sujet générale - A lire le passage et répondre aux questions

**Total : 60 hours**

**Text Book**

Les leçons ont été choisi et tiré de I & II degré de G .Mauger « Cours de Langue et de Civilisation Française » The Millenium, Publication Hachette, Edition 2002

**Reference Books**

- 1.Dondo Mathurin, “ Modern French Course”, Oxford University Press, New Delhi, Edition 1997
- 2.Paul Chinnapan, « Saraswati Grammaire Française facile », Saraswathi House Pvt. Ltd., New Delhi., Edition 2010
- 3.Larouse, “Larouse French Grammar”, Goyal Publication, New Delhi., Edition 1995

**15LEN004**

**FOUNDATION ENGLISH IV**

**5 0 0 4**

**Course objectives**

To train the students in the use of the english language in varied literary and non literary context,  
To teach them soft skills and strength their foundation in grammar and composition, To elevate their comprehension skills

**Unit 1 Prose I**

**12**

1. The Complete Man - Prince Philip

2. Try Prayer Power - Norman Vincent Peale	
3. On Not Answering The Telephone - W. Plomer	
<b>Unit 2 Prose II</b>	<b>12</b>
4. Science, humanities and religion - S. Radhakrishnan	
5. The Reason - E. V. Lucas	
<b>Unit 3 Short Stories</b>	<b>12</b>
1. The Ant and the Grasshopper - W. Somerset Maugham	
2. How much land does a man need - Leo Tolstoy	
3. The Dying Detective - Sir Arthur Conan Doyle	
<b>Unit 4 Primary Composition Exercises</b>	<b>12</b>
1. Business Letters	
2. Hints Development	
<b>Unit 5 Advanced Composition Exercises</b>	<b>12</b>
3. Paraphrasing	
4. Writing Abstract	
5. Dialogue Writin	

**Total : 60 hours**

**Text Books**

1. Subramanian, S. Dr. Words of Wisdom. An Anthology of Modern Prose. Anu Chitra Pub., Chennai. 2003.
2. Subramanian, A, E. Gifts to Posterity. An Anthology of Modern Short Stories. Anu Chitra Pub., Chennai. 2003.

**15EVS201**

**ENVIRONMENTAL STUDIES**

**2 0 0 2**

**Unit 1 Multidisciplinary nature of environmental studies**

Definition, scope and importance (2)

Need for public awareness.

**Unit 2 Natural Resources**

Renewable and non-renewable resources: Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles. (5)

### **Unit 3 Ecosystems**

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem:-
  - a. Forest ecosystem
  - b. Grassland ecosystem
  - c. Desert ecosystem
  - d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)(4)

### **Unit 4 Biodiversity and its conservation**

- Introduction – Definition: genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
  - Biodiversity at global, National and local levels.
  - India as a mega-diversity nation
  - Hot-spots of biodiversity.
  - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
  - Endangered and endemic species of India
  - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.



### **Unit 5: Environmental Pollution**

(4)

Definition • Cause, effects and control measures of :- a. Air pollution b. Water pollution  
c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

(3)

### **Unit 6: Social Issues and the Environment**

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

(3)

### **Unit 7 : Human Population and the Environment**

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.
- Environment and human health.
- Human Rights.

- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

(3)

### **Unit 8 : Field work**

- Visit to a local area to document environmental assetsriver/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

**Total : 24 hours**

### **Text Books**

Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.

### **Reference Books**

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India,
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford

## **SKILL ENHANCEMENT COURSES**

**15NSS255**

**NATIONAL SERVICE SCHEME**

**2 0 0 2**

### **Course objectives**

To inculcate interest in building up a better society.

### **Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Voluntarily involve with the community situation.

**CO2:** Provide opportunities to play their due roles in the implementation of various community development "programmes.

**CO3:** Plan and organize awareness camps

- CO4:** Assist and working with local authorities in relief and rescue operation
- CO5:** Emphasise the dignity of labour and self-help and the need for combining physical work with intellectual pursuits
- CO6:** Participate enthusiastically in the process of national development and promote national integration through democratic living and cooperative action.
- CO7:** Voluntarily assist people for their welfare

**Unit 1 Environment Issues (5)**

Environment conservation, enrichment and Sustainability - Climate change - Waste management - Natural resource management - (Rain water harvesting, energy conservation, waste land development, soil conservations and afforestation)

**Unit 2 Disaster Management (4)**

Introduction to Disaster Management, classification of disasters - Role of youth in Disaster Management

**Unit 3 Project Cycle Management (5)**

Project planning - Project implementation - Project monitoring - Project evaluation : impact assessment

**Unit 4 Documentation and Reporting (5)**

Collection and analysis of data - Preparation of documentation/reports - Dissemination of documents/reports

**Unit 5 Project work/ Practical (5)**

Workshops/seminars on personality development and improvement of communication skills.

**15BBC251                      ENTREPRENEURSHIP DEVELOPMENT                      2 0 0 2**

**Course objectives**

The course intends to introduce to the students the field of entrepreneurship and to inculcate the interest in entrepreneurship.

**Course outcomes**

**After the completion of this course, the student will be able to**

- CO1:** Discuss fundamentals of entrepreneurship
- CO2:** Assess the development of entrepreneurship as a field of study and as a profession
- CO3:** Demonstrate business models and plans for a new enterprise
- CO4:** Identify capital resources for the new enterprise
- CO5:** Discuss marketing strategies for the business
- CO6:** Evaluate the role and process of marketing research

**CO7:** Analyze global business environment

**CO8:** Understand global market

**CO9:** Explain marketing decisions underlying international business made with differences in the political, legal, economic, and cultural environments

**CO10:** Analyze factors affecting a business/organization to evaluate business opportunities

**Unit 1 Introduction (5)**

Meaning, Needs and Importance of Entrepreneurship, Promotion of entrepreneurship, Factors influencing entrepreneurship, Features of a successful Entrepreneurship.

**Unit 2 Establishing An Enterprise (5)**

Forms of Business Organization, Project Identification, Selection of the product, Project formulation, Assessment of project feasibility.

**Unit 3 Financing The Enterprise (5)**

Importance of finance / loans and repayments, Characteristics of Business finance, Fixed capital management: Sources of fixed capital, working capital its sources and how to move for loans, Inventory direct and indirect raw materials and its management.

**Unit 4 Marketing Management (5)**

Meaning and Importance, Marketing-mix, product management – Product line, Product mix, stages of product like cycle, marketing Research and Importance of survey, Physical Distribution and Stock Management.

**Unit 5 Entrepreneurship And International Business (4)**

Meaning of International business, Selection of a product, Selection of a market for international business, Export financing, Institutional support for exports.

**Total : 24 hours**

**Text Books**

1. Holt DH. Entrepreneurship: New Venture Creation. 2005

**Reference Books**

1.Kaplan JM Patterns of Entrepreneurship. 2004

2.Gupta CB, Khanka SS. Entrepreneurship and Small Business Management, Sultan Chand & Sons. 2014.

**Course objectives**

Medical Lab Diagnostics would help students enhance their practical skills and would enable them work in a Hospital setup. The students would orient themselves to work in a proper diagnostic setting, would be introduced to detection of diseases using microbiological and molecular methods.

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Demonstrate the theoretical knowledge and technical skills in the performance of routine laboratory testing.

**CO2:** Explain and apply basic principles of medical terminology, safety measures, universal precautions, infection control and potential sources of error as they relate to standard laboratory operating procedures and quality patient care.

**CO3:** Demonstrate technical skills by following established procedures for collecting and processing biological specimens for analysis.

**CO4:** Apply mathematical calculations and statistical methods to ensure the accuracy of laboratory test results.

**CO5:** Operate and calibrate clinical laboratory instruments or equipment after proper orientation.

**CO6:** Demonstrate laboratory practice standards in safety, professional behavior and ethical conduct.

**CO7:** Be proficient in performing the full range of clinical laboratory tests in areas such as hematology, clinical chemistry, immunohematology, microbiology, serology/immunology, coagulation, urinalysis, molecular, and other emerging diagnostics.

**CO8:** Effective communication skill to ensure accurate and appropriate information transfer.

**CO9:** Maintain confidentiality of patient information and test results.

**CO10:** Inform superiors of activities including unusual patient data or results.

**Unit 1 Introduction****(6)**

Organization of clinical laboratory, Introduction to instrumentation and automation in clinical biochemistry laboratories safety regulations and first aid. General comments on specimen collection, types of specimen for biochemical analysis. Precision, accuracy, quality control, precautions and limitations.

**Exercises:** Collection of blood and storage, Separation and storage of serum.

**Unit 2 Assessment of glucose metabolism in blood (5)**

Clinical significance of variations in blood glucose. Diabetes mellitus.

**Exercises:** Estimation of blood glucose by glucose oxidase peroxidase method.

**Unit 3 Lipid profile (4)**

Composition and functions of lipoproteins. Clinical significance of elevated lipoprotein.

**Exercises:** Estimation of triglycerides.

**Unit 4 Liver function tests (4)**

**Exercises:** Estimation of bilirubin (direct and indirect).

**Unit 5 Renal function tests and urine analysis (5)**

Use of urine strip / dipstick method for urine analysis.

**Exercises:** Quantitative determination of serum creatinine and urea.

**Total : 24 hours**

**Text Books**

Bailey and Scott's Diagnostic Microbiology, 12th edition (2007), Betty A. Forbes, Daniel F. Sahm and Alice S. Weissfeld; Mosby Elsevier Publishers, ISBN-13: 978-0808923640.

**Reference Books**

1. Ramnik Sood Medical Laboratory Technology Methods and Interpretations Volume 1 and 2, 6th edition (2009),; Jaypee Brothers Medical Publishers, ISBN-13: 978-8184484496.
2. James Cappuccino and Natalie Sherman, Benjamin Cummings Microbiology: A Laboratory Manual, 10th edition (2013), ISBN-13: 978-0321840226

**15BBC253**

**TECHNIQUES FOR FORENSIC SCIENCE**

**2002**

**Course objectives**

Forensic science is the application of scientific knowledge to questions of civil and criminal law. Interest in forensic science has grown considerably in recent years. Keeping this in view, the present forensic science course is designed for students to explore how forensic scientist's work, the tools and techniques they use and how they reach the conclusions they present in court.

**Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Discuss about the concepts of forensic Science

**CO2:** Understand about legal proceedings involved in a civil and criminal cases

**CO3:** Understand the procedures involved in the investigation of the crime scene

**CO4:** Have in depth understanding of identification procedures utilized under Forensic toxicology

**CO5:** Discuss about identification of different types of injuries and their cause

**CO6:** Discuss about causes of death by different means and the associated medico-legal aspects

**CO7:** Discuss about fingerprint analysis and interpretations

**CO8:** Discuss about isolation of DNA from available biological samples

**CO9:** Understand the analysis of DNA by DNA fingerprinting method

**CO10:** Understand the different types of samples used in forensic investigation

**Unit I: Crime Scene Investigation (5)**

Documentation of crime scene by photography, sketching and field notes. Simulation of a crime scene for training. To lift footprints from crime scene. Introduction and principles of forensic science, Forensic science laboratory and its organization and service, tools and techniques in forensic science, branches of forensic science, causes of crime, role of modus operandi in criminal investigation

**Unit 2: Types of injuries and death (5)**

Case studies to depict different types of injuries and death. Classification of injuries and their medico-legal aspects, method of assessing various types of deaths.

**Unit 3: Forensic Toxicology (5)**

Identification techniques of common toxins, drugs, pesticides, Volatile poisons, vegetable poisons etc. in given biological samples and crime scene. Role of the toxicologist, significance of toxicological findings

**Unit 4: Fingerprint analysis (5)**

Investigation method for developing fingerprints by Iodine crystals. To observe the effects of surface temperature on fingerprints. Fundamental principles of fingerprinting, classification of fingerprints, development of finger print as science for personal identification.

**Unit 5: DNA Fingerprinting (4)**

DNA isolation in minimal available biological samples. PCR amplification on target DNA and DNA profiling. Principle of DNA fingerprinting, application of DNA profiling in forensic medicine

**Total : 24 hours**

## **Text Books**

1. James SH, Nordby JJ and Bell S Forensic Science – An introduction to Scientific and Investigative Techniques, 3rd edition (2009),; CRC Press, ISBN-13: 978-1420064933.
2. Barbara Wheeler and Lori J Wilson; Practical Forensic Microscopy: A laboratory manual, 1st edition (2008), Bios Scientific Publisher, ISBN-13: 978-0470031766.

## **Reference Books**

1. Rajesh Bardale, Principles of Forensic Medicine and Toxicology, 1st edition (2011); Jaypee Brothers Medical Pub, ISBN-13: 978-9350254936.
2. Ross M Gardner, Practical Crime Scene Processing and Investigation, 2nd edition (2011), CRC press ISBN-13: 978-1439853023.
3. Karmakar, Forensic Medicine and Toxicology: Oral, Practical And Mcq, 3rd edition (2006), Jaypee Brothers, ISBN-13: 978-8171797350.
4. Houck, M.M. and Siegel, JA; Fundamentals of Forensic Science, 2nd edition (2010), Academic Press, ISBN-13: 978-0123749895.

**15BBC254**

**MEDICAL LAB DIAGNOSTICS-II**

**2002**

### **Course objectives**

Medical Lab Diagnostics would help students enhance their practical skills and would enable them work in a Hospital setup. The students would orient themselves to work in a proper diagnostic setting and introduced to detection of diseases using various methods.

### **Course outcomes**

**After the completion of this course, the student will be able to**

**CO1:** Demonstrate the theoretical knowledge and technical skills in the performance of routine laboratory testing.

**CO2:** Explain and apply basic principles of medical terminology, safety measures, universal precautions, infection control and potential sources of error as they relate to standard laboratory operating procedures and quality patient care.

**CO3:** Demonstrate technical skills by following established procedures for collecting and processing biological specimens for analysis.

**CO4:** Apply mathematical calculations and statistical methods to ensure the accuracy of laboratory test results.

**CO5:** Operate and calibrate clinical laboratory instruments or equipment after proper orientation.

**CO6:** Demonstrate laboratory practice standards in safety, professional behavior and ethical conduct.



**CO7:** Be proficient in performing the full range of clinical laboratory tests in areas such as hematology, clinical chemistry, immunohematology, microbiology, serology/immunology, coagulation, urinalysis, molecular, and other emerging diagnostics.

**CO8:** Effective communication skill to ensure accurate and appropriate information transfer.

**CO9:** Maintain confidentiality of patient information and test results.

**CO10:** Inform superiors of activities including unusual patient data or results.

**Unit 1 Fundamentals (5)**

Sterilization Techniques: Physical methods and Chemical methods.

General overview of blood banking, blood typing, blood screening in transfusion medical lab.

**Excercise:** Blood grouping

**Unit 2 Tests for cardiovascular diseases (5)**

Involvement of enzymes in diagnostics of heart disease including aspartate transaminase, isoenzymes of creatine kinase and lactate dehydrogenase and troponin.

**Excercise:** Estimation of creatine kinase MB.

**Unit 3 Endocrinology (5)**

Significance of hormones and normal levels of hormones in biological samples. Use of biosensors in hormone assay

**Excercise:** Beta HCG

**Unit 4 Immunoserology: Principles and Application I (5)**

Use of Antigen-antibody interaction in diagnosis: Detection and diagnosis of common infectious diseases: Widal and typhi dot for typhoid, Malaria antigen in Malaria, NS1 antigen in Dengue

**Excercise:** Widal Test

**Unit 5 Immunoserology: Principles and Application II (4)**

Use of Antigen-antibody interaction in diagnosis: Detection and diagnosis of common non-infectious diseases: Acylatedhaemoglobin in Diabetes, TSH levels in Thyroid condition.

**Total : 24 hours**

**Text Books**

Bailey and Scott's Diagnostic Microbiology, 12th edition (2007), Betty A. Forbes, Daniel F. Sahm and Alice S. Weissfeld; Mosby Elsevier Publishers, ISBN-13: 978-0808923640.

**Reference Books**

1. Ramnik Sood Medical Laboratory Technology Methods and Interpretations Volume 1 and 2, 6th edition (2009),; Jaypee Brothers Medical Publishers, ISBN-13: 978-8184484496.

2. James Cappuccino and Natalie Sherman, Benjamin Cummings Microbiology: A Laboratory Manual, 10th edition (2013), ISBN-13: 978-0321840226