

15CBPH11

Pharmaceutical Analysis I

Course Objective

The students should be introduced into basic analytical technique and principle involved in analytical methods involved in Pharmaceutical field. The student should learn about different types of titration methods like Acid Base titration, Redox titration and precipitation methods and principle involved analysis of drugs by titration methods. The students should also know about the advantages of non instrumental methods in analytical chemistry.

Theory

3-0-0-3

Unit I: Introduction

12hrs

Significance of quantitative analysis in quality control, different techniques of analysis preliminaries and definitions significant figures, rules for retaining significant digits, types of errors, mean deviation, standard deviation, statistical treatment of small data sets, selection of sample, precision and accuracy. Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards.

Unit II : Acid base titrations

15hrs

Acid base concepts, role of solvent, relative strengths of acids and bases, ionization, law of mass action, common-ion effect, ionic product of water, pH, hydrolysis of salts, Henderson-Hasselbach equation, buffer solutions, neutralization curves, acid-base indicators, theory of indicators, choice of indicators, mixed polyprotic system, amino acid titration.

Unit III :Oxidation reduction titrations

12 hrs

Concepts of oxidation and reduction, redox reactions, strengths and equivalent weights of oxidizing and reducing agents, theory of redox titrations, redox indicators, cell representations, measurement of electrode potential, oxidation-reduction curves, iodimetry and iodometry, titrations involving ceric sulphate, potassium iodate, potassium bromate, potassium permanganate.

Unit IV: Precipitation titrations

10hrs

Precipitation reactions, solubility products, effect of acids, temperature and solvent upon the solubility of a precipitate. Argentometric titrations and titrations involving Ammonium or potassium thiocyanate, mercuric nitrate and barium sulphate, Gaylussac method; Mohr's method, Volhard's method and Fajan's method.

Unit V Gravimetric analysis

11hrs

Precipitation techniques, solubility products, the 'Colloidal state, supersaturation co- precipitation, post-precipitation, digestion, washing of the precipitate, filtration, filter papers and crucibles, ignition, thermo gravimetric curves, barium as barium sulphate, aluminium as aluminium oxide, calcium as calcium oxalate and magnesium as magnesium pyrophosphate, organic precipitants.

Total :

60 hrs

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Outline the importance of quality control in Drug and Pharmaceutical Formulations
- CO2:** Apply the acid base titrations for analysis of drugs and Pharmaceuticals
- CO3:** Compare and contrast different oxidation and reduction reactions using various reducing/oxidising agents
- CO4:** Explain the concepts of precipitation titrations and the importance of various precipitation methods
- CO5:** Discuss about the various gravimetric techniques and application involved in analysis

Practicals

0-0-2-1

1. Standardization of analytical weights and calibration of volumetric apparatus.
2. Standardization of Sodium hydroxide,
3. Standardization of Hydrochloric acid
4. Standardization of Sulphuric Acid
5. Standardization of Potassium permanganate
6. Standardization of sodium thiosulphate
7. Assay of Ferrous Sulphate
8. Assay of Copper Sulphate
9. Assay of Boric acid
10. Assay of Ammonium chloride
11. Assay of Aspirin
12. Assay of Benzoic acid

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Outline the importance of quality control in Drug and Pharmaceutical Formulations
- CO2:** Apply the acid base titrations for analysis of drugs and Pharmaceuticals
- CO3:** Compare and contrast different oxidation and reduction reactions using various reducing/oxidising agents
- CO4:** Explain the concepts of precipitation titrations and the importance of various precipitation methods
- CO5:** Discuss about the various gravimetric techniques and application involved in analysis

Textbooks

- 1 A. M. Beckett and J. B. Stenlake ,Practical Pharmaceutical Chemistry, Vol. I & II, 4th edition, CBS Publishers and Distributors, New Delhi,2005.
- 2 Pharmaceutical Titrimetric Analysis – Theory and Practical, A. A. Napoleon, 1st edition, Kalaimani publication and Distributors, Tamil Nadu,2006.

References

1. Indian Pharmacopoeia, Government of India, Ministry of Health and Family welfare, 5th edition, 2010, The controller of Publication, New Delhi
2. K.A.Connors, A text book of Pharmaceutical Analysis, 3rd edition, A Wiley Interscience,Singapore,1999.
3. Kasture & Wadodkar, Text Book of Pharmaceutical analysis Vol.I & II.Nirali prakashan, 13 th edition ,2008
4. G.Vidya sagar, Text book of Pharmaceutical analysis ,Kalyani publication,Vol I and II 2009.
5. David G .Watson ,Pharmaceutical Analysis ,3rd Edition, British library cataloguing in publication data,2012

15CBPH12

Pharmacognosy I

Course objective:

The aim of the curriculum was designed as a multidisciplinary science for the scope of phytochemistry, modern medicines formulated from plants and animals, research of new drugs from natural sources including taxonomical classification, authentication, factors involved in collection, cultivation and systematic pharmacognostic study of crude drugs. Practical experiments were also designed to identify macroscopical characters, microscopic constants and chemical tests of the crude drugs.

Theory

3-0-0-3

Unit I: Introduction, sources and classification of drugs

12 hrs

Definition, history, scope and development of pharmacognosy. Sources of drugs - Biological, marine, mineral and plant tissue cultures.Classification of drugs - Alphabetical, morphological, taxonomical, chemical and pharmacological.

Unit II: Plant Taxonomy:

12 hrs

Study of the following families with special reference to medicinally important plants - Apocynaceae, Solanaceae, Rutaceae, Umbelliferae, Leguminosae, Rubiaceae, Liliaceae, Graminae, Labiatae, Cruciferae, Papaveraceae.

Unit III: Cultivation, collection, processing and storage of crude drugs:

12 hrs

Factors influencing cultivation of medicinal plants. Types of soils and fertilizers of common use. Pest management and natural pest control agents. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants.

Unit IV: Quality control and Introduction to active constituents of crude drugs

12 hrs

Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation.Isolation of active constituents of crude drugs, their classification and properties.

Unit V: Systematic Pharmacognostic Studies

12 hrs

Carbohydrates and derived products: Agar, Guar gum, Acacia, Honey, Isabgol, Pectin, Starch, Sterculia and Tragacanth.

Lipids: Bees wax, Castor oil, Cocoa butter, Cod-liver oil, Hydnocarpus oil, Kokum butter, Lard, Linseed oil, Rice-bran oil, Shark liver oil and Wool fat.

TOTAL

60 hrs

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Relate the scope of Pharmacognosy with various pharmaceutical fields. And summarise the knowledge about the various sources of crude drugs.
- CO2:** Classify crude drugs as per alphabetical, morphological, taxonomical, chemical, pharmacological, chemo taxonomical and serotaxonomical method. And medicinally important plants using taxonomical characters
- CO3:** Analyze adulteration of crude drugs and evaluate using organoleptic, microscopical, physico chemical method and biological method. Discuss various factors influencing cultivation of medicinal plants
- CO4:** Develop knowledge on chemistry of active constituents – alkaloids, glycosides, tannins, flavonoids, volatile oil and resins.
- CO5:** Discuss the Pharmacognosy of carbohydrate containing and lipid containing crude drugs and identify by chemical test.

Practicals

0-0-4-2

1. Identification of taxonomical characters of Apocynaceae, Solanaceae, Labiatae and Leguminosae.
2. Identification of taxonomical characters of Liliaceae, Rutaceae, Umbelliferae and papaveraceae.
3. Quantitative microscopic measurement of diameter of Starch grains.
4. Quantitative microscopic measurement of diameter of Calcium oxalate crystals.
5. Quantitative microscopic measurement of Length and width of Phloem fibers.
6. Determination of Leaf constants – Stomatal index.
7. Determination of Leaf constants – Stomatal number.
8. Determination of Vein - islet number.
9. Determination of Vein – Termination number.
10. Determination of Palisade ratio.
11. Chemical tests of Carbohydrates and Lipid containing drugs.
12. Preparation of Herbarium Sheets.

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Identify the morphological characters of different plant families of medicinally important crude drugs
- CO2:** Determine the dimensions of cell and cell content – Phloem fibers, starch grains, calcium oxalate crystals by microscopical method.
- CO3:** Evaluate the leaf constant – stomatal number, stomatal, index, palaisade ratio, vein islet number, vein termination number using quantitative microscopy
- CO4:** Test the presence of carbohydrates and lipids in powdered sample of crude drugs using chemical test
- CO5:** Create and compile the information of medicinal plants in a herbarium sheet

Textbooks

1. Textbook of Pharmacognosy. T. E. Wallis, Fourth edition J. & A. Churchill Ltd., London, 1960.
2. Trease and Evans Pharmacognosy William Charles Evans, Fifteenth edition W. B. Saunders, Edinburg London New York Philadelphia St. Louis Sydney Toronto 2002.
3. Study of crude drugs – M.A. Iyengar Fourth Edition. B.S Publications .1997

Reference Books

1. Trease and Evans Pharmacognosy William Charles Evans, Fifteenth edition W. B. Saunders, Edinburg London New York Philadelphia St. Louis Sydney Toronto 2002.
2. Pharmacognosy and Pharmaco biotechnology – James Robbers, Marilyn K. Speedice and Varro E., Tyler. 1996
3. Study of crude drugs – M.A. Iyengar Fourth Edition. B.S Publications .1997
4. Pharmacognosy – Kokate C.K, Purohit A.P, Gokhale Third Edition. B.S Publications. 1987
5. Anatomy of Crude drugs – M.A. Iyengar and Nayak Fifteenth Edition Carrer Publications 1998
6. Pharmacognosy of Powdered Crude drugs – Iyengar and Nayak Tenth Edition Scattered Publications.1968

15CBPH13 **Pharmaceutics – I (Physical Pharmacy – I)**

Course Objective:

Physical pharmacy is a fundamental course that leads to proper understanding of subsequent courses in Pharmaceutics and pharmaceutical technology. It leads to integrates knowledge of mathematics, physics and chemistry and applies them to the pharmaceutical dosage form development. And it also provides the basis for understanding the chemical and physical phenomena that govern the in vivo and in vitro actions of pharmaceutical products.

Theory

3-0-0-3

Unit I: Matter, Properties of Matter:

12 hrs

States of matter, change in the state of matter, latent heat and vapor pressure, sublimation-critical point, Eutectic mixtures, gases, aerosols, relative humidity, liquid complexes, liquid crystals, glassy state, solids-crystalline and amorphous polymorphism.

Unit II: Surface and Interfacial Phenomenon

12hrs

Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB classification, solubilization, detergency, absorption at solid interfaces, solid gas and solid-liquid interfaces, complex films, electrical properties of interface.

Unit III: Colloidal Dispersions

12hrs

Definition, types and properties of colloids, protective colloids, applications of colloids in pharmacy.

Unit IV: Coarse Dispersions

12 hrs

Suspensions and emulsions: Interfacial properties of suspended particles, settling in suspensions, theory of sedimentation, effect of Brownian movement, sedimentation of flocculated particles, sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheological considerations, emulsions; types, theories and physical stability.

Unit V: Complexation and Protein Binding

12hrs

Types of complexes, metal complexes, organic molecular complexes, inclusion complexes, methods of analysis of complexes, protein binding, binding equilibria.

Total

60 hrs

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Explain states of matter and classify properties of matter
- CO2:** Make Use of HLB scale in solubilztion and explain surface and interfacial tensions
- CO3:** Classify types of colloids and explain its properties and apply in pharmacy
- CO4:** Determine the importance in rheological properties of suspensions and emulsion

CO5: Classify complexation and evaluate protein binding

Practicals

0-0-3-2

1. Determination of density, latent heat, vapor pressure critical point.
2. Studies on polymorphs, their identification and properties.
3. Determination of critical micelle concentration of surfactant
4. Determination of surface/interfacial tension of the given solution using Stalagmometer
5. Determination of HLB value of surfactants.
6. Studies of different types of colloids and their properties.
7. Preparation of various types of suspensions and determination of their sedimentation parameters.
8. Effect of viscosity on sedimentation of suspensions
9. Determination of partition co-efficient of drugs
10. Evaluation of Emulsion by Globule size method.
11. Studies on protein binding of sulphmethoxazole
12. Determination of emulsion type

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Find bulk density, true density and porosity of polymorphs
- CO2:** Determine critical micelle concentration and HLB value of surfactant
- CO3:** Demonstrate different types of colloids and their properties
- CO4:** Examine sedimentation volume of suspension with effect of different suspending agents
- CO5:** Measure protein binding of sulphamethoxazole

Textbooks

1. Experimental pharmaceutical technology, Eugene L. Parrott, Witold Saski.3rd edition publisher Burgess, 1971
2. A Guide to Pharmaceutical Particulate Science, Timothy M. Crowder, Anthony M. Hickey, Margaret D. Louey, Norman Orr. Printed in the United States of America- 2003

Reference Books

1. Martin's Physical Pharmacy and Pharmaceutical Sciences, Alfred N. Martin, Patrick J. Sinko 5th ed publisher:Lippincott Williams & Wilkins, 2011 ,659 pages.
2. Textbook of Physical Pharmaceutics, 2/E, author C. V. S. Subrahmanyam.2nd ed, Publisher: Vallabh Prakashan , India.
3. PHYSICAL PHARMACEUTICS, Manavalan R Ramasamy C, 2nded. Published by Vignesh Publisher.
4. Pharmaceutical Dosage Forms Tablets, Herbert liberman,Leon lachman 2nd ed Published by agarciah1 on Nov 19, 2010.
5. Cooper and Gunn`s Tutorial Pharmacy, S.J. Carter. Published by CBS Publishers & Distributors Pvt. Ltd (2005).

15CBPH14 Basic Electronics & Computer Applications

Course Objective:

The course is designed to impart the knowledge in the field of basic electronics and computer applications to the students. It deals with basic concepts in electronic applications and also teaches the basic operations involved in computers like preparation of word document, power point presentation etc.,

Theory

2-0-0-2

Unit I: Basic Electronics

12 hrs

Semiconductors, p-n function diode, LED, photodiode and its uses. Rectifiers (half wave, full wave/with filters). Transistors, configurations, transistor amplifiers, introduction to integrated circuits, photocells and photomultiplier tubes.

Unit II : Introduction to Computers

12 hrs

(a) History of Computer development and respective generation: Abaccer, Napier, Bonar, Slide rule, PASCAL'S Calculator. Need to use computers, applications in pharmacy and in general.

(b) Computer classification: Mainframe, Mini and Micro Computers, comparison of Analogue and Digital Computers, Hardware and Software, Calculator and Computer.

Unit III: Operating Systems & Languages

12 hrs

Operating Systems: Introduction to types of operating systems, UNIX, MS - DOS, etc. RAM, Virtual Memory etc.

Type of Languages: Conventional languages; their advantages, limitations; C, PASCAL, FORTRAN, Programming of these languages.

Basic Language: Constants and Variables: Character set, constants, variables, Naming the variables getting data into memory, LET, INPUT, READ, DATA, Print Statement.

Unit IV: Introduction to Computer Networks

12 hrs

Introduction to Computer Networks: Architecture of seven layers of communications. Introduction to Data Structure: Like Queues, list, trees, Binary trees algorithms, Flow chart, Structured System, Analysis and development, Ingress-SQL, Gateways etc. Statistics, methodologies.

Unit V: Computer Applications & Graphics

12 hrs

Expressions: Arithmetic expression, Hierarchy of operations, rules of Arithmetic, evaluation of expressions, relational expressions, logical operations, library functions. Printer Control: Comma and semicolon control, the TAB function, PRINT, LPRINT. Functions and Subroutines: User defined functions, subroutines, subscripted variables, Computer graphics Computer applications in pharmaceutical and clinical studies.

Total

60 hrs

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Define the scope and importance of Computers in Pharmacy
- CO2:** Classify and summaries Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMs)
- CO3:** Apply the Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System
- CO4:** Analyze the Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement ,Two's complement method, binary multiplication, binary division
- CO5:** Discuss the Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

Practicals

0-0-2-1

1. Introduction to Computers
2. Basic operations in computers
3. Unix computer operating systems
4. MS DOS computer operating systems
5. Programming of languages - C Pascal
6. Programming of languages- Fortran
7. Creation of Word Document
8. Preparation of Word Document
9. Basics of Internet
10. Preparation of Powerpoint
11. Creation of Excel sheet
12. Preparation of Graphs in Excel Sheet

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Define the scope and importance of Computers in Pharmacy
- CO2:** Classify and summaries Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMs)
- CO3:** Apply the Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence

- monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System
- CO4:** Analyze the Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One’s complement ,Two’s complement method, binary multiplication, binary division
- CO5:** Discuss the Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

Textbooks

1. Basic Electronics and Computer Applications, Rajiv Khanna, New Age Publishers, 2007.
2. Computer Fundamentals and Programming in C Rajiv Khanna, New Age Publishers, 2010.

Reference Books

1. Computer Fundamentals and C Programming (English) 1st Edition (Paperback) By: B L Juneja, A Seth, Cengage Learning, 2011.
2. Programming in C By: B.L. Juneja, Thomson Press, 2010

15EBPH1B

Remedial Mathematics

Course Objective:

The course is designed to impart the knowledge in the field of mathematics to science graduate students. It is one of the foundation courses to bridge the gap between the pure science and mathematics students. The course deals with the basics in mathematics.

Theory

3-0-0-3

Unit I: Algebra

12 hrs

Equations reducible to quadratics, simultaneous equations (linear and quadratic), determinants, properties of solution of simultaneous equations by Cramer's rule, matrices, definition of special kinds of matrices, arithmetic operations on matrices, inverse of a matrix, solution of simultaneous equations by matrices, pharmaceutical applications of determinants and matrices. Evaluation of En1, En2 and En3 mensuration and its pharmaceutical applications.

Unit II : Trigonometry **12 hrs**

Measurement of angle, t-ratios, addition, subtraction and transformation formulae, t- ratios of multiple, sub-multiple, allied and certain angles. Application of logarithms in pharmaceutical computations.

Unit III: Analytical Plans Geometry **12 hrs**

Certain co-ordinates, distance between two points, area of triangle, a locus of point, straight line; slope and intercept form, double-intercept form, normal (perpendicular form), slope-point and two point form, general equation of first degree.

Unit IV: Calculus **12 hrs**

Differential: Limits and functions, definition of differential coefficient, differentiation of standard functions, including function of a function (Chain rule). Parametric differentiation, differentiation of implicit functions, logarithmic differentiation, successive differentiation.

Integral: Integration as inverse of differentiation, indefinite integrals of standard forms, integration by parts, substitution and partial fractions, formal evaluation of definite integrals.

Unit V: Basic Statistics **12 hrs**

Measures of Central Value Objectives and pre-requisites of Ideal measure, mean, mode and median

Total **60 hrs**

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Relate the use of determinants and matrices in Pharmaceutical applications by knowing the algebra like simultaneous equations, Cramer's rule & En1, En2 and En3
- CO2:** Extend the application of logarithms in pharmaceutical computations with trigonometry
- CO3:** Illustrate the Certain co-ordinates, distance between two points, straight line; slope and intercept form, double-intercept form, slope-point and two point form, equation of first degree.
- CO4:** Outline the Calculus: Parametric differentiation, differentiation of implicit functions, logarithmic differentiation, successive differentiation and its Integral
- CO5:** Explain the basic Statistics - Ideal measure, mean, mode and median

Textbooks

1. Text book of Remedial Mathematics by Dr. A Ramakrishna Prasad Cengage Learning, 2012
2. Remedial Mathmatics by Shahnaz Bathul, New Arrivals, 2012

Reference Books

1. Pharmaceutical Arithmetic's by Mohd. Ali CBS publishers and distributor, New Delhi.2010
2. Higher Engineering Mathematics by Grewal.43rd edition, Khana Publishers, 2014

15EBPH1A**Remedial Biology****Course Objective**

The curriculum was framed to provide a detailed information about the zoological as well as botanical aspects of life with intensive study of different species of plants and animals, physical and chemical functions of tissues, and many other aspects. Practical application of biology is to differentiate morphology, histology and microscopy of roots, stems, life cycle of parasites and insects.

THEORY**2-0-0-2****Unit I Classification of plants****9 hrs**

Methods of classification of plants.

Unit II Introduction to Plant cell**9 hrs**

Its structure and Non-living inclusions. Mitosis and Meiosis. Different types of plant tissues and their functions.

Unit III Morphology and Histology**9 hrs**

Morphology and Histology of Root, Stem, Bark, Wood, Leaf, Flower, Fruit and Seed. Modification of Root and Stem.

Unit IV Life history of Parasites**9 hrs**

General survey of Animal kingdom - Structure and Life History of Parasites as Illustrated by Amoeba, Entamoeba, Trypanosoma, Plasmodium, Taenia, Ascaris, Schistosoma, Oxyuris and Ancylostoma.

Unit V Life cycle of insects**9 hrs**

General Structure and Life History of Insects like Mosquito, Housefly, Mites and Silkworm.

Total**45 hrs****Course Outcomes**

At the end of the course, the student will be able to

- CO1:** Recall the classification and salient features of classification of plants
- CO2:** Understand the basic structure and cell inclusion of plant cell and plant tissue. Outline the process of the types of cell division.
- CO3:** Identify the morphology and histology of root, stem, bark, wood, leaf and flower. Classify the different types of modification of roots and stem.
- CO4:** Know and explain the survey of animal kingdoms and its structure and life history.
- CO5:** Identify and summarize the general structure and life history of insects such as mosquito, housefly, mites and silkworm

Practicals

0-0-2-1

1. Structure of a Plant cell
2. Morphology of Root and Stem.
3. Morphology of Bark and Wood.
4. Morphology of Leaf and Flower.
5. Morphology of Fruits and Seeds.
6. Studies of different types of microscopes.
7. Histology of Monocot and Dicot Root.
8. Histology of Monocot and Dicot Stem.
9. Histology of Monocot and Dicot Leaf.
10. Identification of Life cycle of Lower Plants and Animals.
11. Identification of Structure of Human Parasites Amoeba, Ascaris and Plasmodium.
12. Studies on Life of Insects like Mosquito, Housefly, Mites and Silkworm.

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Identify the morphological characters of plants parts
- CO2:** Outline the care, use and types of microscopes
- CO3:** Examine the gross identification of slides of structure and life cycle of lower plant/animals in theory.
- CO4:** Dissect and observe the microscopic examination of stem, root and leaf of monocot and dicotyledonous leaves.
- CO5:** Elaborate the structure of human parasites and insects mentioned in the theory.

Textbooks

1. Outlines of Botany Narayanaswamy, R.V. & Rao, K.N. - S. Viswanathan Printers & Publishers. 1976.
2. Remedial Biology Gupta First Edition Pragati Prakashan 2009.
3. A Text Book of Pharmaceutical Biology S. Sardana, O.P. Sharma Birla publications 2007.

Reference Books

1. Pharmaceutical Biology S.B Gokhale Kokate and DR. D.S Bidarkar Fourth Edition Nirali Prakashan – 2006.
2. Outlines of Botany Narayanaswamy Eleventh Edition V.Subramanian printers and publishers 1996.
3. Remedial Biology Gupta First Edition Pragati Prakashan 2009.

NOTE: Each candidate may select any one out of Remedial Mathematics or Biology. Students studied BOTONY AND ZOOLOGY must opt for REMEDIAL MATHEMATICS alone.

15ENVS11

Environmental Sciences

Course Objective

The Program seeks to create a learning environment in which our students can better understand the changes and be given a greater voice in planning for conservation through an interdisciplinary environmental science curriculum that is designed to enhance scientific inquiry and to strengthen scientific competence. The Program aims at preparing students for careers in environmental sciences, environmental health, public health, and medical schools.

THEORY

2-0-0-2

Unit I: The Multidisciplinary Nature of Environmental Studies

9 hrs

Definition, Scope and Importance.

Unit II: Environment and Natural Resource Management

9 hrs

- A. Forest Resources: Use and Over-Exploitation, Deforestation. Timber Extraction, Mining, Dams and Their Effects on Forests 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.
- D. Food Resources: World Food Problems, Changes Caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer-Pesticide Problems, Water Logging, Salinity.
- E. Energy Resources: Growing Energy Needs, Renewable and Non-renewable energy Sources Use of Alternate Energy Sources.
- F. Land Resources: Land as a Resource, Land Degradation, Man Induced Landslides, Soil Erosion and Desertification.

Unit III: Ecosystems

9 hrs

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 IV: Environmental Pollution

9 hrs

Definition, Causes, 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. Hospital Waste Management: Types of Waste, Collection, Segregation and Disposal. Role of Health Care Professionals Towards Environmental Health. Disaster Management: Floods, Earthquake, Cyclone and Landslides.

Unit V: Environmental Ethics, Protection Act and Human Population 9 hrs

- A. Climate change, Global warming, Acid rain, Ozone Layer Depletion, Nuclear Accidents and

Holocaust. Environment Protection Act. The Air (prevention and Control of pollution) act 1981. The Water (prevention and control of pollution) act 1974. The wildlife protection Act 1972. The Forest conservation Act 1980. Issues Involved In Enforcement of Environmental Legislation.

- B. Public Awareness. Human Population and The Environment Population growth, Variation Among Nations. Population Explosion – Family Welfare Programme. Environment and Human Health, Human Rights. Value Education. HIV / AIDS, Women and Child Welfare, Role of Information Technology In Environment and Human Health.

Total

45 hours

Course Outcomes

At the end of the course, the student will be able to

- CO1:** Define the scope and importance of multidisciplinary nature of environmental studies.
- CO2:** Classify and summaries the types of natural resources and the management of natural resources and its effect
- CO3:** Apply the concept of ecosystem structure and its function and its characteristic features with the use of food chain/food web and pyramid in ecosystem
- CO4:** Analyze the causes, effect and control measures of different types of pollution and the waste from industry and its control measures on health care by conserving the natural resources
- CO5:** Discuss the natural disasters for conservation through the environmental science and Create a public awareness on population, family welfare program, human health and rights, HIV/AIDS, Child welfare and women welfare and the Importance of environmental protection Act.

Text Books

1. Text Book of Environmental Sciences & Technology, M. Anji Reddy, Tenth Edition, BS Publications, 2012.
2. Basic Concepts of Environmental Chemistry, W. Connell, Second Edition, Lewis Publications, 2005.
3. Text book of Environmental studies, D.K Asthana and Meera, First Edition, S.Chand publishers, 2006.

Reference Books

1. Introduction to Environmental Science, Y. Anjaneyulu, New Edition, B.S. Publication, 2004.
2. Principles of Environmental Studies, C. Manohar Chary, P Jayram Reddy, Second Edition, B.S publications, 2011.
3. Principles of Environmental Science - Inquiry & Applications, William P. Cunningham & Mary Ann Cunningham, Third Edition, MC.Graw-Hill science, 2005.
4. Environmental Protection and laws, Dr. Erach Bharucha, University press, 2005.
5. Environmental Studies, R. Rajagopalan, Second Edition, Oxford University Press, 2011..