VELS

INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM - CHENNAI
NAAC ACCREDITED WITH 'A' GRADE
Marching Beyond 25 Years Successfully

B.Sc
Biochemistry

Curriculum and Syllabus

Effective from the Academic year
2018 - 2019

Department of Biochemistry
School of Life Sciences

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO-1: An ability to relate fundamental knowledge related to pure sciences in an interdisciplinary manner for providing innovative ideas to solve problems having global impact.

PEO-2: An ability to critically analyze scientific data, draw objective conclusions and apply this knowledge for human welfare. Students should be able to demonstrate expertise and ethical perspective on areas related to Biochemistry.

PEO-3: After completion of the program the students are well poised to pursue careers in academic, research and industry in the areas of pharmaceutical and biotechnology.

PEO-4: Life-long learning to retain and build on scientific skills and use them to update knowledge and apply them in day to day life.

PEO-5: Understanding and Disciplinary knowledge of biochemistry, structure, function of biological molecules and its mechanisms.

PROGRAM OUTCOME (PO)

The B.Sc. program (Biochemistry, Biotechnology, Bioinformatics and Microbiology) at VISTAS has documented measurable outcomes that are based on the needs of the programme's stakeholders. The programme outcomes that the department presently adapts to future graduates are as follows:

PO-1 Scientific knowledge: Graduates will acquire biochemistry/biotechnology / bioinformatics/ microbiology specific knowledge, including recent techniques in the respective fields coupled with hands-on skills and leadership skills for a successful career.

PO-2 Problem analysis: Graduates will be able to analyse, solve and troubleshoot problems in implementation of biochemistry/biotechnology/ microbiological protocols.

PO-3 Design/development of solutions: Graduates will develop creative thinking and cooperate with each other to solve problems in the field of biochemistry/biotechnology/bioinformatics/ microbiology.

PO-4 Conduct investigations of complex problems: Graduates will acquire practical skills – which help in planning and designing protocols to validate hypothesis and execute experimental techniques independently as well as assimilate, analyse and interpret subsequent data.

PO-5 Modern tool usage and communication: Graduates will effectively be able to manage resources and time using ICT and computer enabled devices and accomplish ability to understand and communicate all ideas effectively.

PO-6 Environment sustainability and Ethics: Graduates will get adequate knowledge to use information and implement solutions for environmental protection and remediation. Graduates will be aware of their role and responsibility in handling and use of microbes including genetically modified microorganisms.

PO-7 Lifelong learning: Graduates will carry on to learn and adapt in a world of constantly evolving technology.

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO1: An ability to acquire in-depth theoretical and practical knowledge of Biochemistry and the ability to apply the acquired knowledge to provide cost efficient solutions in Biochemistry.

PSO2: An ability to properly understand the technical aspects of existing technologies that help in addressing the biological and medical challenges faced by humankind.

PSO3: An ability to translate knowledge of Biochemistry to address environmental, intellectual, societal and ethical issues through case studies presented in the class.

PSO4. Comprehending fundamental concepts in modern biology to meet the emerging trends

PSO5. Contribution to the betterment of the society by inculcating expertise in healthcare sector

BOARD OF STUDIES

S. No	NAME	AFFILIATION	ROLE
1	Dr V. Vanitha	Associate Professor and Head, Department of Biochemistry, School of Life Sciences, VISTAS	Chair Person
2	Dr. A. Geetha	Principal, Hosur Government Arts and Science college Hosur	External expert
3	Dr. Arivazhagan	Associate Professor and Head, Department of Clinical Biochemistry, Cancer Institute, Adyar, Chennai 600020	External expert
4	Dr. K. G. Kripa	Associate Professor, Department of Biochemistry, School of Life Sciences, VISTAS	Internal Member
5	Dr. R. Sangeetha	Associate Professor, Department of Biochemistry, School of Life Sciences, VISTAS	Internal Member
6	Dr. K. Gayathri	Assistant Professor, Department of Biochemistry, School of Life Sciences, VISTAS	Internal Member
7	Dr. R. Padmini	Assistant Professor, Department of Biochemistry, School of Life Sciences, VISTAS	Internal Member
8	Ms. P. Surya	Application Specialist, CPC Diagnostics, Gopalapuram, Chennai	Alumni, MSc Advanced Biochemistry (2010-2012)

VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES

(VISTAS) B.SC BIOCHEMISTRY

COURSES OF STUDY AND SCHEME OF ASSESSMENT

(TOTAL NO OF CREDITS: 140)

Code No.	Course	Hours/Week			Credits	Maximum Marks		
		Lecture	Tutorial	Practical		CA	SEE	Total
SEMESTER 1								
LANG	Tamil I/ Hindi / French	5	0	0	5	40	60	100
ENG	English I	5	0	0	5	40	60	100
CORE	Biomolecules I	6	0	0	5	40	60	100
CORE	Nutritional Biochemistry	6	0	0	4	40	60	100
CORE	Practical I- Qualitative Analysis of Biomoleules	0	0	4	2	40	60	100
CORE	Practical II- Nutritional Biochemistry	0	0	4	2	40	60	100
		22	0	8	23			
SEMESTER 2								
LANG	Tamil II / Hindi / French	5	0	0	5	40	60	100
ENG	English II	5	0	0	5	40	60	100
CORE	Biomolecules II	6	0	0	5	40	60	100
CORE	Biochemical Techniques	6	0	0	4	40	60	100
CORE	Practical III- Biochemical Preparation Techniques	0	0	4	2	40	60	100
CORE	Practical IV Biochemical Separation Techniques	0	0	4	2	40	60	100
		22	0	8	23			

CA - Continuous Assessment

SEE - Semester End Examination

VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES
(VISTAS) B.SC BIOCHEMISTRY
COURSES OF STUDY AND SCHEME OF ASSESSMENT

		Hours/Week				Maximum Marks		
Code No.	Course	Lecture	Tutorial	Practical	Credits	CA	SEE	Total
SEMESTER 3								
LANG	Tamil III / Hindi / French	5	0	0	5	40	60	100
ENG	English – III	5	0	0	5	40	60	100
CORE	Enzymes & Intermediary Metabolism I	5	0	0	4	40	60	100
CORE	Clinical Biochemistry I	5	0	0	4	40	60	100
CORE	Practical V- Hematology	0	0	4	2	40	60	100
CORE	Practical VI – Enzymology & Clinical Biochemistry I	0	0	4	2	40	60	100
SEC	Soft Skill – I	2	0	0	2	40	60	100
		22	0	8	24			
SEMESTER 4								
LANG	Tamil IV / Hindi / French	5	0	0	5	40	60	100
ENG	English IV	5	0	0	5	40	60	100
CORE	Enzymes & Intermediary Metabolism II	5	0	0	4	40	60	100
CORE	Clinical Biochemistry II	5	0	0	4	40	60	100
CORE	Practical VII-Enzymology & Clinical Biochemistry II	0	0	6	3	40	60	100
AECC	Environmental Studies	2	0	0	2	40	60	100
SEC	Soft Skill – II	2	0	0	2	40	60	100
		24	0	6	24			

CA - Continuous Assessment

SEE - Semester End Examination

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COURSES OF STUDY AND SCHEME OF ASSESSMENT

Code No.	Course	Hour / Week			Credits	Maximum Marks		
		Lecture	Tutorial	Practical		CA	SEE	Total
SEMESTER 5								
DSE	Discipline Specific Elective – 1	6	0	0	5	40	60	100
DSE	Discipline Specific Elective – 2	6	0	0	5	40	60	100
DSE	Discipline Specific Elective - 3	6	0	0	5	40	60	100
DSE	Practical VIII - DSE	0	0	6	3	40	60	100
GE	Generic Elective -1	4	0	0	3	40	60	100
SEC	NSS	2	0	0	2	40	60	100
		23	0	6	23			
SEMESTER 6								
DSE	Discipline Specific Elective - 4	6	0	0	6	40	60	100
DSE	Discipline Specific Elective – 5	6	0	0	6	40	60	100
GE	Generic Elective -2	4	0	0	3	40	60	100
SEC		2	0	0	2	40	60	100
	Project Work	0	0	12	6	40	60	100
		18	0	12	23			

CA - Continuous Assessment

SEE - Semester End Examination

List of Discipline Specific Elective (DSE)

1. Microbiology & Immunology
2. Clinical Nutrition
3. Basics of Molecular Biology
4. Immunobiology
5. Biotechnology
6. Nutrition and Health
7. Essentials of Endocrinology
8. Lifestyle diseases
9. Stem Cell biology
10. Developmental Biology
11. Cancer Biology
12. Plant and tissue culture
13. Neurobiology
14. Plant Biochemistry
15. Human Physiology

List of Generic Elective (GE)

1. Introduction to Bioinformatics
2. Principles of Genetics
3. Statistics
4. Pathological Basis of Diseases
5. Natural Resources Management
6. Intellectual Property Rights
7. Herbal Technology
8. Pharmacology
9. Disaster Management
10. Consumer Affairs

List of Languages

Subject Code	Title of the Paper
18LEN001	Foundation Course English I
18LTA001	Foundation Course Language I
18LHN001	Hindi Paper – I
18LFR001	French Paper - I
18LEN002	Foundation Course English II
18LTA002	Foundation Course Language II
18LHN002	Hindi Paper – II
18LFR002	French Paper - II
18LTA003	Foundation Course Language III
18LHN003	Hindi Paper – III
18LFR003	French Paper - III
18LTA004	Foundation Course Language IV
18LHN004	Hindi Paper – IV
18LFR004	French Paper – IV

List of Skill Enhancement Course (SEC)

1. Soft Skills I
2. Soft Skills II
3. NSS
4. Entrepreneurship Development
5. Medical Lab Diagnostics
6. Techniques in Forensic Science

List of Ability Enhancement Compulsory Course (AECC)

AECC1	Environmental Science

CORE COURSES

SYLLABUS

BIOMOLECULES –I 6 0 0 5

Course Objective

Biomolecules is to study about the structure and biological function of molecule, thast 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.

UNIT I

Classification of carbohydrates, steroisomerism and optical isomerism of Sugars, anomeric forms, and mutarotation. Occurrence, structure and biological importance of mono,di and polysaccharides. Reactions of carbohydrates due to the presence of hydroxyl group, aldehyde and ketone groups (12 hrs).

UNIT II

Structure, function and biological importance of important carbohydrate derivatives-chitin, pectin, heparin, proteoglycans, sialic acids, blood group polysaccharides. Bacterial cell wall polysaccharides, Glycoproteins (12 hrs).

UNIT III

Classification and structures of amino acids. Physical and chemical properties of amino acids. Essential and non-essential amino acids. Non protein amino acids. Proteins-Classification based on solubility, shape, composition and function. Properties of proteins. Denaturation and renaturation of proteins. Structure of peptide bond. Isolation and Purification of Proteins
(12 hrs).

UNIT IV

Protein structure-Primary, secondary, tertiary and quaternary (helix and pleated sheet) structures of protein. Forces stabilizing the secondary, tertiary and quaternary structures of proteins. Chemical synthesis of polypeptides-solid phase peptide synthesis. Determination of the amino acid sequence of a polypeptide chain. Biologically important peptides-structure and functions (12 hrs).

UNIT V

Vitamins-Fat soluble and water-soluble vitamins-structure and function. Coenzymes and their structures. Antibiotics-Structure and functions of Pencillin, Streptomycin and Chloromycetin (12 hrs).

Course outcome:

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 and describe the classification of biomolecules.

CO2: Understand the structures and functions of biomolecules and Describe the basic reaction types and mechanisms of bio molecules.

CO3: Analyse and study the chemical and biochemical properties of bio molecules and Understand relationships between biological molecules and human health.

CO4: Identify biomolecules structural differences and its properties and Gain an understanding the basic principle of chemistry as well as biology.

CO5: Understand the scope of biological chemistry and the interrelationship of organic compounds and homeostasis in biological organisms.

Recommended books

1. Text book of Biochemistry-West & Todd.
2. Text book of Biochemistry-A. Lehninger.
3. Chemistry of natural products-Chatwal.
4. Text book of Biochemistry-O.P. Agarwal.
5. Text book of Biochemistry-Jain.
6. Hand book of Biochemistry-Sathynarayana

NUTRITIONAL BIOCHEMISTRY 6 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.

Unit 1 Basic concepts of Nutrition

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. (12 hrs)

Unit 2 Food

Food Groups: Definition and Functions of food – physiological functions of foods, ICMR Five food Groups and its significance, Food Pyramid. (12 hrs).

Unit 3 Energy

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. (12 hrs).

Unit 4 Nutrition Deficiency Disorders

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 (12 hrs).

Unit 5 Macro and Micromolecules

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 (12 hrs)

Course outcome:

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: Easily assess nutritional status of the person by anthropometric measurements and Indices and educate others about how to overcome economical and clinical burden of malnutrition.

Text Books

1. Swaminathan, Advanced Textbooks of food and Nutrition, Vol 1, 2, BAPPCO Press, 2005

2. Viswanath Sardesai, Introduction to Clinical nutrition, 3rd 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 Dietitics and Clinical Nutrition, 1st edition, 2010.

PRACTICAL – I QUALITATIVE ANALYSIS OF BIOMOLECULES 0 0 4 2

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 amino acids by suitable tests.

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

Course outcome:

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

CO1: Identify the given solution as carbohydrate or amino acid. Identify sugar as aldose and ketose.

CO2: Classify sugar as monosaccharide, disaccharide and polysaccharide. Demonstrate sugar as reducing and non reducing sugar.

CO3: Identify pentose and hexose sugar.

CO4: Study general color reaction of proteins. Distinguish aromatic amino acids and basic amino acid.

CO5: Determine sulfur containing amino acid. Study general color reaction of proteins and properties (Denaturation, precipitation and hydrolysis) of proteins.

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.

PRACTICALS II NUTRITIONAL BIOCHEMISTRY 0 0 4 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.

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

Course outcome:

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. Plan and execute practicals

CO2: Understand the methods of reagent preparation and its uses. Confidently demonstrate practical skills.

CO3: Know how to calculate BMR and BMI values, interpret and evaluate. Understand the good laboratory practice

CO4: Develop academic as well as research curiosity. Efficiently Carryout projects in higher studies

CO5: Logically understand the reaction principle. Understand the nutritional values of different foods.

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. 2nd edition, 2005.

Reference Books

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6th 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. 2nd edition, 2002.

BIOMOLECULES – II 6 0 0 5

Course Objective

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.

UNIT I

Definition and classification of lipids. Fatty acids - classification, nomenclature, structure and properties. Classification, structure and function of prostaglandins, triacyiglycerols. Chemical properties of fats - iodine value, Sap value, acid number, Rancidity, Rm value (12 hrs)

UNIT II

Chemical properties and functions of phospholipids and their structures. Lecithins, cephalins, phosphatidyl serine, phosphatidyl inositol, plasmalogens, glycolipids (cerebrosides and gangliosides), isoprenoids and sterols (chitosterol and zymosterol), steroids (steroid hormones, bile acids and bile salts). Biological significance of fats. (12 hrs)

UNIT III

Nature of genetic material. Isolation of RNA and DNA. Composition of RNA and DNA. Structure of purine and pyrimidines, nucleosides and nucleotides (12 hrs).

UNIT IV

Size and structure of different types of DNA-A, B, Z types of DNA. Structure and role of different types of RNA. Properties of nucleic acids. (12 hrs).

UNIT V

Hetero cyclic rings of biologically important compounds. Structure and biological importance of pyridine, pyrrole, quinolene, pyrimidine, purine, pteridine, thiazole, imidazole and indole ring containing compounds. Porphyrin - structure and biologically important compounds containing porphyin ring, bile pigments - structure and biological importance (12 hrs).

Course outcome:

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. Describe the classification of biomolecules

CO2: Describe the basic reaction types and mechanisms of bio molecules. Understand the structures and functions of biomolecules.

CO3: Analyse and study the chemical and biochemical properties of bio molecules. Understand relationships between biological molecules and human health.

CO4: Identify biomolecules structural differences and its properties. Gain an understanding the basic principle of chemistry as well as biology

CO5: Understand the scope of biological chemistry and the interrelationship of organic compounds and homeostasis in biological organisms

Recommended books

1. The Biochemistry of nucleic acids - R.L. Adam and others.
2. Text book of biochemistry - West and Todd.
3. Text book of biochemistry - O. P. Agarwal.
4. Text book of biochemistry – Jain.
5. Principles of biochemistry – Lehninger.
6. Text book of biochemistry - Sathya Narayan

BIOCHEMICAL TECHNIQUES 6 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.

Unit I Homogenisation and Centrifugation

Buffers – pH, pOH, examples of buffers. Methods of cell disruption and tissue homogenization: mechanical (homogenizer, sonicator, French press) and non-mechanical methods (physical, chemical and enzymatic methods). Principle and applications of centrifugation techniquesdifferential, density gradient and Ultra-centrifugation. (12 hrs)

Unit II Chromatography

Introduction to chromatography. Principle and applications of chromatographic techniques paper, thin layer, gel filtration, ion- exchange, affinity chromatography, GLC and HPLC. (12 hrs)

Unit III Electrophoresis and Electrochemical Techniques

Electrophoresis- principles and applications of paper, polyacrylamide (native and SDS) and agarose gel electrophoresis. Principles of electrochemical techniques. Glass electrode, Hydrogen electrode and Oxygen electrode - principle, instrumentation and its applications. (12 hrs)

Unit IV Spectroscopy

Colorimetry and Spectrophotometry- Laws of light absorption- Beer-Lambert law. Principle, Instrumentation and applications of UV- visible spectroscopy; Fluorescence spectroscopy; Flame photometry, Infrared spectroscopy; NMR and ESR spectroscopy. (12 hrs)

Unit V Radioactivity

Radioactivity, Radioactive decay, units of radio activity. Detection and measurement of radioactivity- GM counter, scintillation counter. Biological applications of radioisotopes and Radiation (12 hrs)

Course outcome:

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. Accomplish knowledge on Principle, Instrumentation and applications of Electrochemical techniques such as pH electrode and Oxygen electrode.

CO2: Accomplish knowledge on Principle, Instrumentation and applications of different types of Centrifugation techniques. Study the Role of Chromatography in separation of various biomolecules and other biosamples.

CO3: Accomplish knowledge on Principle, Instrumentation and applications of different types of Chromatographic techniques. Accomplish knowledge on Principle, instrumentation and applications of Paper, Agarose and Polyacrylamide gel electrophoresis (Native and SDS).

CO4: 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. Gain knowledge about radioactivity and its measurement by GM counter and Scintillation counter methods. Biological applications of radioiostopes in various research fields.

CO5: Develops the theoretical knowledge and will be capable of planning and carrying out experiments by employing latest biochemical techniques. With parallel practical training, develops the skill in handling basic biochemical and electrochemical techniques.

Text Books

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, 3rd 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 Hous**e**.2005.

4. K.Sawhney and Randhir Singh, Introductory Practical Biochemistry. Narosa Publications House, 2001.

PRACTICAL – III BIOCHEMICAL PREPARATION TECHNIQUES 0 0 4 2

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.

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.

Course outcome:

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. Estimate the level of bio molecules by using quantitative methods

CO2: Able to Handle laboratory instruments individually. Planning and carrying out projects efficiently.

CO3: Logically understand the reaction mechanism. Develop academic as well as research curiosity.

CO4: Get knowledge about good laboratory practice. Estimate the level of bio molecules by using qualitative methods.

CO5: Evaluate an idea about various solvent and its uses. To realize the importance of time management, group work and uses of data collection in practical.

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.

PRACTICAL IV - BIOCHEMICAL SEPARATION TECHNIQUES 0 0 4 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.

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)

Course outcome:

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. Understand the significance, quality, and limitations of the results produced by the various separation techniques.

CO2: Select the operating conditions (mobile phase, temperature, flow rate, program rate, etc.) for the various separation techniques. Gain Knowledge of phase equilibria in two-component and multi-component systems.

CO3: Gain Ability to analyze the separation system for multi-component mixtures. Get the Ability to design separation system for the effective solution of intended problem.

CO4: Acquire the Ability to Select appropriate separation technique for intended problem. Evaluate data and properly determine their meaning to make correct and ethical decisions.

CO5: Select the operating conditions (mobile phase, temperature, flow rate, program rate, etc.) for the various separation techniques. To develop an appreciation for the difficult task of judging the accuracy and precision of experimental data

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.

ENZYMES & INTERMEDIARY METABOLISM – I 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.

Unit I Introduction to Enzymes

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. (12 hrs)

Unit II Enzyme Kinetics

Derivation of Michaelis - Menton Equation. Enzyme inhibition - Competitive, non- competitive and uncompetitive inhibitions (with reference to Example and graphical representation) (12 hrs).

Unit III Carbohydrate metabolism I

Fate of dietary carbohydrates. Glycolysis with energetic & regulation, Cori cycle, Futile cycles in carbohydrate metabolism. Metabolism of Glycogen, TCA cycle - Energetics and its regulation. (12 hrs)

Unit IV Carbohydrate metabolism II

Pentose phosphate pathway and its significance. Uronic acid pathway. Gluconeogenesis pathway and significance. Glyoxylate cycle. (12 hrs)

Unit V Biological Oxidation

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. (12 hrs)

Course outcome:

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

CO1: Discuss the basic structure and functions of enzymes. Describe the chemical nature of enzymes and their function in biochemical reactions.

CO2: Explain how enzyme activity is (a) regulated, and (b) affected by temperature, pH, and concentration. Analyze kinetic data and understand the principles of enzyme kinetics.

CO3: Write down the key pathways of metabolism. List stages in the catabolism of food molecules and describe what occurs during each stage.

CO4: Describe terms like glycolysis, gluconeogenesis, glyoxylate cycle, glucogenic amino Acids. 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.

CO5: Describe what happens during carbohydrate digestion, glycolysis, glycogenesis, and glycogenolysis. Describe what happens in the citric acid cycle, the electron transport chain and oxidative phosphorylation. Explain the role of each process in energy production. Describe mechanisms of control of these metabolic pathways.

Text Book

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, 2nd edition 2006, Wiley Asia student edition

2. Robert K Murray , Daryl Granner and Victor W Rodwell, Harper's illustrated biochemistry, 2006, 27th edition Mc Graw Hill international edition

3. M.N.Chatterjea and Ranashinde, Text book of Medical biochemistry, 2005, 6th edition Jaypee Brothers Medical Publisher (P) Ltd.

4. Champe and Harvey, Lippincott's illustrated biochemistry, 2007, 4th edition.

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.

Unit I Basic concepts of clinical Biochemistry

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. (12 hrs)

Unit II Disorders of the blood

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. (12 hrs)

Unit III Diseases related to carbohydrate metabolism

Blood glucose regulation, hypo and hyperglycemia. Diabetes mellitus-types, Diagnosis, clinical manifestations and metabolic alterations. Glycosuria, galactosemia and fructosuria. Glycogen storage diseases. Lactose intolerance. (12 hrs)

Unit IV Diseases related to aminoacids and nucleic acid metabolism

Etiology, clinical manifestation, diagnosis and treatment of phenyl ketonuria, cystinuria, alkaptonuria, albinism and tyrosinemia. Hypo and hyperuricemia, Gout. (12 hrs)

Unit V Diseases related to lipid metabolism

Serum lipids in diseases with special reference to cholesterol, lipidosis, triglyceridemia. Hypo and hypercholesterolemia. Clinical features of atherosclerosis and fatty liver. (12 hrs)

Course outcome:

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. Elaborate on the role of health and its affliction by various diseases/disorders.

CO2: Detail on the various biological specimens including the process of collection, preservation and storage.

CO3: Explain the blood clotting pathways –both intrinsic and extrinsic. Enumerate of the different types of anemias based on aetiology. Detail account on the blood clotting disorders.

CO4: Understand the etiology, types, clinical manifestations and treatment of Diabetes mellitus. Discuss on the significance of blood glucose and its regulation. Enumerate of the various disorders of carbohydrate metabolic pathways.

CO5: Understand on the etiology, types, clinical manifestations, diagnosis and treatment of various aminoacidurias. Detail the nucleic acid metabolism disorders. Elaborate on the role of Serum lipids including triglycerides, cholesterol and phospholipids in diseases. Detail the clinical role of serum cholesterol and state the Clinical features of Atherosclerosis.

Text Books

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

2. Carl A. Burtis, Edward R. Ashwood and David E. Bruns (eds), Tietz Textbook of Clinical Chemistry and Molecular Diagnosis. 5thedition, 2012.

Reference Books

1. Thomas M. Devlin, Biochemistry with clinical correlation. John Wiley & Sons. 7thEd, 2010.

2. Allan Gaw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J. O'Reilly, Clinical Biochemistry, 5th edition, 2013.

3. Graham Basten, Introduction to Clinical Biochemistry, Interpreting Blood Results. Book Boon. 2nd edition, 2011.

PRACTICAL - V – HEMATOLOGY 0 0 4 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.

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

Course outcome:

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

CO1: Possess Skill to withdraw blood from patients. Separate plasma/serum from given blood sample

CO2: Explore knowledge on preparation of blood smear. Demonstrate different types of blood grouping.

CO3: To prepare packed cell volume. Discuss sedimentation of erythrocytes by different methods.

CO4: Calculate RBC in normal and patient's blood. Differentiate different types of WBC.

CO5: Perform estimation of haemoglobin by different methods. Calculate WBC in normal and patient's blood.

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. 2nd edition, 2005.

Reference Books

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6 th 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. 2nd edition, 2002.

PRACTICAL - VI ENZYMOLOGY & CLINICAL BIOCHEMISTRY 0 0 4 2

Course objectives

The course introduces students to various practical aspects of enzymology, combined with assessment of clinical reasoning skills and stimulates the students interest in learning the structure, function and kinetics of enzyme and their correlation in disease conditions.

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. Estimation of protein by Lowry method.
7. Estimation of blood glucose by Ortho-Toluidine method.
8. Estimation of blood glucose by Anthrone method.
9. Estimation of serum bilirubin by Malloy & Evelyn method.
10. Estimation of total protein and A: G ratio.
11. Estimation of blood urea by diacetyl monoxime method.
12. Estimation of serum creatinine by Jaffe's method.

Course outcome:

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

CO1: Isolate enzymes from biological sources. Discern optimal conditions of enzyme activity.

CO2: Determine the Optimum pH and temperature of Acid Phospatase. Assay the specific activity of Acid Phospatase.

CO3: Determine the Optimum pH and specific activity of Alkaline Phosphatase. Determine the Optimum pH of Salivary Amylase. Assay the specific activity of Salivary Amylase.

CO4: Estimate the enzyme activity of Creatine kinase. Assay the enzyme activity of Lactate Dehydrogenase.

CO5: Estimate the enzyme activity of Adenosine Tri Phosphatase. Assay the enzyme activity of Serum Glutamate Oxaloacetate Transaminase. Determine the 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 th 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. 2nd edition, 2002.

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.

Unit I Enzymes

Coenzymes, metalloenzymes, multienzyme complexes, Isoenzymes. Enzyme regulation: General mechanism of enzyme regulation, feedback inhibition and feed forward stimulation. Covalent modification of enzymes. Allosteric enzymes.Regulation of enzymic activity by products and substrates. (12 hrs)

Unit II Metabolism of Lipids I

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. (12 hrs)

Unit III Biosynthesis of lipids

Biosynthesis of fatty acid. Metabolism of Triglyceride, Phospholipids and cholesterol. Biosynthesis of saturated and unsaturated fatty acids. (12 hrs)

Unit IV Metabolism of proteins

Introduction, fate of dietary proteins, catabolism of amino acids - transamination, oxidative and non-oxidative deamination, decarboxylation- urea cycle and its regulation. (12 hrs)

Unit V Metabolism of nucleic acids

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. (12 hrs)

Course outcome:

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.

Text Book

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

Reference Books

1. Robert K Murray, Daryl Granner and Victor W Rodwell, Harper's illustrated biochemistry, 2006, 27th edition, Mc Graw Hill international edition

2. M.N.Chatterjea and Ranashinde, Text book of Medical biochemistry, 2005, 6th edition, Jaypee Brothers Medical Publisher (P) Ltd.

3. David L Nelson and Michael M Cox, Principles of biochemistry 2007, 4th edition. W.H. Freeman company New York

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.

Unit I Liver Function tests

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. (12 hrs)

Unit II Renal function tests

Formation of urine-Glomerular filtration and tubular reabsorption. Clearance tests-urea, creatinine, inulin, PAH test, concentration, and dilution tests. (12 hrs)

Unit III Gastric function tests

Collection of gastric contents, Examination of gastric residium, FTM.Stimulation tests. Tubeless gastric analysis. (12 hrs)

Unit IV Clinical enzymology

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. (12 hrs)

Unit V Diagnosis of tumors

Definition of tumor markers, Markers produced by various tissues, classification and clinical applications. Imaging techniques to diagnose cancer – CT, MRI, PET, SPECT. (12 hrs)

Course outcome:

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. Understand the molecular basis of diseases and novel strategies to prevent the diseases. Understand the processes for formation of urine.

Text Book

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

Reference Books

1. Carl A. Burtis, Edward R. Ashwood and David E. Bruns (eds), Tietz Textbook of Clinical Chemistry and Molecular Diagnosis. 5thedition, 2012.

2. Thomas M. Devlin, Biochemistry with clinical correlation. John Wiley & Sons. 7 th Ed, 2010.

3. Marshall & Lapsle & Day & Ayling, Clinical Biochemistry, Metabolic and Clinical Aspects. 3rd Edition, 2014.

PRACTICAL – VII ENZYMOLOGY & CLINICAL BIOCHEMISTRY II 0 0 6 3

Course objectives

The course introduces students to various practical aspects of enzymology, combined with assessment of clinical reasoning skills and stimulates the students interest in learning the structure, function and kinetics of enzyme and their correlation in disease conditions.

1. Determination of Optimum pH of Salivary Amylase.
2. Determination of specific activity of Salivary Amylase.
3. Determination of enzyme activity of Lactate Dehydrogenase
4. Determination of enzyme activity of Serum Glutamate Oxaloacetate Transaminase
5. Determination of enzyme activity of Serum Glutamate Pyruvate Transaminase
6. Estimation of serum uric acid by phosphotungstate method.
7. Estimation of serum cholesterol by Zaks method.
8. Estimation of serum triglycerides
9. Estimation of serum phospholipids
10. Qualitative Analysis of Urine for the presence of normal and abnormal constituents.

Course outcome:

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

CO1: Gain knowledge of biological samples and their collection procedures. Perform biochemical laboratory analysis in blood samples

CO2: Analyze biochemicals in urine samples. Distinguish serum, plasma and whole blood emphasizing the role of anticoagulants

CO3: Assess presence and absence of normal and abnormal constituents in urine by performing qualitative urine analysis.

CO4: Analyze glucose, urea protein, total protein and A/G ratio in blood

CO5: Determine analytes such as creatinine, uric acid, cholesterol and triglycerides in serum. Evaluate and interpret the generated results after analysis in order to determine the likely diagnosis

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. 2nd edition, 2005.

Reference Books

1. Harold Varley, Practical Clinical Biochemistry, CBS. 6th edition, 2006.

2. Hans Bisswanger, Practical Enzymology. Wiley VCH. 2nd Edition, 2011.

DISCIPLINE SPECIFIC ELECTIVES

MICROBIOLOGY AND IMMUNOLOGY 6 0 0 5

Unit – I

History and scope of Microbiology. Classification of microbes. Ultra structure of Bacteria , Fungi , virus , Algae. beverages. Antimicrobial agents – physical and chemical agents. Antiseptics and sterilants (12 Hrs)

Unit – II

Clinical Microbiology: Infection – types of infection, method of infection, factors influencing infection. Normal microbial flora and pathogenic microbes. Bacterial diseases - typhoid, cholera. Viral diseases - Hepatitis, HIV (12 Hrs)

Unit – III

Immunity and its types- innate immunity, acquired immunity, active and passive immunity, Vaccines - commonly used toxoid vaccines, killed vaccines, live attenuated vaccines. Cells of the immune system. Lymphoid organs – Thymus, Bone marrow, Spleen (12 Hrs).

Unit – IV

Immunoglobulins- structure, function and types. Antigens- nature, immunogenicity, haptens., Humoral and cellular immunity, Complement pathway (12 Hrs).

Unit V

Hypersensitivity reactions- type I, II, III, IV. Immunological tolerance. Transplantation immunology- Mechanism of Host Vs Graft rejectIon - Bone marrow transplantation (12 Hrs) .

Course outcome:

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. Explain about the scope of Microbiology and its relationship with Biochemistry. Acquires knowledge about the principles and working of various types of microscopic techniques.

CO2: Demonstrate various staining techniques to identify gram positive and negative bacteria. Understand about the Prokaryotic and Eukaryotic cell arrangement and organization and about the various functions of different Intracellular organelles present in it.

Explain about different types of microbial culture media, preparation and isolation methods.

CO3: Explain about preservation and maintenance of microbial cultures. Demonstrate various sterilization techniques employed in microbiological experiments. Widen the awareness about personal hygiene to be carried inside a microbiology lab and available safety measures.

CO4: Understands the significance of microorganisms that are used as model systems to study basic biology, genetics, metabolism and ecology. Learn about various classes of immunity. Understand the cell mediated immunity. Understand the humoral immunity.

CO5: Gain knowledge on various types of antigens and their antigenic structure. Illuminate knowledge on structure of various antibodies and their production. Understand various types of autoimmune disorder – Rheumatoid arthritis, Sickle cell anemia. Explore definition of hypersensitive reaction and its types including Type I, II, III, IV and V.

Reference Books

1. Microbiology – Panicker – 2500 6th edition, orient Longman, Hyderabad.
2. Microbiology – M.J.Pelzar, 5th edition (2005), Tata mac hran, Hill New Delhi.
3. Principles of Microbiology – Atlas RM 1997, WCB Publishers.
4. Kuby immunology 4th edition- Goldsby et al., Freeman and Co. 2000.
5. Immunology 3rd edition- Roitt *et al*., Mosby publishers 1993.
6. Cellular and molecular immunology 2nd edition Abbas et al., W.S.Saunders 1994.
7. Immunology V- The immune system in health and disease. Janeway Jr.Paul, Travers and Co., 2001.
8. Essential Immunology (8th Edition), Ivan Roitt, 1994. Blackwell Scientific Publication. Immunology W.H. Freemen and Company.
9. Abdul .K. Abbas. Andrew .K. Litchmen and Jordan, 1997, Cellular and Molecular
10. Immunology, 3rd Edn. W.B. Saunder Company.
11. Weir, D.M. and Stewart, J., 1997, Immunology, 8th Edn., Churchill Livingston, New York.

CLINICAL NUTRITION 6 0 0 5

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.

Unit 1 Basic concepts of Nutrition

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. (12 hrs)

Unit 2 Food

Food Groups: Definition and Functions of food – physiological functions of foods , ICMR Five food Groups and its significance, Food Pyramid. (12 hrs)

Unit 3 Energy

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. (12 hrs)

Unit 4 Nutrition Deficiency Disorders

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 (12 hrs)

Unit 5 Macro and Micromolecules

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 (12 hrs)

Course outcome:

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. Easily assess nutritional status of the person by anthropometric measurements and indices.

Text Books

1. Swaminathan, Advanced Textbooks of food and Nutrition, Vol 1, 2, BAPPCO Press, 2005

2. Viswanath Sardesai, Introduction to Clinical nutrition, 3rd 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 Dietitics and Clinical Nutrition, 1st edition, 2010.

BASICS OF MOLECULAR BIOLOGY 6 0 0 5

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 everchanging discipline. This course will emphasize the molecular mechanisms of DNA replication, repair, transcription, protein synthesis, and gene regulation in different organisms.

Unit 1 DNA as the vehicle of inheritance

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. (12 hrs)

Unit 2 DNA Replication

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

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. (12 hrs)

Unit 4 Transcription

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. (12 hrs)

Unit 5 Translation

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 (12 hrs).

Course outcome:

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.

Text Books

1. De Robertis, Cell and molecular biology. Dhanpat Rai Publisher, 8th 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, 5th edition, 2011

Reference Books

1. Benjamin Lewin, Genes IX. Jones & Bartlett Learning; 9th edition (2007).

2. Harvey Lodish, Arnold Berk & Chris A. Kaiser, Molecular Cell Biology. W. H. Freeman; 6th edition (2007).

IMMUNOBIOLOGY 6 0 0 5

Course objectives

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

Unit 1 Immunity

Immunity and its types. Innate Immunity, acquired immunity, active and passive immunity. Humoral and cellular immunity. Complement pathway. (12 hrs)

Unit 2 Immunoglobins

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. (12 hrs)

Unit 3 Antigen Antibody interactions

Antigen Antibody interactions – precipitation, agglutination, complement fixation reaction, tissue typing, ELISA, RIA, immunofluorescence. Monoclonal antibody - preparation and application in biology. (12 hrs)

Unit 4 Hypersensitivity

Hypersensitivity reactions – type I, II, III, IV. Immunological tolerances and autoimmune diseases. Vaccines – acive and passive immunization, commonly used vaccines – toxoid vaccines, killed vaccines, live attenuated vaccines, bacterial polysaccharide vaccines. (12 hrs)

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. (12 hrs)

Course outcome:

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: Illuminate knowledge on structure of various antibodies and their production.

Text Book

1. Roitt, Brostoff, Mal, Immunology, 6th edition, 2001

Reference Books

1. Panicker , Microbiology, orient Longman , Hyderabad, 6th edition, 2005.

2. M.J.Pelzar, Microbiology, Tata mac hran, Hill New Delhi, 5th edition, 2005.

3. Donald.M.Weir, Immunology, John Stewart, 7th edition, 1993

4. P.M.Lydyard, A.Whelan, M.W. Fanger, Immunology, 2003

5. Jacqueline Sharon, Williams & Williens, Immunology,1998

BIOTECHNOLOGY **6 0 0 5**

Course objectives

The content of the syllabus consists of basic biotechnology and its application such as new tools, products developed by biotechnologists such as cell culture, transgenic animals, Genetic engineering is 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.

Unit 1 Biotechnological Tools

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, Seclection 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. (12 hrs)

Unit 2 Cloning Vectors and Techniques

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. (12 hrs)

Unit 3 Animal biotechnology

Animal biotechnology – Cell and organ culture. Gene transfer methods into animal cells, production of medically important biomolecules – Insulin, growth hormone, monoclonal antibodies and interferons. (12 hrs)

Unit 4 Plant biotechnology

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. (12 hrs)

Unit 5 Nanotechnology (12)

Nanotechnology – Introduction and application of nanotechnology in tissue engineering, nucleic acid, enzymes, cancer and organ transplantation (12 hrs)

Course outcome:

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. Understand basic biochemistry, immunology, molecular biology and genetics and their associated laboratory techniques

CO2: Understand the importance of cells to genetic engineering. Explain the process of cell division in both somatic and germ cells.

CO3: Explain key concepts of transgenic plant and animal technologies. Understand how insulin is produced using bacterial cells and importance to gene technology.

CO4: Understand restriction enzymes, DNA ligation, transformation, gene libraries, gene cloning and expression, hybridization, mutagenesis, DNA sequencing and PCR.

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

Text Books

1. Sathyanarayana, Biotechnology, Books and allied Publishers, 3rd edition, 2006

2. RC Dubey, Text book of Biotechnology, S. Chand & Co, 2009

Reference Books

1. Brown TA “Gene cloning: An introduction” Nelson Thornes, 3rd edition, 1995

2. William.J. Thieman, Michael A. Pallidino. Introduction to biotechnology. Pearson Publication. 2nd edition, 2013

3. SS Purohit. Biotechnology Fundamentals and applications. Agrobios Publication. 4th edition. 2007

4. SB Primrose & R Twyman. Principles of gene manipulation and genomics. Blackwell publishing. 7th edition. 2006.

NUTRITION AND HEALTH 6 0 0 5

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.

Unit 1 Overview of nutrition

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 (12 hrs)

Unit 2 Macronutrients

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 (12 hrs)

Unit 3 Energy

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. (12 hrs)

Unit 4 Micronutrients

An overview of Vitamins, water and major minerals, Trace minerals, Antioxidant nutrients and phytochemicals in disease prevention. (12 hrs)

Unit 5 Minerals

Calcium roles in the body, calcium deficiency.Iron deficiency, Iron toxicity, Osteoporosis and calcium, Zinc deficiency, zinc toxicity, Functional foods (12 hrs)

Course outcome:

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. Discuss the processes involved in digestion, absorption, metabolism and utilization of each of the macronutrients.

TextBooks

1. Swaminathan, Advanced Textbooks of food and Nutrition, Vol 1, 2 ed, BAPPCO Press, 2005

2. Viswanath Sardesai, Introduction to Clinical nutrition, 3rd 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, 1st edition, 2010.

4. Edited by Jim Mann & A.Stewart Truswell, Essentials of human nutrition, 3rd Oxford University, 2008

ESSENTIALS OF ENDOCRINOLOGY 6 0 0 5

Course objectives

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

Unit 1 Basic Concept of Hormones

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. (12 hrs)

Unit 2 Pituitary hormones

Pituitary gland –Adenohypophysis and adenohypophysial hormones, their regulation. Structure of Neurohypophysis and functions of neurohypophysial hormones, their regulation. Pathophysiology. (12 hrs)

Unit 3 Thyroid hormones

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. (12 hrs)

Unit 4 Pancreatic hormones

Pancreatic hormones - insulin, glucagon, somatostatin - physiological role and related disorders. Gastrointestinal hormones - Types and functions. (12 hrs)

Unit 5 Adrenal hormones

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. (12 hrs)

Course outcome:

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

CO1: Describe the different classes and structures of hormones. Explain various roles of endocrine system in maintaining homeostasis, integrating growth, development and reproduction.

CO2: Discuss the synthesize, secretion and transport of amino acid derived, peptide and steroid hormones. 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,

CO3: Explain how regulation of hormone secretion, including principles of negative and positive feedback mechanisms. Illuminate knowledge on second messengers and their mechanism of action. Explore mechanism of action of steroid, amino acid derived hormones on their receptors.

CO4: Discuss hormone related clinical disorders, their symptoms and treatment. Learned more about signaling pathways and secondary messengers.

CO5: Study about pathophysiology of all endocrine glands.

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, 10th ed. , 2003 Elsevier

LIFE STYLE DISEASES 6 0 0 5

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.

Unit 1 Nutrition in various stages of life

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 (12 hrs)

Unit 2 Nutrition in GI disorders

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. (12 hrs)

Unit 3 Nutrition for cardio disorders

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. (12 hrs)

Unit 4 Nutrition in Renal disorders

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. (12 hrs)

Unit 5 Nutrition in Cancer and HIV

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 (12 hrs)

Course outcome:

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

CO1: Understand basic terminologies about the human anatomy and physiology. Have an in-depth knowledge about nutrition in different stages of life

CO2: Have an over-view of nutritional medications and therapeutic interventions. Have the knowledge about gastro-intestinal tract and associated disorders

CO3: Have Indepth knowledge about cardiovascular system and associated disorders. Know about structure/ function of kidney and associated disorders

CO4: Know about development and consequences of cancer. Know the current treatment and nutritional therapies that are available for cancer

CO5: Have the knowledge about development and consequences of HIV infection. Know the current treatment and nutritional therapies that are available for AIDS

Text Books

1. Carl A. Burtis and Edward R. Ashwood . Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 5 th edition, 2012. Saunders Publication.

2. M N Chatterjee and Rana shinde. Textbook of Medical Biochemistry, 8th ed, 2011. Jaypee Publishers.

Reference books

1. Thomas M. Devlin. Biochemistry with Clinical Correlation, 7th edition, John Wiley & Sons

2. Harold Varley, Practical Clinical Biochemistry, fourth edition, 2005. CBS Publisher

STEM CELL BIOLOGY 6 0 0 5

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.

Unit 1 Introduction to Stem Cells

Definition, Classification and Sources. Embryonic Stem Cells. adult, haematopoietic, fetal, cord blood, placenta, bone marrow, primordial germ cells, cancer stem cells, induced pleuripotent stem cells. (12 hrs)

Unit 2 Stem cell characterizations

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 pleuripotency and stem cell niche (12 hrs)

Unit 3 Genetic and Epigenetic Gene Regulation in Stem Cells

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 (12 hrs).

Unit 4 Application of Stem Cells

Overview of embryonic and adult stem cells for therapy Neurodegenerative diseases; Parkinson’s, Alzheimer, Spinal Code Injuries and other brain Syndromes; Tissue system Failures; Diabetes; Cardiomyopathy; Kidney failure; Liver failure; Cancer; Hemophilia etc. (12 hrs)

Unit 5 Regulations and Ethics

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. (12 hrs)

Course outcome:

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

CO1: Understand the inter relationships of stem cells

CO 2: Describe the structure of stem cells and their characterization

CO 3: Explain the interplay between genetic and epigenetic gene regulation.

CO 4: Describe the applications of stem cells.

CO5: List the regulations and ethics of stem cell in the society.

Text Books

1. Kiessling, A.A. Human Embryonic Stem cells. Jones & Barlett Publishers. (2nd Ed.) 2006

2. Lanza, R . Essentials of Stem Cell Biology. Academic Press. (1st Ed.) 2005.

Reference Books

1. Turksen, K. Adult Stem Cells. Humana Press, Inc., 1st Ed, 2004

2. Thomson, J et al. Handbook of Stem Cells: Embryonic/ Adult and Fetal Stem cells (Vol. 1 & 2). Academic Press., 1st Ed, 2004.

3. Institute of Medicine (Corporate author). Stem cells and the future of regenerative medicine. National Academy Press. 1st Ed. 2002.

DEVELOPMENTAL BIOLOGY 6 0 0 5

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.

Unit 1 Overview

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. (12 hrs)

Unit 2 Embryonic development in animals

Early Embryonic Development in animals: Blastula formation, Types of Cleavage, Gastrulation and formation of germ layers in animals. (12 hrs)

Unit 3 Organogenesis

Organogenesis in animals – an overview: Tissue organization and stem cells; development of nervous system, mesodermal and endodermal organs. Organogenesis –vulva formation in *Caenorhabditis elegans* (12 hrs)

Unit 4 Embryonic developments in plants

Early Embryonic Development in plants: Gametogenesis, Fertilization, Embryo sac development and double fertilization in plants (12 hrs)

Unit 5 Cell death

Cell death and regeneration: Concept of regeneration; programmed cell death; aging and senescence. (12 hrs)

Course outcome:

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

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

CANCER BIOLOGY 6 0 0 5

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.

Unit 1 Introduction

Growth characteristics of cancers cells; neoplasia, anaplasia, metaplasia and hyperplasia, types of cancer benign, malignant, metastatic cancers. Carcinomas, sarcomas, adenomas, haemopoetic cancers. Characteristics of cancer cells, changes in cell membrane structure and functions. (12 hrs)

Unit 2 Oncogenes

Provirus, protovirus, 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. (12 hrs)

Unit 3 Carcinogenesis

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. (12 hrs)

Unit 4 Tumour markers

Tumour markers- types of tumour markers. Apoptosis in cancer Cell death by apoptosis role of caspases. Death signaling pathways mitochondrial and death receptor pathways. (12 hrs)

Unit 5 Diagnosis and Treatment

Cancer screening diagnosis and treatment. RIA and ELISA.Strategies of anticancer drug therapy chemotherapy, gene therapy, Immunotherapy and radiotherapy. (12 hrs)

Course outcome:

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

CO1: Have better understanding of terminologies of 'Molecular Biology'. Have basic understanding of 'Genetics'.

CO2: Gain knowledge on cell cycle as well as apoptosis. Have knowledge about cancer, its development and types.

CO3: Have knowledge about genes with reference to cancer formation and mechanism. Have basic understanding of carcinogens and carcinogenesis

CO4: Have elementary knowledge about tumor markers. Know about the role of tumor suppressor genes.

CO5: Understand the signaling of cancerous cells. Have basic understanding of diagnostic tools for cancer and therapies available.

Text Books

1. Vincent.T, Devita, Cancer-Principles & practice of oncology, 3rd edition, 2014.

2. Momna Hejmadi, Introduction to Cancer Biology. 2nd edition.

Reference Books

1. Kinnell Parchment G. Mc. R. E, Perantoni. The Biological Basis of Cancer, Cambridge University Press, 2nd Edition, 2006

2. Lauren Pecorino, Molecular Biology of Cancer: Mechanisms, Targets, and Therapeutics Oxford University Press; 3 edition, 2012.

PLANT AND ANIMAL TISSUE CULTURE 6 0 0 5

Course objectives

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

Unit 1 Basics of animal cell culture

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. (12 hrs)

Unit 2 Cell culture techniques

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. (12 hrs)

Unit 3 Plant tissue culture

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. (12 hrs)

Unit 4 Gene transfer methods

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 (12 hrs)

Unit 5 Applications

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; Kideney failure; Liver failure, Cancer, Hemophilia, Application of cell culture technology in production of human and animal vaccines and pharmaceutical proteins. (12 hrs)

Course outcome:

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

CO1: Understand the basics of animal cell culture

CO 2: Describe the gene transfer methods

CO 3: Explain the applications of plant and animal tissue culture

CO 4: Describe the cell culture techniques.

CO5: List the levels of organization of culture and the characteristics of each.

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 2nd edition, 2008. Oxford University Press.

3. SS Purohit. Biotechnology Fundamentals and applications. 4th ed. Agrobios Publication. 2007

Reference Books

1. Biotechnology and genomics. PK Gupta. Rastogi Publication.2nd reprint. 2006

2. Roberta H. Smith. Plant Tissue Culture. 3rd Edition. 2013. Academic press.

NEUROBIOLOGY 6 0 0 5

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

Unit 1 Nervous System

Neuron - Neurocellular anatomy, neural membrane, classification of neuron, nerve fibers, axonal transport, neural growth, neuroglia, nervous system, blood brain barrier, cerebrospinal fluid (12 hrs)

Unit 2 Signalling

Neuronal signaling - Membrane potentials, ion channels, recording neuronal signals, ionic basis of resting potential and action potential, propagation of action potential. (12 hrs)

Unit 3 Synapse

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 (12 hrs)

Unit 4 Neurotransmitters

Neurotransmitters - Chemistry, synthesis, storage, release, receptors and function- acetyl choline, catecholamines, serotonin, histamine, glutamate, asparatate, GABA, glycine, neuropeptides, nitric oxide (12 hrs)

Unit 5 Disorders

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 (12 hrs)

Course outcome:

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

CO1: Learn about the nervous system and its anatomy

CO 2: Describe the signalling pathways and its potential

CO 3: Explain the synaptic transmission

CO 4: Describe the chemistry, synthesis and functions of neurotransmitters.

CO5: Learn about the various disorders of neurons.

Text Books

1. Arthur C. Guyton and John E Hall, Text book of medical physiology 11th Edition; 2006

2. Bruce Alberts, Alexander Johnson, Juliana Lewis, Martin Raff, Keith Roberts and Peter Walter, Molecular biology of the cell, 4th Edition; 2004

3. David Nelson and Michael Cox, Lehninger Principles of Biochemistry, 4th edition; 2005

Reference Books

1. Gordon Shepherd, Neurobiology, 3rd Edition; 1994

2. Mark F Bear, Barry W Connors and Michael A Paradiso, Neuroscience: Exploring the brain, 4th Edition; 2015

PLANT BIOCHEMISTRY 6 0 0 5

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.

Unit 1 Photosynthesis

Ultra Structure and organization of chloroplast membranes, lipid composition of choloroplast membranes, electron transport chain. Thylakoid membrane protein complexes Calvin cycle: Biochemistry of RuBp Carboxylase or oxygenase, Hatch and slack pathway, CAM plants; productivity of C4 plants. (12 hrs)

Unit 2 Nitrogen Metabolism

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. (12 hrs)

Unit 3 Plant Hormones

Plant growth regulators: Auxins; gibberllins, cytokines, abssicic acid and ethylene – biosynthesis and their metabolic functions, synthetic growth hormones, inhibitors. Stress response in Plants. (12 hrs)

Unit 4 Secondary metabolites

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) (12 hrs)

Unit 5 Uses of secondary metabolites

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. (12 hrs)

Course outcome:

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

CO1: Understand the process of photosynthesis

CO 2: Describe the metabolism of nitrogen.

CO 3: Explain about the plant hormones, metabolites, and its regulation.

CO 4: Describe the general function of secondary metabolites.

CO5: List the uses of secondary metabolites.

Text Books

1. Plant Metabolism by H.D Kumar and H.N Singh. Publisher. Macmillan, ISBN-10: 0333256387: ISBN-13:978-0333256381.1st Ed, 1980.

2. Biotechnology: Secondary Metabolites by K.G Ramawat, (2000) Publisher: Science Publishers, U.S. ISBN-10: 1578080576 ISBN-13: 978-1578080571, 1st Ed., 2000.

Reference Books

1. Plant Biochemistry by P.M Dey and J.B. Harborne (Editors) (1997) Publisher: Academic Press ISBN-10:0122146743, ISBN-13:978-0122146749, 1st Ed, 1997.

2. 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, 1st Ed, 1997

HUMAN PHYSIOLOGY 6 0 0 5

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.

Unit I Blood and Circulatory System

Blood: composition and function, types and function of blood cells, erythropoiesis, Blood groups- ABO and Rhesus system. Blood coagulation, Spleen – Structure and function. Structure and function of lymphatic System Circulatory system and Heart - Structure and functions of heart and associated blood vessels, Cardiac cycle. (12 hrs)

Unit II Digestive System

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. (12 hrs)

Unit III Respiratory system

Outline of various components of respiratory system. Mechanism and chemistry of respiration. Muscles-Types of muscles and their functions.Mechanism of muscle contraction. (12 hrs)

Unit IV Excretory system

Structure and role of kidney, nephrons. Mechanism of urine formation- Glomerular filtration, tubular secretion and reabsorption. (12 hrs)

Unit V Nervous System

Brief outline of nervous system-brain, spinal cord, nerve fibres. Transmission of nerve impulse and neurotransmitters. (12 hrs)

Course outcome:

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

CO 2: Describe the structure of major human organs and explain their role in the maintenance of healthy individuals.

CO 3: 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.

CO 4: Describe the general function of each organ system. List the levels of organization in the human body and the characteristics of each.

CO5: Explain how the activities of organs are integrated for maximum efficiency. Understand in-depth the neurophysiology and respiratory system. Identify how changes in normal physiology lead to disease. Understand in-depth the anatomy and physiology of digestive system. Understand the muscle and cardiovascular physiology

Text Books

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, 11thedition, 1985.

Reference Books

1. Ganong (Williams) Review of medical physiology 25th edition. 2015.McGraw-Hill.

2. Ross and Wilson. Anatomy and physiology In health and illness. 12th ed, 2014. Elsevier.

GENERIC ELECTIVES

SYLLABUS

INTRODUCTION TO BIOINFORMATICS 4 0 0 3

Course objectives

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

Unit 1 Introduction to bioinformatics and data generation

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. (5 hrs)

Unit 2 Biological Database I

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). (5 hrs)

Unit 3 Biological Database II

Derived databases (Prosite, Pfam, PRODOM, PRINTS). Structure databases (CATH, SCOP, and PDBsum) and bibliographic databases. (5 hrs)

Unit 4 Sequence Alignment

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). (5 hrs)

Unit 5 Anatomy of proteins and Visualization

Primary, Secondary and tertiary structure of proteins and 3D structure viewers (Rasmol, SPDBv, Chime, Cn3D, PyMol. (4 hrs)

Course outcome:

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

CO4: Differentiate about the various derived and structural databases PRODOM, PRINTS, Pfam, Prosite, CATH, SCOP & Bibilographic databases. Develop the ability to analyse sequences, alignments and dynamic programming including BLAST and FASTA Alogarithm.

CO5: View primary, secondary and tertiary structures of proteins by using bioinformatics tools like Rasmol, SPDBv, Chime, Cn3D &PyMol.

Text Books

1. Mount David. Bioinformatics: sequence and genome analysis, 2nd 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 Edition2009, Wiley Blackwell.

3. Stephen Misener, Stephen A. Krawetz. Methods and Protocols (Methods in Molecular Biology) 1999, Humana Press.

4. Jonathan Pevsner. Bioinformatics and Functional Genomics 2nd Edition2009, Wiley Blackwell.

PRINCIPLES OF GENETICS 4 0 0 3

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.

Unit 1 Concept of genetic inheritance

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. (5 hrs)

Unit 2 Physical basis of inheritance

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. (5 hrs)

Unit 3 Extra nuclear inheritance

Criteria for extra nuclear inheritance**,** plastid inheritance in *Mirabilis jalapa*, maternal effect snail shell coiling, cytoplasmic inheritance (mitochondria and chloroplast). (5 hrs)

Unit 4 Analysis of genetic inheritance in human

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. (5 hrs)

Unit 5 Karyotyping

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) (4 hrs)

Course outcome:

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.

Text Books

1. Principles of Genetics, 6 th 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.

STATISTICS 4 0 0 3

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.

Unit I Computer Components and Programming

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. (5 hrs)

Unit II Internet

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. (5 hrs)

Unit III Introduction to statistics

Introduction to statistics – diagrammatic and graphical representation – measures of central tendency: mean, median, mode – measures of dispersion: quartile deviation, mean deviation, standard deviation. (5 hrs)

Unit IV Correlation Analysis

Correlation analysis : Scatter diagram method, karl pearson's method, spearman's rank correlation method- regression analysis : regression equation of Y on X and Y on X – simple problems. (5 hrs)

Unit V Test of Hypothesis

Test of Hypothesis-, T test, F test , א_ test- ANOVA: one way, two way anova. (4 hrs)

Course outcome:

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

CO5: Understand standard deviation and standard error. Correlate two or more samples with ANOVA. Understand Correlation and regression. Demonstrate probability and hypothesis for sample selection.

Text Books

1. Levin and Rubin, Statistics for Management, Prentice hall of India. 7th 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.

PATHOLOGICAL BASIS OF DISEASES 4 0 0 3

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.

Unit 1 Introduction

History of pathology, Basic definitions and common terms used in pathology, Survival mechanism and disease, microscopic and cellular pathology, scope and techniques used. (5 hrs)

Unit 2 Cell Injury and responses of cells: Cellular Adaptations, and Cell Death

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 (5 hrs)

Unit 3 Role of Inflammation in disease

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. (5 hrs)

Unit 4 Role of Tissue repair Healing and Fibrosis

Basic mechanism of tissue regeneration, and repair by healing, scar formation and fibrosis (4 hrs)

Unit 5 Common Hemodynamic Disorders in diseases

An overview of Edema, hyperemia, congestion, hemorrhage, hemostasis and thrombosis, Embolism, Infarction and shock with suitable examples (5 hrs)

Course outcome:

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. Understand the pathological changes during cellular ageing and other infectious diseases.

CO2: Gain an insight into the history of pathology covering all the basic definitions and common terms. Detail on the survival mechanism in diseases, an insight into microscopic and cellular pathology.

CO3: Give an overview of cellular adaptation including Hyperplasia, Hypertrophy, Atrophy, and Metaplasia. Elaborate on the causes and mechanisms of cell injury- reversible and irreversible injury, and also on Necrosis and Apoptosis.

CO4: Understand the basic concepts related to acute and chronic inflammation. Discuss the vascular changes and cellular events that happen during inflammation.

CO5: Explain the morphological effects of an inflammation response. Understand the basic mechanism of tissue regeneration, and repair by healing, scar formation and fibrosis. Provide a detailed overview on Edema, hyperemia, congestion, hemorrhage, hemostasis and thrombosis, Embolism, Infarction and shock with suitable examples.

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, 6 th edition (2009); Jaypee Brothers Medical Publishers, ISBN-13: 978-8184484496.

NATURAL RESOURCE MANAGEMENT 4 0 0 3

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.

Unit 1 Natural resources

Definition and types. Sustainable utilization **-** Concept, approaches (economic, ecological and socio-cultural). Renewable and non-renewable sources of energy (5 hrs)

Unit 2 Land and Water

Utilization (agricultural, pastoral, horticultural, silvicultural); Soil degradation and Management. Fresh water (rivers, lakes, groundwater, aquifers, watershed); Marine; Estuarine; Wetlands; Threats and management strategies. (5 hrs)

Unit 3 Biological Resources

Biodiversity-definition and types; Significance; Threats; Management strategies; Bioprospecting; IPR; CBD; National Biodiversity Action Plan). (5 hrs)

Unit 4 Forests

Definition, Cover and its significance (with special reference to India); Major and minor Forest products; Depletion; Management. (5 hrs)

Unit 5 Contemporary practices in resource management

EIA, GIS, Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon footprint, Resource Accounting; Waste management. (4 hrs)

Course outcome:

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. Demonstrates ability for critical thinking to analyse, assess deal with problems associated with the field of biodiversity.

CO5: Develops awareness about Forests and Cover and its associated risk factors of forest depletion. Discuss about various Bioprospecting programmes and related government ordinances (IPR, CBD & National Biodiversity Action Plan). Understands about the contemporary Practises followed in biodiversity EIA (Environmental impact assessment), GIS (Geographic information system) and Footprinting and its importance in Ecological studies.

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).

INTELLECTUAL PROPERTY RIGHTS 4 0 0 3

Course objectives

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

Unit 1: Introduction to intellectual property right (IPR)

Concept and kinds. Economic importance. IPR in India and world: Genesis and scope, some important examples.IPR and WTO (TRIPS, WIPO).(5 hrs)

Unit 2: Patents and Copyrights

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. (5 hrs)

Unit 3: Trademarks and Geographical Indications

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 (5 hrs)

Unit 4 : Protection of Traditional Knowledge

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. (5 hrs)

Unit 5: Protection of Plant Varieties

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. (4 hrs)

Course outcome:

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. Compare and contrast the different forms of intellectual property protection in terms of their key differences and similarities.

CO2: Unravel the holistic understanding of the complexities involved in the process of attributing intellectual property rights to people. Explain the legalities of intellectual property to avoid plagiarism and other IPR relates crimes like copyright infringement etc

CO3: Assess and critique some basic theoretical justifications for each form of intellectual property protection. Analyze the effects of intellectual property rights on society as whole.

CO4: Solve legal problems and provide effective legal advice to clients concerning their intellectual property rights and obligations. Understand the various rationales proffered for the granting of intellectual property Rights

CO5: Grasp and analyse intellectual property issues raised in novel problems. 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

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 (14th 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.

HERBAL TECHNOLOGY 2 0 0 2

Course objectives

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

Unit 1 Introduction

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. (5 hrs)

Unit 2 Pharmacognosy

Pharmacognosy - systematic position medicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka. (5 hrs)

Unit 3 Phytochemistry

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). (5 hrs)

Unit 4 Analytical pharmacognosy

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). (5 hrs)

Unit 5 Conservation of herbs

Medicinal plant banks micro propagation of important species (*Withania somnifera*, neem and tulsi)- Herbal foods-future of pharmacognosy. (4 hrs)

Course outcome:

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

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.

PHARMACOLOGY 4 0 0 3

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, with roots both in basic biology and chemistry, and plays a vital role in helping to safeguard our health and welfare.

Unit 1 General Pharmacology

Nature and Source of drugs, Routes of drug administration and their advantages, receptor and receptor subtypes. (5 hrs)

Unit 2 Pharmacokinetics

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. (5 hrs)

Unit 3 Pharmacodynamics

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. (5 hrs)

Unit 4: Drugs acting on CNS

(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). (5 hrs)

Unit 5: Anti-inflammatory, Hormones and hormone antagonists

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). (4 hrs)

Course outcome:

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

CO1: Explain the relationship between dose and biological response. Explain the role of absorption, distribution, metabolism and excretion in drug disposition. CO2: Describe how drugs affect the body, i.e., how they cause their effects (Pharmacodynamics). The various routes of drug administration and the concept of drug bioavailability.

CO3: Explain how the body handles drugs (Pharmacokinetics; Biotransformation). Explain the mechanisms of drug action of well-known drug examples**.**

CO4: List the major drugs and drug classes currently used in medical practice. List the mechanisms underlying differences between distinct individual's dose- responses to the same drug (both pharmacokinetic and pharmacodynamic).

CO5: Explain the relationship between desired and undesirable effects of drugs as a function of dose. Describe how the administration of multiple drugs can affect each individual drug' effect(s) (i.e., drug interactions).

Text Book

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, 7th edn (2011), , Churchill Livingstone.

2. S.K. Kulkarni, Vallabh Prakashan Hand book of Experimental Pharmacology, 4th ed (2012)

DISASTER MANAGEMENT

Course objectives

The overall aim of this is to provide broad understanding about the basic concepts of Disaster Management, its types, challenges and impact.

UNIT I - Introduction to Disasters: 4

Concepts and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks).

UNIT II – Disasters: Classification, Causes, Impacts 5

Disasters – classification, causes and impacts including social, economic, political, environmental, health, psychosocial etc.) Differential impacts - in terms of caste, class, gender, age, location, disability Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change.

UNIT III – Approaches to Disasters Risk reduction: 5

Disaster cycle – its analysis, Phases, Culture of safety, prevention, mitigation and preparedness, community based DRR, Structural – non structural measures, roles and responsibilities of community, Panchayat Raj Institutions/Urban Local Bodies (PRIs/ULBs), states, Centre and other stake-holders.

UNIT IV – Inter-relationship between Disasters and Development: 5

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT V - Disaster Risk Management in India 5

Hazard and Vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation).

Course outcomes

CO 1. Application of Disaster Concepts for Management

CO 2. Analyze Relationship between Development and Disasters.

CO 3. Ability to Categories Disaster

CO 4. Acquire knowledge for appropriate planning, preparation and response for emergency treatment in disaster situation.

CO 5. Apply disaster drills and make opportunities available to all medical caregivers to participate in disastrous situation.

Text Books:

1. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press, 2000.
2. Andharia J. Vulnerability in Disaster Discourse, JTCDM, Tata Institute of Social Sciences Working Paper no. 8, 2008.
3. Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.
4. Coppola P Damon, 2007. Introduction to International Disaster Management.
5. Carter, Nick 1991. Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.

CONSUMER AFFAIRS

Course Objective: This paper seeks to familiarize the students with their rights and responsibilities as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights. It also provides an understanding of the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards. The student should be able to comprehend the business firms interface with consumers and the consumer related regulatory and business environment.

Unit 1 Conceptual Framework **4**

Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price(MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. Consumer buying process, Consumer Satisfaction / dissatisfaction – Grievances – complaint, Consumer Complaining Behavior: Alternatives available to Dissatisfied Consumers, Complaint Handling Process: ISO 10000 suite.

Unit 2 The Consumer Protection Law in India **5**

Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice and restrictive trade practice. Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

Unit 3 Grievance Redressal Mechanism under the Indian Consumer Protection Law **5**

Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties. Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

Unit 4: Role of Industry Regulators in Consumer Protection **5**

Banking: RBI and Banking Ombudsman, Insurance: IRDA and Insurance Ombudsman, Telecommunication: TRAI, Food Products: FSSAI, Electricity Supply: Electricity Regulatory Commission, Real Estate Regulatory Authority.

Unit 5: Contemporary Issues in Consumer Affairs **5**

Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings. Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview.

Course Outcomes

CO 1. Comprehensive understanding about the existing law on consumer protection in India.

CO 2. Acquainted with major international instruments on consumer protection

CO 3. Aware of the basic procedures for handling a consumer dispute.

CO 4. Able to appreciate the emerging questions and policy issues in consumer law for future research.

CO 5. Identify and interpret phenomena and consumption, consumer protection processes

Text Books:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, Universities Press.
2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications Pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, Regal Publications.
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi.
5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company.

LANGUAGES
SYLLABUS

SEMESTER I

தமிழ் மொழி, இலக்கிய வரலாறு – அறிமுகம் 5 0 0 5

நோக்கம்: தமிழ்மொழி மற்றும் இலக்கியத்தின் வரலாற்றை அறிமுகம் செய்யும் நோக்கில் இப்பாடம் வடிவமைக்கப்பட்டுள்ளது. தமிழ்மொழியின் வரலாற்றை அறிவியல் கண்ணோட்டத்துடனும் மொழிக்குடும்பங்களின் அடிப்படையிலும்விளக்குகிறது. 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. சு., "தமிழ்மொழி வரலாறு", மணிவாசகர் பதிப்பகம், முதற்பதிப்பு 1998.

3. பூவண்ணன், " தமிழ் இலக்கிய வரலாறு", சைவசித்தாந்த நூற்பதிப்புக் கழகம், முதற்பதிப்பு, 1998.

4. வரதராசன். மு., "இலக்கிய வரலாறு",சாகித்ய அகாதெமி, ஒன்பதாம் பதிப்பு, 1994.

5. விமலானந்தம். மது.ச., "இலக்கிய வரலாறு", பாரி நிலையம், மறுபதிப்பு, 2008.

Total : 60 hours

Course outcome:

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

CO 1: Recall and recognize heritage and culture of Tamils through History of Tamil Language.

CO 2: Interpret the cultural life style of Ancient Tamils.

CO 3: Evaluate social and indivituals moral value after studying Epics and Ethics Literature.

CO 4: Build the humanistic concept and moral life skills after studying divine and minor Literature.

CO 5: Improve their own creativity and writing skills after studying history of Modern Tamil Litrature.

HINDI I **5 0 0 5**

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

Course outcome:

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

CO 1: Through the story students will be familiar with the writing style of great writer "sri Jayashankar Prasad" & can understand the situation of country during Mughal period.

CO 2: To make the children understand the importance of selecting a profession according to one's own interest.

CO 3: To describe the present situation ;politician's behaviour& their selforiented activities.

CO 4: To explain the importance of computer in daily life in all the fields.

CO 5: This story helps the students to understand the Writing style of writer "Fanishwarnath renu" who Is wellknown for his village type Stories .

FRENCH I 5 0 0 5

OBJECTIVE:

To introduce French language.

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

UNIT:I INTRODUCTION 12

AIM :Is to impart the basics of french language

CONTENT :Introduction-Alphabet-comment prononcer, écrire et lire les mots-base: les prénoms personnel de 1er , 2eme et 3eme personnes-conjugaisons les verbes être et avoir en forme affirmative, négative Et interrogative.

OUTCOME :The content of the unit 1 aids the students to explore the basics of the new foreign language.

UNIT II- LECON 1-3 12

AIM : Is to make the students to known about the words formation and elementary grammar

CONTENT :Leçon 1 :Premiers mots en français- 2.Les hommes sont difficiles 3.Vive la liberté-Réponses aux questions tires de la leçon-Grammaire: Les adjectives masculines ou féminines-Les article définies et indéfinis-Singuliers et pluriels.

OUTCOME :The content of unit 2 to experience the basic formations of words and its basic grammar by differentiating with English.

UNIT III-LECON 4-6 12

AIM : Is to motivate the students community by teaching about the Francophonie.

CONTENT :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 tires 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

OUTCOME :This imparts the additional information in terms of general in the sense of geographical and culture.

UNIT :IV-LECON 7-9 **12**

AIM : Is to teach about the intermediate level of French grammar

CONTENT :Leçon 7.Trois visage de l'aventure , 8. A moi Auvergne 9.Recit de voyage-Réponses aux questions tires de la leçon- Grammaire : Adjectif processif- Les phrases au présent de l'indicatif-Les phrases avec les verbes pronominaux au présent.

OUTCOME :Enable students for framing the basics sentence.

UNIT :V- COMPOSITION : **12**

AIM :Is to teach about the basic content of essay and letter writing.

CONTENT :A écrire une lettre a un ami l'invitant a une célébration différente ex :mariage-A faire le dialogue- A lire le passage et répondre aux questions.

OUTCOME :Making the students community to know the french format of letter writing and essay writing.

TEXTBOOK :

Jack GIRARDER & Jean Marie GRIDLIG,<<Méthode de Français PANORAMA>>, Clé Internationale, Goyal Publication ,New Delhi Edition 2014.

REFERENCE BOOKS:

DONDO Mathurin, "Modern French Course", Oxford University Press, New Delhi Edition 2014.

Nithya Vijayakumar get ready French grammar-Elementary Goyal publications ,New Delhi Edition 2014.

English I **5 0 0 5**

COURSE OBJECTIVE:

- To enable students to develop their communication skills effectively. To make students familiar with the English Language.
- To enrich their vocabulary in English
- To develop communicative competency

Credit Hours

UNIT I - Preparatory Lesson **12**

1. Competition Matters
   Suzanne Sievert
2. A Personal Crisis May Change History
   Dr. A.P.J. Abdul Kalam
3. Why Preserve Biodiversity
   Prof. D. Balasubramanian

UNIT II –Prose **12**

1. The Unexpected
   Robert Lynd
2. My Greatest Olympic Prize
   Jesse Owens
3. If You are wrong, admit it
   Dale Carnegie

UNIT III –Poetry **12**

1. The Night of the Scorpion
   Nissim Ezekiel
2. Pulley or The Gift of God
   George Herbert
3. La Bella Dame Sans Merci
   John Keats

UNIT IV- Short Story **12**

1. The Gift of Magi

   O Henry

2. Three Questions

   Leo Tolstoy

UNIT V – One Act Play **12**

1. The Shirt

   Francis Dilion

2. The Pie and the Tart

   Hugh Chesterman

Total: 60 Hours

COURSE OUTCOME

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

CO 1 Examine the difference between poetic language and the language of the prose.

CO 2 Utilize instructions on fundamentals of grammar

CO 3 Develop their own style of writing after studying diverse prose essays.

CO 4 Classify different poems on the basis of their types.

CO 5 Conclude the textual content of both prose and poetry.

Books Prescribed:

- Confluence - Anu Chithra Publications

SEMESTER II

தமிழிலக்கியம் **5 0 0 5**

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.

Course outcome:

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

CO 1: Measure human mind through the studying of Tamil classical literature in the aspect of moral value.

CO 2: Justify the contemporary social issueses through studying Tamil Epics.

CO 3: Build the life skills after studying of the poetry.

CO 4: Develop narrative skill after reading short stories.

CO 5: Improve their own style of writing after studying Sirpiye Unnai Sethukkukiren essays collection.

HINDI II **5 0 0 5**

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 Book

1. N.Lavanya, Sankalan Kahani evam Ekankied Mayura Publishers, edition 2010

Course outcome:

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

CO 1: This story explains the problems faced by the farmers 'Upanyas samrat Premchand' describes the life of a poor farmer who represents present day's situation**.** Author 'Uday Shankar bhatt' criticized the rich&stingy person's behaviour and explains the importance of human values in a humorous manner.

CO 2: By translating the English passage into Hindi,students learn the rules which should be followed while translation.

CO 3: Female writer'Usha priyamvada 'describes the mentality of a retired person in a beautiful manner. This humorous story written by 'chiranchith'points out the problems occur due to carelessness &lack of communication.

CO 4: Writer 'Mannu bhandari'describes the condition of middle aged woman left lonely who longs only for love &affection&nothing else.**'**Vrajabhushan' shows the clear picture of cunning woman and creates Awareness.

FRENCH II **5 0 0 5**

OBJECTIVE:

To introduce French language.

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

UNIT:10-11 **12**

AIM : Is to teach about the tense and objects.

CONTENT : Leçons :10 Les affaires marchent,11 un repas midi a problèmes- Réponses aux questions tires de la leçon-grammaire ;présent progressif passe récent ou future proche-complément d'Object directe-complément d'objet

OUTCOME :This enable students to learn the language without any grammatical errors.

UNIT II- LECON 12-13 **12**

AIM : Is explain about the pronouns and their differences.

CONTENT : Leçons 12 :tout est bien qui fini bien,-13 aux armes citoyens-réponses aux questions tires de la leçon-grammaire :les pronoms<<en ou y>> rapporter des paroles-Les pronoms relatifs que, qui ou ou.

OUTCOME :As a result of the content makes the students to known about the types of pronouns and their useage.

UNIT III-LECON 14-**15** **12**

AIM : Is to involve the students by making them to frame the own simple sentence without any grammatical mistakes.

CONTENT : Leçons 14.Qui ne risque rien n'a rien-15.la fortune sourit aux audacieux-réponses aux questions tires de la leçon-grammaire : comparaison-les phrases au passe compose.

OUTCOME :This imparts the students in order to develop their basic writing skills.

UNIT :IV-LECON 16-18 **12**

AIM : Is to teach about the intermediate level of French grammar

CONTENT : Leçons 16 la publicité et nos rêves 17 la France la monde 18 campagne publicitaire réponses aux questions tires de la leçon-grammaire :les phrases a l'imparfait-les phrases au future

OUTCOME :Enable students for framing the basics sentence.

UNIT :V- COMPOSITION : **12**

AIM :Is to teach about the basic content of essay and letter writing.

CONTENT : A écrire une lettre a un ami l'invitant a une célébration différente ex :mariage-A faire le dialogue- A lire le passage et répondre aux questions.

OUTCOME :Making the students community to know the french format of letter writing and essay writing.

TEXTBOOK :

Jack GIRARDER & Jean Marie GRIDLIG,<<Méthode de Français PANORAMA>>, Clé Internationale, Goyal Publication ,New Delhi Edition 2014.

REFERENCE BOOKS:

DONDO Mathurin, "Modern French Course", Oxford University Press, New Delhi Edition 2014.

Nithya Vijayakumar get ready French grammar-Elementary Goyal publications ,New Delhi Edition 2014.

ENGLISH II **6 0 0 4**

COURSE OBJECTIVE:

- To enable students to develop their communication skills effectively
- To make students familiar with various sentence patterns of the English Language
- To enrich their vocabulary in English
- To develop communicative competency

Credit Hours

UNIT-I Prose **12**

1. The Words of Wisdom
   Chetan Bhagat
2. Forgetting
   Robert Lynd
3. My Early Days
   Dr. A.P.J. Abdul Kalam

UNIT II –Poetry **12**

1. Ozymandias
   Percy Bysshe Shelley
2. Mending Wall
   Robert Frost
3. Where the Mind is Without Fear
   Rabindranath Tagore

UNIT III –Short Story **12**

1. Am I Blue?
   Alice Walker
2. The Last Leaf
   O' Henry

3. The Selfish Giant

   Oscar Wilde

UNIT IV – One Act Play **12**

1. Soul Gone Home

   Langston Hughes

UNIT V **12**

1. Lexical Skills

2. Vocabulary

3. Communication and Grammar at the end of all lessons

Total: 60 Hours

COURSE OUTCOME

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

CO 1 Construct sentences owing to advanced grammar skills taught.

CO 2 Prove better communicative ability because of illustrations from fundamental grammar.

CO 3 Prove their skill in writing sentences after the modals of American, British and Indian English writers.

CO 4 Develop different sensibilities in approaching life.

CO 5 Solve life's problems as highlighted in the selections.

Books Prescribed:

Radiance - Emerald Publications

SEMESTER III

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.

Course outcome:

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

CO 1: Utilizing fundemendal tami grammer in their practical life.

CO 2: Improve their oratorical skill after studying of concept of oratory.

CO 3: Develop their own style of Terminology afer studying the Nomenclature.

CO 4: Translate english passage to Tamil.

CO 5: Apply their knowledge into journals, articles writings.

HINDI III **5 0 0 5**

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 Book

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.

Course outcome:

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

CO 1: Students can understand the writing style of Kabir & also learn valuable messages

CO 2: To learn the precious poems of Surdas & SriKrishna Leela

CO 3: Students get the opportunity to learn the poems of Ram bhakthi poet Thulssi das

CO 4: The poems of Rahim are different &valuable and students will get confidence &ideas to tackle the problems ahead.

CO 5: The aim of teaching 'Hindi Sahitya ka ithihas' is to make them understand the different periods of growth of Hindi Literature & the remarkable literary works in Hindi literature.

FRENCH III **5 0 0 5**

OBJECTIVE:

To strengthen the Grammar and Composition in French language.

To train the students to enhance his skills in French language for communication.

UNIT: I LECON 1 **12**

Aim: To foster the students to know about the past tense , singularity and plural of vocabularies.

Content : Leçon 16-La famille Vincent. Page 44-Grammaire : Passe compose. Leçon 29-

Vers l'hôtel. Page80- Grammaire : Impératif, a mettre phrases Singulier, Pluriel.

Outcome: Student could differentiate between the past imperfect and past tense in a phrase.

UNIT II- LECON 12-13 **12**

Aim: To know about the vocabularies related to food items and to teach imperative

Content : Leçon 40-L'Epicerie les Légumes et les Fruits. Page 112-Grammaire ; Présent de

L'indicatif. Leçon 44 La poste. Page-124 l'Grammaire : A mettre les phrases a l'impératif.

Out Come: Students will learn about vocabularies related to content and will use it during conversations.

UNIT III-LECON 14-15 **12**

Aim: To teach them about interrogative and past imperfect tense

Content : Leçon 51-Le café et tabac page142- Grammaire : A changer les phrases en

Interrogatif. Leçon 58-La chasse et la pèche. Page160-Grammaire :Le plus que parfait.

Outcome: Learners will frame sentences based on the grammar topics as mentioned.

UNIT: IV-LECON 16-18 **12**

Aim: To teach grammar topic present continuous.

Content : Leçons 61-Un mariage a la campagne. Pagé-170 -grammaire :a changer au

Participe présent.

Outcome: Students will learn the differences between present tense and present continuous tense.

UNIT: V- COMPOSITION: **12**

Aim: To teach the learners group about the basic foramet of letter writing.

Content : A écrire une lettre a un ami l'invitation d'une célébration différente

ex :Mariage-a faire un essai sur un sujet générale-a lire le passage et répondre

Aux questions.

Outcome: Students will write French letter based on relative subject as mentioned in content.

TEXTBOOK:

Les leçons ont été choisi et tire de i & ii degré de gauger<<Cours de Langue et De Civilisation Française>> The Millenium, Publication Hachette, édition 2002

REFERENCE BOOKS:

DONDO Mathurin, “Modern French Course”, Oxford University Press, New Delhi Edition 2014.

English –III **5 0 0 5**

COURSE OBJECTIVE:

- To train students in the use of English language in varied literary and non-literary context
- To teach them soft skills and strengthen their foundation in grammar and composition
- To evaluate their comprehension skills.

Credit Hours

UNIT - I- Prose **12**

1. Two Gentleman of Verona - A.J. Cronin
2. Judas Iscariot - Bonnie Chamberlain
3. Dangers of Drug Abuse - J. V. S. Henbane

UNIT II - Short Stories **12**

1. Journey by Night - Norah Burke
2. The 2000-Mile Turtle - Henry Edward Fox
3. Fools Paradise - Isaac Bashevis Singer

UNIT III – Fiction **12**

R. L. Stevenson - Dr. Jekyll & Mr. Hyde (Retold by Kennet) – S. Chand & company Ltd.

UNIT IV - Functional English **12**

1. Paragraph Writing
2. Comprehension
1. Letter Writing
2. Report writing
    a) News Paper Report
    b) Reports for Government Official Attention
    c) Definition

UNIT V – Conversation In Situations & Conversation Practice **12**

1. **Conversation in Situations**

    a) At the Airport
    b) In a Bank
    c) On the Beach
    d) At the Customs
    e) At the Doctors'

f) In a Flight
g) In a Hotel
h) In a Restaurant
i) In a Shop
j) Tea Time
k) On the Telephone
l) In a Travel Agency
m) On a Country Walk
n) At the theatre
o) In a Street

2. Conversation Practice

a) Daily Activities
b) Asking Directions
c) Travel plans
d) Living in an Apartment
e) Money Problems
f) Weather Conditions
g) Dinner Conversations
h) Common Health Problems
i) Tag Questions
j) Office Conversations

3. Expansion of Hints

Total: 60 Hours

COURSE OUTCOME

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

CO 1 Estimate the essays in the light of appeal of values-based essays.
CO 2 Prioritize pragmatic day to day communication through letter and comprehension.
CO 3 Develop narrative skill after reading the short stories.
CO 4 Improve their own style of writing after an expose to the prescribed prose pieces.
CO 5 Adapt themselves to life context wherein soft skill learning is a must

Books Prescribed:

1. Effective English Communications for You – V. Syamala, Emerald Publishers, Chennai.
2. English Conversation Practice by D. H. Spencer, Oxford University Press
3. English Conversation Practice by Grant Taylor, Tata McCraw-Hill, Publishing Company Limited, New Delhi.

SEMESTER IV

தமிழர் நாகரிகமும் பண்பாடும் 5 0 0 5

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.

Course outcome:

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

CO 1: Re-Construct Tamil culture and civilization in the aspect of life style of ancient Tamils.

CO 2: Formulated their new methods of fine arts through the sprite of ancient art of Tamils.

CO 3: Find out the solutions for the problems of life throgh the philosophical ideology of Tamil religions.

CO 4: Aquire the Knowledge and understanding theories of political system

CO 5: Formulate the art of life through Tamil traditional scientific approach.

HINDI IV **5 0 0 5**

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 Book

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

Course outcome:

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

CO 1: Rashtra kavi'Maithili sharan gupta' dreams about his life in a beautiful Manner.

CO 2: Describes how his world should be.students get an opportunity to know about Hindi journalism & the developments took place gradually.

CO 3: Taken from 'Jayashankar prasad' 's Kamayani ,this poem explains the condition of human beings at different situations.

CO 4: ‘Shri Gajanan madhav mukthi bodh’ describes the present day’s thought of a common man & expectations

CO 5: Poet ‘Bhavani Prasad mishra ‘ points out the importance of love & affection and also the bad effects of enmity.

FRENCH IV 5 0 0 5

OBJECTIVE:

To strengthen the Grammar and Composition in French language. To train the students to enhance his skills in French language for communication.

UNIT:I

Aim : To teach grammar topics on adverb ,future tense formation , usage and vocabularies related to modes of transportation.

Content : Leçon 20 : Une grande Nouvelle-Grammaire Le future.

Leçon 46 :Le mètre ;l'autobus-Grammaire-A former ou a changer L'adjectif masculin ou féminine a l'adverbe-Trouvez les noms qui correspondent aux verbes suivants.

Out come : Learners group will able to make sentences related to the content and its vocabulary.

UNIT :II

Aim : To teach grammar topics based on relative pronoun , conditional present and vocabularies related to public services

Content :Leçon 48 : A la préfecture de police-Grammaire Les pronoms relatifs.

Leçon 63 :les sports-Grammaire le conditionnel présent.

Out come :Learners group will able to make conversation based on the vocabularies related to content.

UNIT :III

Aim : To teach about grammar topic future anterieure

Content : Leçon :56 A Biarritz la page-Grammaire le futur antérieur. Leçon :57 Dans les Pyrénées-Grammaire le future antérieure suite.

Out come : Students will be doing comprehension d'ecrit based on the content.

UNIT :IV

Aim :To teach grammar topic based on singular , plural and subjonctif.

Content : Leçons 65-a fin des vacances Grammaire-a changer les phrases du pluriel au singulier, le présent du subjonctif.

Outcome : Learners group will be able to transform sentences from singular to plural or vice-versa.

UNIT :V

Aim :To teach about the basic translation of sentences from English to French

Content :Grammaire et composition :Transduction - réponses aux questions sur les passage-essaie sur un sujet générale, :lettre :Ecrire une lettre a une amie.

Out come : learners group will able to do basic translations .

TEXTBOOK:

Les leçons ont été choisi et tire de i & ii degré de gauger<<Cours de Langue et De Civilisation Française>> The Millenium, Publication Hachette, édition 2002

REFERENCE BOOKS:

DONDO Mathurin, “Modern French Course”, Oxford University Press, New Delhi Edition 2014.

ENGLISH IV **5 0 0 5**

COURSE OBJECTIVE:

- To train students in the use of 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.

Credit Hours

UNIT I – Prose **12**

1. Walking Tours - R. L. Stevenson
2. All About a Dog - A. G. Gardinar
3. No Man is an Island - Minno Masani

UNIT II - Short Stories **12**

1. The Man Who Likes Dickens - Evelyn Waugh
2. Lamb to the Slaughter - Roald Dahl
3. Buck Hears the Call - Jack London

UNIT III – Drama **12**

1. Selected Scenes from Shakespeare's Plays – Book I, Emerald Publishers
   a) Funeral Oration (Julius Caesar)
   b) Trial for a Pound of Flesh (The Merchant of Venice)
   c) Patterns of Love (As You Like It)

UNIT IV **12**

1. General Essay Writing & Group Discussion
2. Persuasive Writing and Role Play

UNIT V **12**

1. Notice, Agenda, Minutes.

Total: 60 Hours

COURSE OUTCOME

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

CO 1 Illustrate the essential of presentation skills, thoughts, structure, voice modulation, audience analysis and body language

CO 2 Utilize the psychological skills pertaining to time management, articulation, assertion and stress management

CO 3 Utilize the psychological skills pertaining to time management, articulation, assertion and stress management

CO 4 Appraise learners with varied skills needed for expose to interviews

CO 5 Categorise the nature of questions asked usually in interviews

Books Prescribed:

1. Invitation to English Prose – A. E. Varadarajan & S. Jagadisan, Orient Black Swan, Chennai

SKILL ENHANCEMENT COURSES

SOFT SKILL I

1. **Reading Comprehension and Vocabulary**

   Filling the blanks – Cloze Exercise – Vocabulary building – Reading and answering Questions.

2. **Listening and Answering Questions.**

   Listening and writing – Listening and sequencing sentences – Filling in the blanks – Listening and answering questions.

3. **Group Discussions**

   Why GD part of a selection process – Structure of a GD – strategies in GD – Team Work – Body Language

4. **Conversation.**

   Face to face Conversation and Telephone conversation.

5. **Self- Introduction and Role Play**

COURSE OUTCOME

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

CO 1 Prioritize power of understanding and aids assimilation of vocables. Vocabulary to charge communication with educated words

CO 2 Develop comprehensive knowledge through listening leading to answering questions

CO 3 Build observation power and infuse self-confidence through group discussions

CO 4 Identify methodology for befitting constructional ability

CO 5 Experiments with inward looking and visualization of the ‘otherness’ of situations

BOOKS RECOMMENDED

Barun K. Mitra. Personality Development and Soft Skills. Oxford University Press. New Delhi.2011.

S.P. Sharma. Personality Development. Pustaq Mahal. New Delhi. 2010.Meenakshi Raman and Sangeetha Sharma. Technical Communication. Oxford University Press. New Delhi. 2009.

SOFT SKILL II

1. **Presentation Skills**

   Elements of an effective presentation – structure of presentation – voice modulation – Audience analysis – Body language

2. **Soft Skills**

   Time Management – Articulateness – Assertiveness – Stress management

3. **Resume / Report preparation / Letter Writing**

   Structuring the resume / Report – Business letters – E-Mail Communication

4. **Interview Skills**

   Kinds of Interviews – Required by Skills – Corporate Culture – Mock Interviews

5. **30 Frequently asked questions**

COURSE OUTCOME

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

CO 1 Illustrate the essential of presentation skills, thoughts, structure, voice modulation, audience analysis and body language

CO 2 Utilize the psychological skills pertaining to time management, articulation, assertion and stress management

CO 3 Construct methodology for preparation of resume, reports, business letters and email communication

CO 4 Appraise learners with varied skills needed for expose to interviews

CO 5 Categorize the nature of questions asked usually in interviews

BOOKS RECOMMENDED

Barun K.Mitra. Personality Development and soft skills. Oxford University Press. New Delhi. 2011.

S P Sharma. Personality Development. Pustaq Mahal. New Delhi. 2010.

Meenakshi Raman and Sangeetha Sharma. Technical Communication. Oxford University Press. New Delhi. 2009.

NATIONAL SERVICE SCHEME 2 0 0 2

Course objectives

To inculcate interest in building up a better society.

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 date - Preparation of documentation/reports - Dissemination of documents/reports

Unit 5 Project work/ Practical (5)

Workshops/ seminars on personality development and improvement of communication skills.

Total : 24 hours

ENTERPRENEURSHIP 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.

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 Book

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.

MEDICAL LAB DIAGNOSTICS 2 0 0 2

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.

Unit 1: Fundamentals of Clinical Diagnostics (5)

Sterilization Techniques: Physical methods and Chemical methods.

General overview of blood banking, blood typing, blood screening in transfusion medical lab.

Unit 2: Approaches to diagnosis of infectious diseases I (5)

Isolation of bacteria from mixed culture. Study of morphological, cultural, biochemical characteristics of common bacterial pathogen. Composition and use of important differential media for identification of pathogenic bacteria EMB agar, McConkey agar, TCBS agar and Salmonella-Shigella agar and blood culture media (any two)

Unit 3: Approaches to diagnosis of infectious diseases II (5)

Enumerate the microbial load on the selected fresh produce from major outlets. Isolate and identify the common microorganisms present on their surface using microbiological, biochemical and PCR techniques.

Unit 4: Immunoserology: Principles and Application I (5)

Antigen-antibody interaction and its use in diagnosis: Detection and diagnosis of common infectious diseases: Widal and typhi dot for typhoid, Malaria antigen in Malaria, NS1 antigen in Dengue

Unit 5: Immunoserology: Principles and Application II (4)

Antigen-antibody interaction and its use in diagnosis: Detection and diagnosis of common non infectious diseases: Acylatedhaemoglobin in Diabetes, TSH levels in Thyroid condition.

Total : 24 hours

Text Book

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 & 2, 6 th edition (2009); Jaypee Brothers Medical Publishers, ISBN-13: 978-8184484496.

2. James Cappuccino and Natalie Sherman, Benjamin Cummings Microbiology: A Laboratory Manual, 10 th edition (2013), ISBN-13: 978-0321840226

TECHNIQUES IN FORENSIC SCIENCE 2 0 0 2

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.

Unit 1: 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.

15EVS201 ENVIRONMENTAL STUDIES 2 0 0 2

Unit 1 Multidisciplinary nature of environmental studies (2)

Definition, scope and importance, Need for public awareness.

Unit 2 Natural Resources (4)

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 resoureces for sustainable lifestyles.

Unit 3 Ecosystems (3)

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)

Unit 4 Biodiversity and its conservation (3)

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-sports 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. 106

Unit 5: Environmental Pollution (3)

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. • Diaster management: floods, earthquake, cyclone and landslides.

Unit 6: Social Issues and the Environment (3)

From Unsustainable to Sustainable development • Urban problems related to energy • Water conservation, rain water harvesting, watershed management • Resettlement and rahabilitation 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.

Unit 7 : Human Population and the Environment (3)

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.

Unit 8: Field work (3)

Visit to a local area to document environmental assets river/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