# COURSE STRUCTURE
# AND
# DETAILED SYLLABUS

## II, III & IV – B.PHARMACY – I & II - SEMESTERS

# B.PHARMACY

**FOR**
**B.PHARMACY FOUR YEAR DEGREE COURSE**
**(Applicable for the batches admitted from 2015-2016 Onwards)**


**ANURAG GROUP OF INSTITUTIONS**
**(AUTONOMOUS)**
**(Formerly Lalitha College of Pharmacy)**
Venkatapur, Ghatkesar, Hyderabad – 500 088, Telangana State.

**II YEAR I SEMESTER** **COURSE STRUCTURE**

| Subject Code | Category | Subject Name | Lectures | T/P | Credits |
|---|---|---|---|---|---|
| A63001 | PC | Pharmaceutical Unit Operations-I | 3 | 1 | 3 |
| A63002 | PS | Pharmaceutical Organic Chemistry-III | 4 | 1 | 4 |
| A63003 | BS | Biostatistics | 3 | 1 | 3 |
| A63004 | PS | Physical Pharmacy -I | 3 | 1 | 3 |
| A63005 | PS | Anatomy, Physiology and Pathophysiology | 3 | 1 | 3 |
| A63006 | MC | Environmental Science | 2 | 0 | 0 |
| A63201 | PS | Pharmaceutical Organic Chemistry-III Lab | 0 | 3 | 2 |
| A63202 | BS | computer Applications Lab | 0 | 3 | 2 |
| A63203 | PS | Physical Pharmacy-I Lab | 0 | 3 | 2 |
| A63204 | PS | Health Education and Pathophysiology- Lab | 0 | 3 | 2 |
| | | Total | 18 | 17 | 24 |

**II YEAR II SEMESTER** **COURSE STRUCTURE**

| Subject Code | Category | Subject Name | Lectures | T/P | Credits |
|---|---|---|---|---|---|
| A64001 | PC | Pharmaceutical Unit Operations-II | 3 | 1 | 3 |
| A64002 | PC | Pharmaceutical Analysis-I | 3 | 1 | 3 |
| A64003 | PC | Pharmacognosy-I | 3 | 1 | 3 |
| A64004 | PC | Physical Pharmacy-II | 4 | 1 | 4 |
| A64005 | PC | Pharmaceutical Jurisprudence | 3 | 1 | 3 |
| A64006 | MC | Gender Sensitization | 2 | 0 | 0 |
| A64201 | PC | Pharmaceutical Unit Operations-II Lab | 0 | 3 | 2 |
| A64202 | PC | Pharmaceutical Analysis-I Lab | 0 | 3 | 2 |
| A64203 | PC | Pharmacognosy-I Lab | 0 | 3 | 2 |
| A64204 | PC | Physical Pharmacy-II Lab | 0 | 3 | 2 |
| | | Total | 18 | 17 | 24 |

**III YEAR I SEMESTER** **COURSE STRUCTURE**

| Code | Category | Subject | Lectures | T/P | Credits |
|---|---|---|---|---|---|
| A65001 | PS | Pharmaceutical Biochemistry | 3 | 1 | 3 |
| A65002 | PC | Pharmacognosy-II | 3 | 1 | 3 |
| A65003 | PC | Pharmaceutical Technology-I | 4 | 1 | 4 |
| A65004 | PC | Pharmacology-I | 3 | 1 | 3 |
| A65005 | PS | Pharmacy Administration | 3 | 1 | 3 |
| A65201 | BS | Advanced English Communication Skills Lab | 0 | 3 | 2 |
| A65202 | PS | Pharmaceutical Biochemistry Lab | 0 | 3 | 2 |
| A65203 | PC | Pharmacognosy-II Lab | 0 | 3 | 2 |
| A65204 | PC | Pharmaceutical Technology-I Lab | 0 | 3 | 2 |
| | | Total | 16 | 17 | 24 |

**III YEAR II SEMESTER** **COURSE STRUCTURE**

| Code | Category | Subject | Lectures | T/P | Credits |
|---|---|---|---|---|---|
| A66001 | PC | Medicinal Chemistry-I | 3 | 1 | 3 |
| A66002 | PC | Pharmaceutical Technology-II | 3 | 1 | 3 |
| A66003 | PC | Pharmacology-II | 3 | 1 | 3 |
| A66004 | PC | Chemistry of Natural Drugs | 3 | 1 | 3 |
| A66005 | PS | Pharmaceutical Microbiology | 2 | 1 | 2 |
| A66201 | PC | Medicinal Chemistry-I Lab | 0 | 3 | 2 |
| A66202 | PC | Pharmaceutical Technology-II Lab | 0 | 3 | 2 |
| A66203 | PC | Pharmacology-II Lab | 0 | 3 | 2 |
| A66204 | PC | Chemistry of Natural Drugs Lab | 0 | 3 | 2 |
| A66205 | PS | Pharmaceutical Microbiology Lab | 0 | 3 | 2 |
| | | Total | 14 | 20 | 24 |

**IV YEAR I SEMESTER** **COURSE STRUCTURE**

| Code | Category | Subject | Lectures | T/P | Credits |
|---|---|---|---|---|---|
| A67001 | PC | Pharmaceutical Analysis-II | 4 | 1 | 4 |
| A67002 | PC | Biopharmaceutics and Pharmacokinetics | 4 | 1 | 4 |
| A67003 | PC | Pharmacology-III and Clinical Pharmacotherapeutics | 4 | 1 | 4 |
| A67004 | PC | Medicinal Chemistry-II | 4 | 1 | 4 |
| A67201 | PC | Pharmaceutical Analysis-II Lab | 0 | 3 | 2 |
| A67202 | PC | Biopharmaceutics and Pharmacokinetics Lab | 0 | 3 | 2 |
| A67203 | PC | Medicinal Chemistry-II Lab | 0 | 3 | 2 |
| A67204 | PC | Industrial Training and seminar | 0 | 3 | 2 |
| | | Total | 14 | 17 | 24 |

**IV YEAR II SEMESTER** **COURSE STRUCTURE**

| Subject Code | Category | Subject Name | Lectures | T/P/D | Credits |
|---|---|---|---|---|---|
| A68001 | PC | Novel Drug Delivery Systems and Regulatory Affairs | 4 | 1 | 4 |
| A68002 | PS | Pharmaceutical Biotechnology | 3 | 1 | 3 |
| A68003 | PC | Medicinal Chemistry-III | 4 | 1 | 4 |
| A68004 | PC | Pharmacognosy-III | 3 | 1 | 3 |
| A68201 | PC | Novel Drug Delivery Systems and Regulatory Affairs Lab | 0 | 3 | 2 |
| A68202 | PC | Pharmaceutical Biotechnology Lab | 0 | 3 | 2 |
| A68203 | PC | Pharmacognosy-III Lab | 0 | 3 | 2 |
| A68204 | PC | Comprehensive Viva | 0 | 0 | 2 |
| A68205 | PC | Project work** | 0 | 0 | 2 |
| | | Total | 14 | 13 | 24 |

**** Suggested areas for project work**

**1. Industrial Pharmacy**
**2. Clinical Pharmacy/Pharmacology**
**3. Pharmacognosy/Medicinal Chemistry**
**4. Pharmaceutical Analysis/Quality Assurance**
**5. Pharmaceutical Marketing**

**The candidates have to undergo Industrial training for one month (200 hours minimum) during 3rd year summer vacation)**

**Note: All the end examinations (Theory and Practical) are of Three hours duration.**

**T – Tutorial** **P – Practical**

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| | **3** | **1/-** | **3** |

## (A63001)PHARMACEUTICAL UNIT OPERATIONS – I

**Objective:** The student shall be exposed to various aspects of handling of maerials, fluids, application of Extraction, Evaporation, Distillation, drying, size reduction, size separation and mixing in Pharmaceutical Industry.

**UNIT-I**

**Unit operation:** Definition of laboratory scale, pilot scale, and industrial scale operations. Unit processes, material and energy balance. Material handling systems. Handling of solids: Belt, screw, chain, pneumatic and bucket conveyers Hadling of liquids: reciprocating pumps, piston pumps Handling of gases: Fans, Reciprocating compressor, centrifugal blower

**UNIT-II**

**Extraction:** Theory of extraction, seed extraction, equipment, counter current extraction, leaching of solids and equipment.

**Evaporation:** Basic concept of phase equilibria, factors affecting the evaporation. Principle, construction, working, advantages, disadvantages and pharmaceutical applications of following evaporators, film evaporators, single effect and multiple effect evaporators.

**UNIT-III**

**Distillation:** Raoult's law, volatility, simple steam and flash distillations, principles of rectification, Azeotropic and extractive distillation.

**Drying:** Moisture content and mechanism of drying, rate of drying and time of drying calculations, classification and types of dryers. Principle, construction, working, advantages, disadvantages and pharmaceutical applications of tray dryer, Fluid bed dryer, spray dryer and freeze-dryer.

**UNIT-IV**

**Size Reduction and size separation:** Definition, objectives of size reduction, factors affecting size reduction, laws governing energy and power requirements of a mill, Principle, construction, working, advantages, disadvantages and pharmaceutical applications of ball mill, hammer mill, fluid energy mill. Official standards for powders, modes of motions in size separation. Sieve analysis: testing of powders, equipment for size separation: Rotex Screen, cyclone separator, Air separator, bag filter.

**UNIT-V**

**Mixing:** Theory of mixing, solid solid, solid liquid and liquid liquid mixing. Mixing of solids: Twin shell blender, double cone, Sigma blade, planetary mixer, ribbon blender; Mixing of liquids: silverson mixer, colloid mill; Mixing of semi solids: Triple roller mill.

**Outcomes: Student will understand the concepts of fluid flow, parameters of** Evaporation, Distillation, drying, size reduction, size separation and mixie.ng. They also understand the safety factors and posses a sound knowledge of the above.

**TEXT BOOKS**


1. Carter SJ, Cooper and Gunss's Tutorial Pharmacy (2005). Tutorial Pharmacy. 6th ed. Delhi: CBS publisher.
2. Subramanyam CVS (2009). Pharmaceutical Unit Operation. Delhi: Vallabh Prakashan.
3. Sambamurty K (2008). Pharmaceutical Engineering. Delhi: Newage INT(P) LMT.
4. Badger and Banchoro (2010). Introduction to Chemical Engineering. Delhi: Tata Mc graw hill Education pvt lmt.
5. DERLY (2010). Pharmaceutical Engineering. 2nd ed. Hyderabad: Pharma Med Press.
6. Mc Cabe and Smith (2005). Unit operations. 7th ed. delhi: Mc Graw-Hill Companies
7. M.C Cabe and Smith (2001). Elements of Chemical Engineering. 6th ed. Newyork: Mc graw-hill.
8. Lippincott Williams and Wilkins (2010). Remingtons Pharmaceutical sciences. 4th ed. New-Delhi: Wolters Kluwer(India) Pvt ltd.
9. Rawlin's EA, Bentley's (2004). Textbook of Pharmaceutics. 8th ed. Delhi: All India traveller book seller.

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## (A63002)PHARMACEUTICAL ORGANIC CHEMISTRY – III

**Scope and Objective:** This course is designed to impart a very good knowledge about
a) The chemistry of highly complicated organic compounds like heterocyclic's, carbohydrates, aminoacids, polypeptides and proteins along with their stereo chemical aspects; and
b) Some named organic reactions with mechanisms

**Note: Definition, nomenclature, structure, acidity-basicity and characteristic reactions of the following heterocyclic compounds of Unit I. Few examples of drugs which contain the cited ring system.**

**UNIT – I**
**Five membered and six membered ring systems with one hetero atom**:
Furan, Pyrrole and Pyridine.
**Fused ring systems with one hetero atom**:
Indole, Quinoline and Iso-quinoline
**Five membered and six membered ring systems with two hetero atoms**:
Pyrazole, Imidazole, Oxazole, Isoxazole, Thiazole and Pyrimidine.
**Fused ring systems with two hetero atoms**: Benzimidazole, Phenothiazine

**UNIT – II**
**Stereochemistry of Carbon compounds**: Optical rotation, plane polarized light, optical activity, chirality, notations (assignment of configuration), relative configuration (Fischer DL configuration) and absolute configuration (R&S), sequence rules with examples, enantiomers, meso compounds, racemic mixture and resolution of racemic mixtures, Elements of symmetry.Stereochemistry of alkenes: Concept of E & Z configurations.

**UNIT-III**
**Carbohydrates**: Definition, classification, nomenclature, study of glucose structure, mutarotation, oxidation-reduction reactions, osazone formation, epimerization, Lobry De Bruyn – Van Ekenstein reaction, structure of the disaccharide sucrose, glycosidic linkage, structural components of starch and cellulose.
A brief account on pharmaceutical importance of various carbohydrates.

**UNIT-IV**
a) **Amino acids**: Definition, classification, essential amino acids, configuration, three important methods of preparation, Zwitter ionic nature, isoelectric point. A brief account on the pharmaceutical importance of amino acids.
b) **Polypeptides and proteins**: Definition, Classification, denaturation, C-terminal and

N-terminal concept, Peptide synthesis. A brief account of the pharmaceutical importance of Polypeptides and proteins.

c) **Lipids (oils and fats):** Definition, fatty acids, characterization of lipids (Saponification value, acid value and Iodine value), hydrogenation and rancidity of oils and fats.

**UNIT - V**

a) Definitions of nucleic acids, nucleotides, nucleosides. A brief account on structure of DNA and RNA.

b) **A study of the mechanism and application in synthesis of the following named reactions**

A. Beckmann rearrangement
B. Birch reduction
C. Mannich reaction
D. Michael addition reaction

**Outcome**: as the structural and stereo chemical aspects and chemistry of organic compounds are discussed, it would help the students to have a good command over structural composition of organic compounds to evaluate and analyse the chemistry of these compounds.

**TEXT BOOKS**


1. Morrison TR, Boyd RN, Bhattacharjee SK, 2011, Organic chemistry, 7th Ed, Pearson Prentice hall of India private limited, New Delhi.
2. Arun bhal, Bhal BS, 2010, Advanced Organic chemistry, S.Chand & Company Ltd, New Delhi.
3. Agarwal OP, 2008, Reactions and Reagents in Organic Chemistry, 43rd Ed, Goel Publishing House, Meerut.
4. Finar IL, 2009, The Fundamentals Principles of Organic Chemistry, 6th Ed, Vol.I Pearson Education Ltd, New Delhi.
5. Jerry March, 2007, Advanced Organic Chemistry, 6th Ed, John Wiley & Sons Publishers, New Delhi.
6. Tatchell AR, Furniss BS, Hannaford AJ, Smith PWG, 2008, Vogel's Textbook of Practical Organic Chemistry, 5th Ed, Pearson Education Ltd, New Delhi.

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## (A63003)BIOSTATISTICS

**LEARNING OUTCOMES**

After studying this course, the student will

1. Understand the basic concepts and terminology of biostatistics, including the various kinds of variables, frequency, measurement, and measurement scales.
2. Understand the probability and distributions and how to use them to calculate probabilities in real-world problems.
3. be able to calculate and interpret parametric and non-parametric statistics for making statistical inferences.
4. Understand how regression and correlation differ and when the use of each is appropriate.
5. able to calculate and interpret the epidemiological concepts of relative risk, odds ratios.

**Unit-1: INTRODUCTION TO BIOSTATISTICS**: Introduction, Some Basic Concepts (Data, Statistics, Sources of Data, Biostatistics, Variable (Quantities, Qualitative, Random, Discrete and Continuous), Population, Sample), Measurement and Measurement Scales (Nominal, Ordinal, Interval, Ratio), Sampling (random and non-random), The Scientific Method and the Design of Experiments

**DESCRIPTIVE STATISTICS**: Introduction, Measures of Central Tendency, Descriptive Statistics: Measures of Dispersion

**Unit-2: SOME BASIC PROBABILITY**: **CONCEPTS**, Introduction, Two Views of Probability: Objective and Subjective, Elementary Properties of Probability, Calculating the Probability of an Event, Bayes' Theorem.

**PROBABILITY DISTRIBUTIONS**: Introduction, Probability Distributions of Discrete Variables, The Binomial Distribution, The Poisson Distribution, Continuous Probability Distributions, The Normal Distribution, Normal Distribution Applications.

**Unit -3: HYPOTHESIS TESTING**: Introduction, Hypothesis Testing (Small Sample): A Single Population Mean, Hypothesis Testing: The Difference Between Two Population Means, Paired Comparisons. A Single Population Proportion, the Difference between Two Population Proportions. The Ratio of Two Population Variances. The Type II Error and the Power of a Test, Determining Sample Size to Control Type II Errors.

**ANALYSIS OF VARIANCE**: Introduction, the Completely Randomized Design, the Randomized Complete Block Design, Latin Square Design.

**Unit-4: SIMPLE LINEAR REGRESSION AND CORRELATION**: Introduction, the Regression Model, the Sample Regression Equation, Evaluating the Regression Equation, the Correlation Model, the Correlation Coefficient.

**THE CHI-SQUARE DISTRIBUTION AND THE ANALYSIS OF FREQUENCIES**: Introduction, the Mathematical Properties of the Chi-Square Distribution, Tests of Independence, Relative Risk, Odds Ratio.

**Unit-5: NONPARAMETRIC AND DISTRIBUTION-FREE STATISTICS**: Introduction, Measurement Scales, The Sign Test, The Wilcoxon Signed-Rank Test for Location, The Median Test, The Mann–Whitney Test, The Kolmogorov–Smirnov Goodness-of-Fit Test, The Kruskal–Wallis One-Way Analysis of Variance by Ranks, The Friedman Two-Way Analysis of Variance by Ranks.

**Reference Books**:

1. Lloyd D Fisher and Gerald Van Belle, "Biostatistics A Methodology for the Health Sciences", 2nd Edition, Wiley.
2. Olive Jean Dunn and Virginia A. Clark, "Basic Statistics A primer for the biomedical sciences", Wiley.
3. Anders Kallen, "Understanding Biostatistics", Wiley.
4. BK Mahajan, "Methods in Biostatistics for Medical Students and Research Workers", Jaypee.
5. P.S.S. Sunder Rao, and J. Richard, "Introduction to Biostatistics and Research Methods", PHI.
6. Wayne W. Daniel, and Chad L. Cross, "Biostatistics: Basic Concepts and Methodology for the Health Sciences, Wiley.

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## (A63004)PHYSICAL PHARMACY-I

**Objective:** The student shall know important physical properties of drug molecules, phase value & its importance. Different law of thermodynamics, electrolyte and non-electrolyte solutions, importance of pH and drug research.

**UNIT-I**

**Intermolecular forces and states of matter**: Binding forces between molecules, the states of matter, the gaseous state, the liquid state, solids and the crystalline state.

Phase equilibria and the phase rule: Systems containing one, two and three components,**Physical properties of Drug Molecules**: Dielectric constant induced polarization, dipole moment, refractive index and molar refraction, optical rotatory dispersion.

**UNIT-2**

**Thermodynamics**: The first law of thermodynamics. Thermochemistry. The second law of thermodynamics. The third law of thermodynamics, Free energy functions and applications.

**UNIT-3**

**Solutions of Non electrolytes**: Concentration expressions, ideal and real solutions, colligative properties, molecular weight determinations.

**Solutions of Electrolytes**: Properties of solutions of electrolytes. The Arrhenius theory of electrolyte dissociation. The modern theory of strong electrolytes

**UNIT -4**

Ionic equilibria: Modern theories of acids, bases and salts, Sorensen's pH scale, specific concentration as a function of pH, calculation of pH, acidity constants.

**Buffers and buffered isotonic systems**: The buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions, methods of adjusting tonicity and pH (relevant numerical problems).

**UNIT-5**

Micromeritics: Particle characteristics, Particle size and size distribution, methods for determining particle size, powder characteristics, methods for determining surface area, pore size, particle shape and surface area, Porosity, derived properties of powders.

**Outcomes:** Student will know about the physical properties of molecules, particle size & distribution. Three laws of thermodynamics, properties of electrolytes and non electrolytes, pH and buffers. They also understand the importance of these studies in the physical pharmaceutics &Formulationdevelopment.

**Text Books**


1. Subrahmanyam C.V.S , **Essentials of Physical Pharmacy**, 2005, Delhi ,Vallabh Prakashan, 1st edition .
2. Martin A.N & Cammarata .A ,**Physical Pharmacy and Pharmaceutical sciences**,1983 Philadelphia, 6th Edition,
3. Hougen and Watson K.M, **Chemical Process principles,**2004, New Age International ,2nd edition
4. Shoton & Ridgway, **Physical Pharmaceutics** ,2004,London , Oxford press ,2nd edition,
5. Gennaro A.R , Remington's Pharmaceuticals Sciences , 2010 , Mack Publishing ,21st edition

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## (A63005)ANATOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY

**Objective**: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms and homeostatic imbalances of various systems of the body. Since a medicament, which is produced by the pharmacist, is used in various disease conditions to correct the abnormal functioning of the body systems, the basic knowledge of this subject is must for a student to understand how drugs act on various systems/organs in correcting the disease state of organs/systems. Thus it becomes a prerequisite subject for the pharmacy course.

**UNIT-I**

**Basic Principles of Cell Injury, Adaptation & Process of Inflammation:** Causes of cellular injury, pathogenesis, morphology of cell injury. Cellular adaptations, atrophy, hypertrophy, acute and chronic inflammation, mediators of inflammation, brief outline of the process of repair.

**UNIT-II**

**A.Urinogenital system:** Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid base balance, Male and Female reproductive systems, physiology of menstruation, coitus and fertilization. Sex differentiation, spermatogenesis.

**B. Pathophysiology of following diseases:**

Renal failure, Glomerulonephritis, Renal calculi, Urinary Tract Infections (UTI) ,Infertility.Sexually transmitted diseases (STD),Dysmenorrhea

**UNIT-III**

**A.Digestive System:** Gross anatomy of the gastro intestinal tract, functions of its different parts including those of the liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food.

**B. Path physiology of following diseases:**

Peptic ulceration, Zollinger – Ellison’s Syndrome, Inflammatory Bowel Disease, Jaundice ,Hepatitis

**UNIT-IV**

**A.Respiratory System:** Anatomy and functions of respiratory system, mechanism and regulation of respiration, respiratory volumes and vital capacity.

**B. Pathophysiology of following diseases:**

Asthma, COPD, Tuberculosis

**UNIT-V**

**Hormones and functions in Health and disease:** Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenals, pancreas, testes and ovary, their hormones and functions.

**Outcome: Upon completion of the course the student shall be able to**

1. Understand the gross morphology, structure and functions of various organs of the human body. Understand the various homeostatic mechanisms and their imbalances.
2. Identify the various tissues and organs and study the pathophysiology of different systems of human body.
3. Appreciate coordinated working pattern of different organs of each system
4. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.
5. Perform the simple urine analysis for normal and abnormal constituents and also record human body temperature, pulse rate and Body Mass Index etc...

**TEXT BOOKS**

1) Gerard Tortora, J., Bryan Derrickson, H. (2009). Principles of Anatomy and Physiology. 12th ed. New Jersey: John Wiley and Sons Inc.
2) Elaine Marieb, N. (2009). Essential of Human Anatomy & Physiology. 8th ed. New Delhi: Pearson education Inc.
3) Anne Waugh, Allison Grant, Ross & Willson. (2010). Text Book of Human Anatomy and physiology in health and illness.11th Ed.UK: Elsevier Ltd.
4) Robbins. (2012). Basic Pathology. 8th Ed. Noida: Elsvier Ltd.
5) Harsh Mohan. (2010). Text Book of Pathology. 6th ed. New Delhi: Jaypee Brothers Medical Publidshers Pvt. Ltd.
6) Arthur Guyton, C., John Hall, E. (2005). Textbook of Medical Physiology. 10th Ed. New Delhi: Elsevier Ltd.
7) Sembulingam, K., and Prema Sembulingam. (2004). Essentials of Medical Physiology. 3rd Ed. New Delhi: Jaypee Bros Medical publishers Ltd.

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**(A63006)ENVIRONMENTAL SCIENCE**

**Objectives:**

1. This course will give the importance of maintenance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding of environmental policies and regulations

**UNIT-I:**

**The Multidisciplinary nature of environmental studies:**

Definition, scope and importance.

Natural Resources:

**a. Forest resources:** Use and over-exploitation, deforestation, case studies. 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, 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-agrochemicals 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.

**UNIT-II:**

Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids.

**Introduction, types, characteristic features, structure and function of the following ecosystem:**

a) Forest ecosystem b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**UNIT-III**:

**Biodiversity and its conservation**: Introduction, definition: genetic species and ecosystem diversity.

**Biogeographically, classification of India. Value of biodiversity**: consumptive use, productive use, and social, ethical, aesthetic and option values, biodiversity at global, national and local levels. India as a mega-diversity nation. Hot spots of biodiversity. **Threats to**

**biodiversity:** Habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India.
**Conservation of biodiversity:** In-situ conservation of biodiversity

**UNIT-IV** :
**Environmental Pollution**: **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 and g) Nuclear hazards.
**Solid and liquid waste Management:** Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies.
**Disaster management:** Floods, earthquake, cyclone and landslides.

**UNIT-V**
**Social Issues and the Environment:** From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns.
**Case studies. Environmental ethics:** Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear Accidents and holocaust.
Case studies: Wasteland reclamation. Consumerism and waste products.
**Environment protection Act**. 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. 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, role of information technology in environment and human health. Case studies.

**TEXT BOOKS**
1. M. Anji Reddy , (2007) Text Book of Environmental Sciences & Technology, Hyderabad, BS Publications.
2. Connar, (1997) Basic Concepts of Environmental Chemistry, New York, Lewis Publications.
3. D.K Asthana and Meera, (2006) Text book of Environmental studies, New Delhi, S Chand Publications.
4. Y. Anjaneyulu (2004), Introduction to Environmental Science, Hyderabad, B.S. Publication.
5. William P. Cunningham & Mary Ann Cunningham (2007), Principles of Environmental Science - Inquiry & Applications, New York, MC GrawHill Publications.
6. W. P. Cooper (2008), Environmental Encyclopedia, , Mumbai, Jaico Publishing House
7. K. C. Agarwal (2008), Environmental Biology, Bikaner, Nidi Publishers Ltd,
8. R.Rajagopalan, (2005), Environmental Studies, India, Oxford University Press.

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| | **0** | **-/3** | **2** |

## (A63201)PHARMACEUTICAL ORGANIC CHEMISTRY- III LAB

**I. Synthesis of some heterocyclic compounds**.

a. Benzotriazole from O-phenylene diamine.
b. 2,3-Diphenyquinoxaline from O-phenylene diamine.
c. Piperazine-2,5-dione from Glycine.
d. 1,4-dihydro pyridine from ethyl acetoacetate.

**II. Molecular rearrangements and named reactions**

a. Benzimidazole from o-phenylenediamine (Phillip's Reaction).
b. Benzanilide from benzophenone oxime (Beckmann's rearrangement)
c. Preparation of 2-phenylindole from Phenyl hydrazine by Fischer's method.

**III Analysis of oils & fats**

a. Determination of Acid value of a fixed oil.
b. Determination of Saponification value of a fixed oil.
c. Determination of Iodine value of a fixed oil.

**IV. Systematic analysis of organic binary mixtures**

**REFERENCES**


1. Tatchell AR, Furniss BS, Hannaford AJ, Smith PWG, 2008, Vogel's Textbook of Practical Organic Chemistry, 5th Ed, Pearson Education Ltd, New Delhi.
2. Bansal RK, 2010, Laboratory Manual of Organic Chemistry, 5th Ed, New Age International (P) Ltd, New Delhi.
3. Mann FG, Saunders BC, 2001, Practical Organic Chemistry, 4th Ed, Orient Longman Limited, New Delhi.
4. Ahluwalia V.K., Renu Aggarwal, 2000, Comprehensive Practical Organic Chemistry Preparation and Quantitative Analysis, University Press (India) Private Limited, Hyderabad.
5. Indian Pharmacopoeia. – 2010.

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## (A63202)COMPUTER APPLICATIONS LAB

1.Sample programs in C: Program to calculate simple and complex arithmetic expressions, program using structures, program using loops and nested loops, program using functions and simple programs using arrays.

2. Operating systems like WINDOWS, UNIX, etc

3. Software packages like MS-WORD, EXCEL, ACCESS and POWER POINT.

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**(A63203)PHYSICAL PHARMACY-1 LAB**

1. Molecular weight – Rast-camphor method
2. Molecular weight – Landsberger method.
3. Calibration of pH Meter
4. pH Estimation – pH meter
5. Phenol water system – CST
6. Effect of impurity on CST of Phenol –Water system.
7. Determination of Refractive index of liquids.
8. Preparation of Buffers and Buffer Capacity Determination.
9. Ternary phase diagram.
10. pH Estimation – colourimetric method.
11. Percent composition – polarimeter & refractometer
12. Lower consolute temperature – Tea and Water
13. Effect of particle size and effect of glidant on angle of repose
14. Microscopic size analysis.
15. Determination of particle size by Andreason Pippette

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**(A63204) Health Education and Pathophysiology Lab**

1. 1. Study of reproductive system with the help of charts and models – 2 Experiments.
2. Study of Various devices used in Famliy planning like Copper T, Lippers loop, Pills, Diaphram and Condom.
3. Study of pregnancy diagnosis test.
4. Microscopic studies of abnormal tissue sections – 4 Experiments.
5. Simple experiments involved in the analysis of normal and abnormal urine; collection of specimen, appearance, determination of pH, sugars, proteins, urea and creatinine – 4 Experiments.
6. Recording of human body temperature, pulse rate and Body Mass Index (BMI).
7. Determination of tidal volume & vital capacity.
8. Determination of blood glucose using Folin –Wu method.

**REFERENCES**

1. Gerard J Tortora, Bryan H Derrickson.Principles of Anatomy and Physiology. Vol -1&2 .12th Ed New Jersey: John Wiley and Sons Inc; 2009.
2. S. R. Kale and R. R. Kale, Practicl Biochemistry and Clinical Pathology, 12th Ed, Pune, Nirali Prakashan, 2011
3. David T. Plummer, An Introduction to Practical Biochemistry, 3rd Ed, Delhi, Tata McGraw Hill Education Pvt. Ltd., 2011

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## (A64001)PHARMACEUTICAL UNIT OPERATIONS-II

**Objective:** The student shall be taught on operations like Filtration, Centrifugation, Crystallization, Industrial hazards and safety precautions.

**UNIT –I**

**Fluid Flow:** Types of flow, Reynold's number, viscosity, concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure. Concept of fluid statics and dynamics, Bernoulli's theorem.

**Heat Transfer:** Nature of heat flow Conduction: - Fourier's law, thermal conductivity, compound resistance in series, heat flow through a cylinder - mean radius and mean area.

**Convection**: - Natural and forced convection, temperature gradients in forced convection, surface and over all coefficients. Parallel current and counter current flow.

**Radiation**: -black body, Stefan Boltzaman law, and gray body. Heaters, heat interchangers, scraped surface exchangers, extended surface equipment.

Steam as heating medium: - properties and uses of steam traps, vacuum pumps, condensers, entrainment separators, foam and its prevention.

**UNIT-II**

**Filtration and Centrifugation**: Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter. Factors affecting filtration, mathematical, optimum-cleaning cycle in batch filters.
Principles of centrifugation, Industrial centrifugal filters, centrifugal filters, and centrifugal sedimeters.

**UNIT-III**

**Crystalization:** Characteristics of crystals like; purity, size, shape, geometry, habit, forms, size and factors affecting it. Solubility curves. Material and heat balances around Swenson Walker Crystallizer. Supersaturation theory and its limitations. Nucleation mechanisms, crystal growth. Study of various types of crystallizers, agitated batch, single vacuum, circulating magma and crystal crystallizers. Caking of crystals and its prevention. Numerical problems on yields.

**UNIT-IV**

Dehumidification and Humidity control :Basic concepts and definition, wet bulb and adiabatic saturation temperature. Psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipments for dehumidification operations.

**UNIT-V**

Industrial hazards and safety precautions: Mechanical, Chemical, Electrical, fire and dust hazards. Industrial dermatities, accident records.

**Outcome:** Students will be familiar with concepts of Filtration, Centrifugation**,** Crystallization, Industrial hazards and safety precautions and understand the pharmaceutical applications in industry.

**TEXT BOOKS**


1. Carter SJ, Cooper and Gunss's Tutorial Pharmacy (2005). Tutorial Pharmacy. 6th ed. Delhi: CBS publisher .
2. Subramanyam CVS (2009). Pharmaceytical Engineering. Delhi: Vallabh Prakashan
3. Sambamurty K (2008). Pharmaceutical Engineering. Delhi: Newage INT(P) LMT.
4. Mc Cabe and Smith (2005). Unit operations. 7th ed. Newyork: Mc Graw-Hill Companies.
5. Macebe WI, Smith Macro JC (2001). Unit operations To Chemical Engineering. London: Hill Int. Book CO.
6. Lachman L, Lieberman H, Kaniz JL (1991). The Theory and Practice of Industrial Pharmacy. 3rd ed. Lee and Febiger Philadelphia,USA: Varghese Publisher house.
7. Badger and Banchoro (2010). Introduction to Chemical Engineering. New-Delhi: Tata Mc graw hill Education pvt lmt.
8. Perry. (2007). Handbook of Chemical engineering. Newyork: McGraw Hill Professional.
9. Aulton ME (2002). Pharmaceutics-The science of dosage form design. Churchill livingstone: Harcourt publications limited.
10. Rawlin's EA, Bentley's (2004). Textbook of Pharmaceutics. 8th ed. India: All India traveller book seller.

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## (A64002)PHARMACEUTICAL ANALYSIS-I

**Objective:** The basic concepts and analytical techniques of various pharmaceuticals are discussed in a detailed manner.

**UNIT–I**

Computation of analytical results, significant figures, concept of error, precision, accuracy, standard deviation, rejection of doubtful values with special reference to volumetric analysis. Calibration of analytical equipment used in volumetric analysis.

A) Theory of Neutralization Titration: Acidimetry, Alkalimetry and pH indicators.

B) General Principles and theory of oxidation-reduction methods. An account of the indicators used in these titrations.

Application of the above methods in the analysis of drugs.

**UNIT-II**

A) Complexometric titration: Theory, types and application in pharmaceutical analysis. Masking and demasking and their applications.

B)Non-aqueous Titration: Theory, types, solvents used and application in pharmaceutical analysis.

C) Precipitation Titration: Theory, types and application in pharmaceutical analysis.

D) Karl-Fisher method of estimation of water and other methods of moisture determination.

**UNIT-III**

A) Potentiometry: Types of Electrodes Potentiometric titrations, applications in pharmaceutical analysis.

B)Conductometric titrations: Basic concepts, different types of conductometric titrations, applications in pharmaceutical analysis.

C) Polarography: Apparatus and principles, general Applications in pharmaceutical analysis.

**UNIT – IV**

A) Differential Scanning Calorimetry & Differential Thermal Analysis

B) Radio Immuno Assay & Enzyme Linked Immunosorbent Assay

C) Principle, instrumentation and applications involved in the following

i) Refractometry

ii) Polarimetry

**UNIT–V**

Study of seperations and determinations involving the following techniques and their applications in pharmacy.

A) Column Chromatography: Adsorption and partition theory, preparation, procedure, methods of detection.

B) Thin layer chromatography: Theoretical consideration, preparation, procedure, detection of compounds.

C) Paper chromatography: Theory of partition, different techniques employed, filter papers used, quantitative and qualitative detection.

D) Introduction to paper electrophoresis.

**Outcome:** The knowledge gained upon the detailed study of the analytical techniques will be useful to analyze the pharmaceutical substances in a systematic, qualitative and quantitative manner.

**TEXT BOOKS**

1. Dr A.V Kasture, DR S.G Wadodkar, Dr K.R Mahadik, Dr H.N More (2011)Pharmaceutical Analysis, Vol I&II, 17th edn., Pune: Nirali Prakashan.

2. Dr Gurudeep R. Chatwal, Dr Sham K.Anand (2002) Instrumental Methods of Chemical Analysis, 5th edn., Mumbai: Himalaya Publishing House.

3. Dr B.K Sharma (2011) Instrumental Methods of Chemical Analysis, 27th edn., Meerut: Goel Publishing House.

4. A.A Napoleon (2006) Pharmaceutical Titrimetric Analysis, 1st edn., Vellore: Kalaimani Publishers and Distributors.

**REFERENCE BOOKS**

1. A.H. Beckett & J.B. Stanlake (1997) Practical Pharmaceutical Chemistry, Vol I&II, 1st edn., New Delhi: CBS Publishers.

2. J Mendham, R.C Denny, JD Barnes, M.Thomas, B.Sivasankar (2000) Vogel's Text book of Quantitative Chemical Analysis, 6th edn., India: Pearson Education Ltd.

3. Indian Pharmacopoeia 2014

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**(A64003) PHARMACOGNOSY – I**

**Objectives:** To know the medicinal and pharmaceutical imporatance of drugs obtained from the natural sources and to acquire the knowledge on crude drugs by studying them under a suitable pharmacognostic scheme.

Systematic Pharmcognosy study, which includes sources (Biological and Geographical) macroscopic characters, microscopic characters, chemical constituents, chemical tests, uses, substituent and adulterants of the crude drugs mentioned in the following units.

**UNIT-I**
**INTRODUCTION TO PHARMACOGNOSY**

Definition, History, Scope and Development of Pharmacognosy. Crude drug: Definition, Classification:-Alphabetical, Morphological, Taxonomical, Chemical classification and Pharmacological classification with examples.

**NATURAL SOURCES OF DRUGS WITH EXAMPLES**

Plant source, Animal source, Mineral source, Marine source and microorganisms. Organized and unorganized crude drugs with examples.

**UNIT-II**

Cultivation, collection, harvesting, drying, garbling, packing, storage and preservation of medicinal plants. Factors influencing cultivation of medicinal plants.

Plant hormones and their applications. Definitions and examples for Polyploidy, mutation and hybridization with reference to medicinal plants.

**UNIT-III**
**Systematic Phamacognostic Study Of Carbohydrates And Derived Products**

Acacia, Agar, Guar gum, Starch, Pectin, Isabgol and Honey.

**Systematic Phamacognostic Study Of Fallowing Fibers**
Cotton, Jute, Wool, and Silk.

**UNIT-IV**
**Systemic Pharmacognostic Study Of The Following Lipids**

**Plant sources:** Castor oil, Linseed oil, Coca butter, and Olive oil.

**Animal sources:** Cod liver oil, Shark liver oil, Bees wax, Wool fat, Spermaceti wax, Lard and Emu bird oil.

**UNIT-V**

**SYSTEMIC PHARMACOGNOSTIC STUDY OF THE FOLLOWING VOLATILE OILS**

Coriander, Cinnamon, Clove, Fennel, Cedar wood oil, Gaultheria, Lavender, Patchouli, Artemesia, Taxus,Coleus and Crocus.

**Outcome:**

At the end of semester the student shall be aware of different sources of crude drugs, cultivation aspects of medicinal and aromatic plants, evaluation methods of crude drugs, the medicinal importance and the role of crude drugs as excipients in various pharmaceutical dosage forms

**TEXT BOOKS**


1. Kokate, C.K., et al., Pharmacognosy , 2010, Pune, Nirali Prakashan, 45th edition.
2. Trease and Evans, Pharmacognosy, 2006, New Delhi, Elsevier, 15th edition.
3. Tyler, V. E.et al., Pharmacognosy 2011, India, Wolters Kluwer, 9th edition
4. Walls, T. E. Textbook of Pharmacognosy, 2005, New Delhi, CBS Publishers and distributors, 5th edition.
5. Vinod Rangari.D Pharmacognosy and phytochemistry, 209, Maharashtra, India, Nishad deshmukh, 2nd edition.
6. Govt. of India, The Ayurvedic Pharmacopeia of India, 2001, New Delhi, The Controller of Publication, Civil Lines, 1st edition, Volume I- II.
7. Handa and Kapoor, V. K., Text book of Pharmacognosy, 2004, New Delhi, Vallabh Prakashan, 3rd edition.
8. Ali. Mohd. Pharmacognosy, 2008, New Delhi, CBS Publishers and Distributors, 1st edition, Volume I- II.
9. Mukherjee. K, Quality Control Herbal Drugs, 2010, New Delhi, Business Horizons, 4th edition.
10. Farooqi, A. A. and Sree Ramu. B.S, Cultivation of medicinal and aromatic crops, 2010, India, University press, Hyderabad, 3rd edition.
11. Ansari.S.H, Essentials of pharmacognosy, 2011, New Delhi, Birla Publications, 4th edition.

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**(A64004) PHYSICAL PHARMACY-II**

**Objective:** The student shall be taught on industrial phenomenon of liquids, rate & order of reactants, micromeritics, flow of liquids and type of colloids and their properties.

**UNIT-I**

Solubility and Distribution Phenomena: Solvent-solute interaction, solubility of gases in liquids, liquids in liquids, solids in liquids, Distribution of solutes in immiscible solvents. Application of Partition-coefficient in Pharmacy.

Introduction to phenomena of diffusion: Ficks first law and second law.

**UNIT-2**

Chemical Kinetics: Rates and orders of the reaction. Determination of order of a reaction. Influence of temperature and other factors on reaction rates Decomposition and stabilization of medicinal agents, kinetics in the solid state and accelerated stability analysis (relevant numerical problems).

Complexation: Metal complexes, organic molecular complexes in inclusion complex, and methods of analysis,

**UNIT-3**

Interfacial Phenomena: Liquid interfaces, measurement of surface and interfacial tensions, adsorption at liquid interfaces. Spreading coefficient Surface-active agents and systems of hydrophilic lipophillic classification, Solubilization, Wetting phenomena and detergency, Adsorption at solid interfaces. Electrical properties of interfaces. (Electrical Double Layer-Concept),

**UNIT- 4**

Colloids: Introduction, types of colloidal systems, solubilization, Stability of colloids, purification of colloidal dispersions, Gold number, optical properties, kinetic properties, electrical properties and Donnan Membrane equilibrium.

Coarse Dispersions: Suspensions, emulsions: suspensions, interfacial properties of suspended particles. Settling in suspensions. Formulation of suspensions: emulsions- theories of emulsification, physical stability of emulsions, preservation of emulsions, rheological properties of emulsions and suspensions

**UNIT- 5**

Rheology: Concept of viscosity. Factors influencing viscosity .Newtonian system, non-Newtonian system, thixotropy, measurement and applications in formulations. Determination of viscosity, Types of viscometer and its applications.

Polymers: Definition, Types of Polymers, Water Soluble and Water Insoluble Polymers; Pharmaceutical Application of Polymers.

**Outcomes:** Student will know about the influence of temperature and other factors on rate of reactants, interfacial phenomena, Newtonian and non-newtonian flows.

**Text Books**

1. Subrahmanyam C.V.S , Textbook of Physical Pharmaceutics, 2005, Delhi ,Vallabh Prakashan, 1st edition .
2. Martin A.N & Cammarata .A ,Physical Pharmacy and Pharmaceutical sciences,1983 Philadelphia, 6th Edition,
3. Hougen and Watson K.M, Chemical Process principles,2004, New Age International ,2nd edition
4. Shoton & Ridgway, Physical Pharmaceutics ,2004,London , Oxford press ,2nd edition,
5. Gennaro A.R , Remington's Pharmaceuticals Sciences , 2010 , Mack Publishing ,21st edition

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| **II Year B. Pharmacy II-Sem** | **L** | **T/P** | **C** |
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## (A64005)PHARMACEUTICAL JURISPRUDENCE

**Objective:** The objective of the course is to expose the students all the laws and roles, which are voges in the country. The scope of the course is extended to update all the laws and roles including recent amendments taken place.

**UNIT-I**
**INTRODUCTION**

a) Pharmaceutical Legislations. A brief review
b) Drugs & Pharmaceutical Industry. A brief review
c) Pharmaceutical Education. A brief review.
d) Pharmaceutical ethics
e) Pharmaceutical policy 2002

**UNIT-II**

Drugs and Cosmetics Act 1940 and Rules 1945

**UNIT-III**

a) Pharmacy Act 1948
b) Drugs (Prices Control) Order 1995.
c) Drugs and Magic Remedies (Objectionable Advertisements) Act 1954 and Rules 1955

**UNIT-IV**

a) Medicinal & Toilet Preparations (Excise Duties) Act 1955
b) Narcotic Drugs & Psychotropic Substances Act 1985 &A.P. N. D. P.S Rules 1986

**UNIT-V**

A study of the salient features of the following

a) Prevention of Cruelty to animals Act 1960.
b) AP State Shops & Establishments Act 1988 & Rules 1990.
c) Factories Act 1948.
d) WTO,
e) The Indian Patents Act 1970

**Outcome:** The outcomes which are expected from the students at the end of the course are:Familiarization of the students with all the legal tenets and enforceable in the country, besides Pharmaceutical ethics and policies.

**TEXT BOOKS**

1. B.M.Mithal, 2009, A Text book of Forensic Pharmacy, 10th ed,
Vallabh Prakashan, Delhi.
2. C.K.Kokate & S.B.Gokhale, 2012, Textbook of Forensic Pharmacy, 2nd ed, Pharmamed press, Hyderabad.

**REFERENCES**

1. N.K.Jain, 2009, A Text book of Forensic Pharmacy, 7th ed, Vallabh Prakashan, Delhi.

2. Dr.B.S.Kuchekar, A.M.Khadatare and Sachin C.Itkar, 2006, Forensic Pharmacy, 6th ed, Nirali Prakashan, Pune.

3. K.Sampath, 2008, Pharmaceutical Jurisprudence (Forensic Pharmacy), 1st ed, Birla publications pvt ltd, Delhi.

4. Dr.B.S.Kuchekar, 2009, Textbook of Pharmaceutical Jurisprudence, 14th ed, Nirali Prakashan, Pune.

5. Dr.B.Suresh, 2011, Forensic pharmacy (Forensic Pharmacy), 14th ed, Birla publications Pvt. Ltd, Delhi.

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## (A64006)GENDER SENSITIZATION

**Course Objectives**:

1. To develop students sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women.

**Course Outcomes**:

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Student will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.
6. Students will develop a sense of appreciation of women in all walks of life.
7. Through providing accounts of studies and movements as will as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

**Unit-I:**

**UNDERSTANDING GENDER:**

Gender: Why Should We Study It? (Towards a World of Equals: Unit-1)
Socialization: Making Women Making Men (Towards a World of Equals: Unit-2)
Introduction. Preparing for Womanhood. Growing up Male. First lesions in Caste. Different Masculinities. Just Relationships: Being Together as Equals (Towards a World of Equals: Unit-12)Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Others and Fathers. Further Reading: Rosa Parks-The Brave Heart.

**Unit-II:**
**GENDER AND BIOLOGY**:
Missing Women: Sex Selection and Its Consequences (Towards a World of Equals: Unit-4) Declining Sex Ratio. Demographic Consequences. Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit-10)Two or Many? Struggles with Discrimination. Additional Reading: Our Bodies, Our Health (Towards a World of Equals: Unit-13)

**Unit-III:**
**GENDER AND LABOUR**:
Housework: the Invisible Labour (Towards a World of Equals: Unit-3)"My Mother doesn't Work." "Share the Load."Women's Work: Its Politics and Economics (Towards a World of Equals; Unit-7)Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

**Unit-IV:**
**ISSUES OF VIOLENCE**:
Sexual Harassment: Say No! (Towards a World of Equals: Unit-6) Sexual Harassment not Eve-Teasing- Coping with Everyday Harassment-Further Reading: "Chupulu". Domestic Violence: Speaking Out (Towards a World of Equals: Unit-8)Is Home a Safe Place? – When Women Unite (Film). Rebuilding Lives. Further Reading: New Forums for Justice. Thinking about Sexual Violence (Towards a World of Equals: Unit-11)Blaming the Victim-"I Fought for my Life…." – Further Reading: The Caste Face of Violence.

**Unit-V**
**GENDER STUDIES:**

Knowledge: Through the Lens of Gender (Towards a World of Equals: Unit-5)
Point of View. Gender and the Structure of Knowledge. Further Reading: Unaknowledged.Women Artists of Telangana.Whose History? Questions for Historians and Others (Towards a World of EqualsReclaiming a Past. Writing other Histories. Further Reading: Missing Pages from Modern Telangana History.Essential Reading: All the Units in the Textbook, "Towards a World of Eqals: A Bilingual Textbook on Gender" written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagarj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.
Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field.

**Reference Books**:
1. Sen, Amartya, "More than One Million Women are Missing." New York Review of Books 37.20 (20 December 1990). Print. 'We Were Making Hisoty…' Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." Women's Studies Journal (14 November 2012) Available online at:http://blogs.wsj.com/ India real

time/2012/11/14/by-the-numbers-where-Indian-women-work/>
3. K.Satyanarayana and Susie Tharu (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2, Telugu and Kannada http://harpercollings.co.in/BookDetail.asp?Book Code=373221
4. Vimala. "Vantilliu (The Kitchen)". Women Writing in India: 600 Bc To the Present, Volume It: The 20th Century, Ed. Susie Tharu and K.Lalitha. Delhi: Oxford University Press, 1995. 599-601.
5. Shatrunghna, Veena et al. Women's Work and its impact on Child Health and Nutrition, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research, 1993.
6. Stree Shakti Sanghatana. "We Were Making History…' Life Stories of Women in the Telangana People's Struggle, New Delhi: Kali for Women, 1989.
7. Menon, Nivedita, Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
8.Jayaprabha, A. "Chupulu (Stares)". Women Writing in India: 600BC to the Present. Volume II: The 20th Century Ed. Susie Tharu and K.Lalita, Delhi: Oxfor Univerity Press. 1995, 596-597.
9.Javeed. Shayan and Anupam Manuhaar. "Women and Wage Discrimination in India: A Critical Analysis." International Journal of Humanities and Social Science Invention 2,.4 (2013).
10. Gautam, Liela and Gita Ramaswamy. "A 'conversation' between a Daughter and a Mother." Broadsheet on Contemporary Politics. Special Issue on Sexuality and Harassment: Gender Politics on Campus Today. Ed. Madhumeeta Sinha and Asma Rasheed. Hyderabad: Anveshi Research Center for Women's Studies, 2014.
11. Abdulali Sohaila. "I Fought For My Life… and Won." Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
12. Jeganathan pradeep, Partha Chatterjee (Ed). "Community, Gender and Violence Subaltern Studies XI". Permanent Black Ravi Dayal Publishers, New Delhi, 2000.
13. K.Kapadia. The Violence of Development: The Politics of Identity, Gener and Social Inequalities in India. London: Zed Books, 2002.
14. S.Benhabib. Situating the Self: Gender, Community, and Postmodernism in Contemporary Ethics, London: Routledge, 1992.
15. Virginia Woolf. A Room of One's Own, Oxford: Black Swan, 1992.
16. T.Banuri and M. Mahmood, Just Development Beyond Adjustment with a Human Face, Karachi: Oxford University Press, 1997.

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## (A64201)PHARMACEUTICAL UNIT OPERATIONS-II LAB

1. Measurement of flow of fluids and their pressure, determination of reynold's number and calculation of frictional losses.
2. Evaluation of filter media, determination of rate filtration and study of factors affecting filtration including filter aids.
3. Determination of Humidity use of Dry Bulb and Wet Bulb thermometers and Psychometric charts.
4. Determination of overall Heat Transfer Coefficient.
5. Determination of rate of evaporation.
6. Determination of rate of drying, free moisture content and bound moisture content.
7. Experiments to illustrate the influence of various parameters on the time of drying.
8. Experiments to illustrate principles of size reduction, Laws governing energy and power requirements of a size reduction.
9. Experiments to illustrate solid solid mixing, determination of mixing efficiency using different types of mixers.

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## (A64202)PHARMACEUTICAL ANALYSIS – I LAB

1. Assay of Pharmaceutical compounds based on chemical methods such as
   a) acid base
   b) oxidation-reduction
   c) non-aqueous
   d) Complexometric titration methods.
2. Conductometric determination of end point of titration of HCI with NaOH.
3. Potentiometric determination of end point.
4. Separation and Identification of drugs by Ascending paper chromatography.
5. Separation and Identification of drugs by Circular paper chromatography.
6. Separation and Identification of drugs by Thin Layer chromatography.
7. Quantitative determination by Polarimeter.
8. Determination of refractive index of liquids by Abbe refractometer.

**TEXT BOOKS**

1. M.M Alam, mumoona Akthar, Asif Husain, M.Shaquiquzzaman (2011) Practical Pharmaceutical Analytical Chemistry, New Delhi: Elsevier.
2. Sonali Sheorey, Meera Honrao (2003) Practical Pharmaceutical Analysis-I, 1st edn., Nashik: Career Publishers.
3. Indian Pharmacopoeia 2011

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## (A64203)PHYSICAL PHARMACY-II LAB

1. 1. Determination of viscosity using Ostwald viscometer.
2. Percent composition – Capillary Flow method
3. Determination of bulk density, true density and percentage porosity.
4. Determination of Surface tension using Stalagmometer
5. Determination of CMC of a surfactant.
6. Partition coefficient determination.
7. Determination of sedimentation volume and degree of flocculation.
8. Determination of Order of reaction – First order.
9. Effect of temperature on solubility of solid in liquid.
10. Effect of addition of Salt/pH/cosolvent on the solubility
11. HLB value estimation of surfactants.
12. Preparation of Multiple emulsion - Demonstration.
13. Demonstration of Brook field viscometer.
14. Calculation of Zeta potential –Demonstration

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## (A64204)PHARMACOGNOSY - I LAB

1. Spotting of crude drugs mentioned in the theory.
2. Collection of natural herbs and preparation of herbarium / laminated photos for five drugs.
3. Measurement of particle size range of potato starch.
4. Isolation and determination of volatile oil content in caraway fruit/clove.
5. Measurement of size range of phloem fibers in Cinnamon powder.
6. Chemical test for identification and detection to adulteration in acacia, tragacanth, agar and honey.
7. Determination of Swelling factor of isabgol seeds
8. Perform the Transverse section of fallowing crude drugs Fennel, coriander, clove, cinnamon.
9. Perform the physical evaluation of olive oil/castor oil ( Solubility, density and viscosity)
10. Perform the chemical methods of evaluation of crude drugs containing fixed oils and lipids, methods mentioned in IP for Castrol oil, Olive oil, Kokum butter, bees wax.
11. Extraction of pectin from orange peels.

**TEXT BOOKS**

1. Kandhelwal, K.R., Practical Pharmacognosy, 2010, Pune, Nirali Prakashan, 22nd edition.
2. Kokate, C. K., Practical Pharmacognosy, 2004, Delhi, Vallabh Prakashan, 4th edition.

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**(A65001) PHARMACEUTICAL BIOCHEMISTRY**

**Scope of the Subject:** Pharmaceutical biochemistry deals with complete understanding of the molecular level of the chemical process associated with living cells.

**Objective:** The objective of the present course is providing biochemical facts and the principles to the students of pharmacy. The metabolism of complex biochemical substances are discussed in detail. The biochemical organization and bioenergetics will help the students to understand the concepts of biochemistry.

**UNIT - I**

a) Bio chemical organization of the cell, Molecular constituents of membrane, Active and passive transport processes, sodium and potassium pumps.

b) Introduction to Bioenergetics, the concept free energy, laws of thermodynamics.

c) Production of ATP and its biological significance, the respiratory chain and its role in energy capture & its control. Oxidative phosphorylation and its energetics, ETC.

**UNIT – II**

Enzymes & co-enzymes – Definition, Classification, mechanism of action, factors affecting, Enzyme kinetics and inhibition, Activators & deactivators of enzymes. Repression with reference to drug action.

**UNIT-III**

Metabolism of Carbohydrates: Glycolysis, glycogenolysis, glycogenesis, gluconeogenesis, Kreb's cycle, HMP pathway, uronic acid pathway. Role of Hormones in blood glucose homeostasis.

**UNIT-IV**

Metabolism of Proteins: deamination, Trans-amination, de-carboxylation, Ureacycle, Metabolism of cystine, cystein, methionine, tryptophan, tyrosine.

**UNIT-V**

**Metabolism of Lipids:**

Biochemistry of lipids, alpha, Beta, gamma & omega oxidation of fatty acids, Bio-synthesis of fatty acids, ketogenesis.

**Vitamins**- Nomenclature, Deficiency diseases and biochemical functions of Vitamin A & B12

**Outcome**: Upon completion of the subject student shall be able to –

a. understand the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases;

b. know the metabolic process of biomolecules in health and illness (metabolic disorders);

The metabolism of complex biochemical compounds would make the students to gain a good knowledge about biochemical organization in the human system.

**TEXT BOOKS**

1. Harper, 2006, Illustrated Biochemistry, 27th ed, McGraw-Hill, India.

2. Lehninger AL, 2011, Principles of Biochemistry, 5th ed, Freeman WH & co, Newyork.

3. Satyanarayana U & Chakrapani U, 2010, Text Book of Biochemistry, 3rd ed, Books and Allied (P) Ltd, India.

**REFERENCES**

1. Conn EE & Stumpf PK, 2011, Outlines of Biochemistry, 5th ed, John Wiley & sons, New York.
2. West, 1974, Text Book of Biochemistry, 4th ed, Oxford & IBH publ company pvt.ltd.
3. Rama Rao AVSS, Text Book of Biochemistry.
4. Sharma PK & Dandiya PC, 2010, Pharmaceutical Biochemistry (Theory & Practicals), Vallabh Prakashan, New Delhi.
5. Pillai KK & Qadry JS, 2008, Biochemistry and Clinical Pathology (Theory & Practicals), CBS Publishers & Distributers, New Delhi.

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## (A65002) PHARMACOGNOSY – II

**Objectives:** To have knowledge on the formation of pharmaceutically important secondary metabolites in plants and their commercial significance. The role of fibers, natural sweetening agents, colorants, volatile oils, tannins, resins in pharmaceutical, cosmetic and food industry. To make the student aware of what is ayurveda and its various preparations.

Systematic Phamacognostic study, which includes sources (Biological and Geographical) diagnostic characters, chemical constituents, chemical tests, uses, substituents and adulterants of the crude drugs mentioned in the following units.

**Microscopical characters of only the drugs underlined shall be studied**

**UNIT I**

**GLYCOSIDES**

Definition, Classification, general chemical test, general method of extraction and detailed pharmacognostic study of the following glycoside containing drugs.

**Anthraquinone Glycosides-** Aloe, **Senna** and Rhubarb

**Cardioactive Glycosides- Digitalis**, Squill and Strophanthus.

**Saponin Glycosides-** Glycyrrhiza, Ginseng and Discorea

**Bitter Glycosides-** Gentian and Chirata.

**Furocoumarin Glycoside**- Psoralea

**UNIT II**

**ALKALOIDS**

Definition, Classification, general chemical test, general methods of extraction and detailed pharmacognostic study of the following Alkaloid containing drugs.

**Indole Alkaloids-** Ergot, **Rauwolfia**, Vinca and **Nux-vomica**

**Tropane Alkaloids -** Hyoscyamus and **Datura**

**Steroidal Alkaloids –** Kurchi and Aswagandha

**Quinoline Alkaloids -** Cinchona

**Isoquinoline Alkaloids -** Ipecac and Opium.

**Alkaloidal amine Alkaloids -** Ephedra and Colchicum.

**UNIT III**

**TANNIN DRUGS**

Definition, Classification, general chemical test, and detailed pharmacognostic study of the following drugs

Gambier, Black catechu, Myroblan and Arjuna.

**RESIN DRUGS**

Definition, Classification, Physical properties, and detailed pharmacognostic study of the following drugs

Benzoin, Asafoetida, Balsam of Tolu, Podophyllum and turmeric.

**UNIT IV**

**ENZYME DRUGS**

Biological sources, method of preparations, identification tests and uses of the following enzymes

Diastase, Papain, Pepsin, Trypsin and Pancreatin.

**MINERAL DRUGS**

Bentonite, Kaolin, Keisulghur and talc

**MARINE DRUGS**

Antiinflammatory, Antimicrobial and Anticancer drugs

**UNIT V**

**PLANT BIOSYNTHESIS**

Study of shikimic acid pathway.

The investigation of biosynthetic pathways by isotopic tracer techniques.

Biosynthesis of alkaloids derived from ornithine, phenylalanine, tyrosine, tryptophan, lysine,

Biosynthesis of glycosides and Biosynthesis of isoprenoid compounds.

**Outcome:**

After study of the course, the student shall be able to know about the Phytopharmaceuticals and commercial significance and the various applications of crude drugs in the preparation of formulations as medicaments and excipients.

**TEXT BOOKS**


1. Kokate, C.K, et al., *Pharmacognosy* , 2010, Pune, Nirali Prakashan, 45th ed, 0.01 – A104.
2. Trease and Evans, *Pharmacognosy*, 2006, New Delhi, Elsevier, 15th ed, 1 – 549.
3. Tyler, V. E., et al., *Pharmacognosy* 2011, India, Wolters Kluwer, 9th ed, 1 – 495.
4. Krishnaswamy, N.R., *Chemistry of natural products*, 2010, Hyderabd, University press (India) private limited, 2nd ed, 17-34.
5. Harborne, J. B., *Phyto chemical methods*, 2011, New Delhi, Springer (India), 7th ed, 1-295.
6. Agarwal, O.P., *Chemistry of organic natural products*, 2011, Meerut, Krishna prakashan media private Ltd., 14th ed, 135-234, 501.

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| **III Year B. Pharmacy I-Sem** | **L** | **T/P** | **C** |
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## (A65003) PHARMACEUTICAL TECHNOLOGY - I

**Objective: T**he student shall be taught on preformulation factors and objectives of preformulation, stability and bioavailability of formulation, concept of products, semisolids, aerosols and cosmetic preparations.

**UNIT-I**

**Preformulation**: Goals and objectives of Preformulation, [Protocol]. Study on Physical properties, powder characteristics, chemical properties of drugs.

Introduction to Stability, different climatic zones**.**

Stability testing of finished products as per ICH guidelines

**UNIT-II**

**Liquid Dosage Form :** Introduction, types of additives used in formulations, vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubulizers, colors and flavours

**Dry syrup**: Formulation, Evaluation and its application.

**UNIT-III**

**Semisolid dosage forms**: Definitions, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection. General formulation of semi solids, clear gels manufacturing procedure, evaluation and packaging.

**Suppositories**: Ideal requirements bases, different types of bases manufacturing procedure, packaging and evaluation.

**Dispersed system:** Suspension – Formulation, types of suspension , Evaluation of suspension ,Emulsion-Formulation, **study of mechanical equipment for emulsification, Stability** of suspensions and emulsions.

**UNIT-IV**

**Pharmaceutical aerosols**: Definition, propellants formulation, manufacturing and packaging systems, pharmaceutical applications and evaluation, **Dry powder inhalers**.

**Opthalmic Preparations:** Formulation, methods of preparation, containers,evaluation.

**UNIT-V**

**Introduction to biopharmaceuticals, biosimilars and biobetters.**

**Special cosmeceuticals: shampoos, anti dandruff shampoos, sun screen products, anti-ageing products, Anti-fungal products.**

**Radiopharmaceuticals: Definition, radioactivity, short list of radiopharmaceuticals**

**Outcome:** Student will know the preformulation parameters in designing the dosage form, ICH guidelines, preparation and evaluation of semisolids, ophthalmic and cosmetics.

**TEXT BOOKS**

1. L. Lachman, H.A, Lieberman and J.L. Kanig, 1976, Theory & Practice of industrial pharmacy, 3rd ed, Varghese publishing house, Bombay.
2. CVS Subramanyam, 2005, Pharmaceutical Production and Management, Vallabh Prakashan, New Delhi.

**REFERENCES**

1. Loyd V, 2011, Ansel's Pharmaceutical Dosage forms and drug delivery systems, 9th ed, Wolters kluwer pvt ltd, New delhi.

2. Lippincott, Williams and Wilkins, 2006, Remington the science and practice of pharmacy, vol-2, 21st ed, Wolters kluwer pvt ltd, New delhi.

3. S.H. Willing, M.M Tuckerman and W.S. Hitchings IV, 1998, Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control, 2nd ed , Marcel Dekker, Inc, New York.

4. Gilbert S. Banker and Christopher T Rhodes, 2005, Modern Pharmaceutics, 4th ed, Marcel dekker, USA.

5. Yiew chien, 2003, Novel drug delivery systems, 2nd ed, Marcel Dekker, USA.

6. Robert. A. Nash, 2003, Pharmaceutical Process Validation, 3rd ed, Marcel Dekker, USA.

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## (A65004) PHARMACOLOGY – I

**OBJECTIVE:-** The main objective of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the complete information about the drugs like sources, physico chemical properties, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

**UNIT I**

**General Pharmacology:**

Introduction to pharmacology, sources of drugs, dosage forms and routes of administration, mechanism of action, combined effect of drugs, factors modifying drug action, tolerance and dependence, pharmacogenetics. Absorption, distribution, metabolism and excretion of drugs, principles of discovery and development of new drugs. Adverse drug reactions and Drug Drug interactions.

**UNIT II**

**Pharmacology of Peripheral Nervous System:**

a. Neurohumoral transmission (autonomic and Somatic)
b. Parasympathomimetics & Parasympatholytics,
c. Sympathomimetics & Sympatholytics
d. Neuromuscular blocking agents. and drugs used in myasthenia gravis
e. Local anesthetic agents.

**UNIT III**

**Pharmacology of Central Nervous System:**

a. General anesthetics.
b. Alcohols and Disulfiram.
c. Pharmacology of Sedatives & Hypnotics
d. Anti anxiety agents and centrally acting muscle relaxants.
e. C.N.S. Stimulants and Cognition Enhancers
f. Drug Addiction and Drug Abuse.

**UNIT IV**

**Psychopharmacology:**

a. Drugs for psychosis
b. Drugs used for depression and bipolar disorder
c. Drugs used in epilepsy
d. Drugs used in parkinsonism

**UNIT V**

**Drugs used for pain and inflammation**

a. Introduction to Autacoids 5-hydroxytryptamine, Histamine, Prostaglandins, and leukotrines.
b. Narcotic analgesics and opioid receptor modulators
c. Non steroidal drugs
d. Anti gout drugs
e. Drugs used for arthritis including biologics (monoclonal antibodies)

**OUTCOME:** Upon completion of the subject student shall be able to -

1. Explain the pharmacological actions of different categories of drugs on various systems of the Body.
2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Handle the animals and conduct the experiments to observe the effect of drugs from different therapeutic classes and to interpret the results using suitable statistical analysis.
5. Appreciate correlation of pharmacology with other bio medical sciences

**TEXT BOOKS**

1. R.S. Satoshkar, Niramala N. Rege and S.D. Bhandarkar, 2011, Pharmacology and pharmacotherapeutics, 22nd ed. Papular Prakashan Pvt.Ltd, Mumbai.
2. Betram G. Katzung, 2012, Basic and Clinical Pharmacology, 9th ed, McGraw hill publication, New Delhi.
3. K D Tripathi, 2013, Essential of Medical Pharmacology, 7th ed, Jaypee publication, New Delhi.

**REFERENCES**

1. Richard A Harvey and Pamela C Champe, 2010, Lippincotts illustrated reviews: Pharmacology, 4th ed, Wolters Kluwer (India) Pvt. Ltd, New Delhi.
2. Goodman & Gilmann, 2006, The Pharmacological Basis and Therapeutics, 11th ed, McGraw Hill publication. , New Delhi.
3. H.P. Rang & M.N. Dale, 2012, Text book of pharmacology, 7th Ed, Elsevier Inc, Spain.
4. H.L.Sharma and K.K. Sharma, 2011, Principles of pharmacology, 2nd ed, Paras Medical publisher, Hyderabad.
5. Charles R. Craig and Robert E Stitzel, 2012, Modern Pharmacology and Clinical Application, 6th ed, Wolters Kluwer (India) Pvt. Ltd, New Delhi.

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## (A65005) PHARMACY ADMINISTRATION

**Objective:**

1. To expose the students, fecets of business administration in the new economic environment
2. The manufacturing management
3. Social and behavior aspects of Pharmacy: Pharmaceutical outcomes, Pharmacoeconomics and Pharmacovigilence.

**Unit –I**

**Features of Business Organizations and New Economic Environment:**
Characteristic features of Business, Features and evaluation of Sole Proprpietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-Liberalisation scenario.

**Manufacturing Management:** Goals of Production Managemnt and Organisation-Production, Planning and control-Plant location-Principles and Types of plant layout –Methods of production (Job, batch and Mass Production), New Product Development.

**Work Study**-Basic procedure involved in method study and work measurement-statistical quality control: X chart, R chart, c chart, p chart, (simple problems), Acceptance sampling, Deming's contribution to quality.

**Unit-II**

**Social Pharmacy**: a. Social uses ofdrugs: Abuse of prescription drugs.

**Behavioral Pharmacy**: Compliants/Adherence to medications.

**Introduction to Pharmacoeconomics**: Definitions of Efficacy: Comparative cost effectiveness ratios; Comparative Clinical Effectiveness and cost Benefit ratios.

**Pharmaceutical Outcomes (Quality of life concepts)**
History of Pharmaceutical outcomes movements in india and abroad

**Pharmaceovigilence/PharmacoEpidemiology:**
Present status in india: State and central initiatives; Reporting of Adverse Drug Reactions; Prescribes format for reporting Adverse Drug Reactions; Irrational Drug Combinations; List of Drugs banned by Governemnt of India and other state Governments.

**Unit-III**

**Organization of Distribution and Marketing**: Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life cycle, Channels of distribution-Factors influencing channels of distribution, sales organization and sales promotion.

**UNIT IV**

**Pharma Industry**: Growth of Pharma Industry in india-current status and it s role in building national economy and national health-Structure of Pharma industry in india-PSUs in Pharma industry-Progress in the manufacture of basic drugs, synthetic and drugs of vegetable origin, Export and import of drugs and pharmaceuticals-Export and import trade.

**Unit V**

**Insurance and Pharma:** Various types of insurance including marine and health insurance Pharmaceutical Associations and Societies, statutory councils governing the profession. General Principles of medical detailing.

**Principles of drug store and community pharmacy administration**: Drug store planning and layout, sales promotion and salesmanship in drug store. Accounting records in drug stores.

**Outcome:** At the end of the course, students will be familiarized with the above all areas.

**TEXT BOOKS**

1. Aryasri and Subbarao, Pharmaceutical Administration, TMH.
2. Smarta, strategic Pharma Marketing.
3. G Vidya Sagar, Pharmaceutical Industrial Management.

**REFERENCES**

1. Subbarao Chaganti, Pharmaceutical Marketing in India-Concepts and Strategy cases, Pharma Book Syndicate
2. O.P Khanna, Industrial Management, Dhanpatrai, New Delhi

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## (A65201) ADVANCED ENGLISH COMMUNICATION SKILLS LAB

### 1. Introduction

The introduction of the English Language Lab is considered essential at 3rd year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be an integrated theory and lab course to enable students to use 'good' English and perform the following:

Gather ideas and information, to organise ideas relevantly and coherently.
Engage in debates.
Participate in group discussions.
Face interviews.
Write project/research reports/technical reports.
Make oral presentations.
Write formal letters.
Transfer information from non-verbal to verbal texts and vice versa.
To take part in social and professional communication.

### 2. Objectives:

This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts. Further, they would be required to communicate their ideas relevantly and coherently in writing.

### 3. Syllabus:

The following course content is prescribed for the Advanced Communication Skills Lab:

1. **Fundamentals of interpersonal communication**-Starting a Conversation-Using the right Body Language- Responding Appropriately and Relevantly –Role Play in Different Situations.
2. **Vocabulary Building** – synonyms and antonyms, Word Roots, One-Word Substitutes, Prefixes and suffixes, study of Word Origin, Analogy, Idioms and Phrases.
3. **Group Discussion** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Coherence.
4. **Interview Skills** – Concept and Process, Pre-Interview Planning, Opening Strategies, Answering Strategies, Interview through Telephone and Video-Conferencing.
5. **E-mail**-Content,Formats-Formal/Informal,Structure,Etiquette–Structure and Presentation.
6. **Resume Writing-** Structure and Presentation, Planning, Defining the Carrier Objective, Projecting Ones Strength and Skill-sets, Summary, Format and Styles, Letter-Writing.

7. **Reading Comprehension –** Reading for Facts, Guessing meanings from context, Scanning, Skimming, Inferring Meaning, and Critical Reading.
8. **Technical Report Writing-** Types of Format and Styles, Subject matter-Organization, Clarity, Coherence and Style, Planning. Data Collection, Tools and Analysis.

4. **Minimum Requirement**: Computer aided Multimedia Language lab with 60 systems with LAN facilities with speakers, head phones and a teacher to console to accommodate 60 students.

**5. Suggested Software**

The software consisting of the prescribed topics elaborated above should be procured and used.

**6. Books Recommended:**

1. Effective Technical Communication, M. Ashraf Rizvi, Tata Mc. Graw-Hill Publishing Company Ltd.
2. A course in English communication by Madhavi Apte, Prentice-Hall of India, 2007.
3. Communication Skills by Leena Sen, Prentice-Hall of India, 2005.
4. Academic Writing- A Practical guide for students by Stephen Bailey, Rontledge Falmer, London & New York, 2004.
5. Body Language- Your Success Mantra by Dr. Shalini Verma, S. Chand, 2006.
6. Books on TOEFL/GRE/GMAT/CAT by Barron's/cup
7. IELTS series with CDs by Cambridge University Press.
8. Technical Report Writing Today by Daniel G. Riordan & Steven E. Pauley, Biztantra Publishers, 2005.
9. Basic Communication Skills for Technology by Andra J. Rutherford, 2nd Edition, Pearson Education, 2007.
10. Communication Skills for Engineers by Sunita Mishra & C. Muralikrishna, Pearson Education, 2007.
11. Objective English by Edgar Thorpe & Showick Thorpe, 2nd edition, Pearson Education, 2007.
12. Objective IELTS by Michal Black & Wendy Sharp, Cambridge University Press.
13. Objective IELTS by Michal Black & Annette Capel, Cambridge University Press.
14. Cambridge Preparation for the TOEFL Test by Jolene Gear & Robert Gear, 4th Edition.
15. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press.

**Outcomes**:

1. Accomplishment of sound vocabulary and its proper use contextually
2. Flair in writing and felicity in written expression
3. Enhanced job prospects
4. Effective speaking abilities.

**TEXT BOOKS**

1. Strengthen Your English, Bhaskaran & Horsburgh, Oxford University Press
2. English for Technical Communication, K R Lakshminarayana, SCITECH
3. Strategies for Engineering Communication, Susan Stevenson & Steve Whitmore ( John Wiley and sons).
4. English for Engineers: With CD, Sirish Chaudhary, Vikas Publishing House Pvt. Ltd.With CD.
5. Basic Communication Skills for Technology, Andrea J Rutherfoord, Pearson Education Asia.

6. Murphy's English Grammar with CD, Murphy, Cambridge University Press
7. English Skills for Technical Students by Orient Longman
8. English for Professional Students, by S S Prabhakara Rao.
9. The Oxford Guide to Writing and Speaking, John Seely, Oxford.
10. Grammar Games, Renvolucri Mario, Cambridge University Press.
11. Everyday Dialogues in English by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
12. English Technical Communication, Vol. 1 & 2, by K. R. Lakshmi Narayanan, Sci tech. Publications.
13. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP English Pronouncing Dictionary Daniel Jones Current Edition with CD.
14. Spoken English- R. K. Bansal, J. B. Marrison and Orient Longman 2006 Edn.
15. A Practical course in English Pronunciation, (with two Audio cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
16. Pronunciation Practice Activities: A resource book for teaching English pronunciation by Martin Hewings, Cambridge University Press, 2004.
17. English Pronunciation in use by Mark Hancock (with 4 CD)- Cambridge University Press, 2005.
18. A text book of English Phonetics for Indian Students by T.Balasubramanian (Macmillan)
19. English Skills for Technical Students, WBSCTE with British Council, OL
20. Effective Technical Communication, M. Ashraf Rizvi, Tata Mc. Graw-Hill Publishing Company Ltd.
21. Professional Presentations- A Video based course by Malcolm Goodale, Cambridge University Press, 2005.
22. A course in English communication by Madhavi Apte, Prentice-Hall of India, 2007.
23. Communication Skills by Leena Sen, Prentice-Hall of India, 2005.
24. Academic Writing- A Practical guide for students by Stephen Bailey, Rontledge Falmer, London & New York, 2004.
25. Body Language- Your Success Mantra by Dr. Shalini Verma, S. Chand, 2006.
26. Books on TOEFL/GRE/GMAT/CAT by Barron's/cup.
27. IELTS series with CDs by Cambridge University Press.
28. Anderson, Technical Communication-Thompson publications
29. Delta's Key to the Next Generation TOEFL Test, Nancy Gallagher.
30. Technical Report Writing Today by Daniel G. Riordan & Steven E. Pauley, Biztantra Publishers, 2005.
31. Basic Communication Skills for Technology by Andra J. Rutherford, 2nd Edition, Pearson Education, 2007.
32. Communication Skills for Engineers by Sunita Mishra & C. Muralikrishna, Pearson Education, 2007.
33. Objective Engish by Edgar Thorpe & Showick Thorpe, 2nd edition, Pearson Education, 2007.

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**(A65202) PHARMACEUTICAL BIOCHEMISTRY- LAB**

1. Identification of carbohydrates.
2. Identification of amino acids.
3. Identification of lipids.
4. To prepare standard buffers (citrate, phosphate & carbonate) and measure the pH.
5. Titration curve for amino acids.
6. Separation of amino acids by two dimensional paper chromatography.
7. The separation of lipids by T.L.C.
8. Qualitative analysis of normal constituents of urine.
9. Qualitative analysis of abnormal constituents of urine.
10. Estimation of glucose in urine.
11. Estimation of creatinine in urine.
12. Estimation of Serum protein.

**REFERENCES**

1. Jayaraman J, 2001, Laboratory manual in biochemistry**,** New Age international Publishers, (P) ltd, Madhurai.
2. David T Plummer, 1998, An Introduction to Practical Biochemistry, 3rd ed, Tata Mc Graw Hill education Pvt ltd, New Delhi.
3. Rodney F. Boyer, 2006, Modern experimental Biochemistry, 3rd ed, Pearson.
4. Sharma PK & Dandiya PC, 2010, Pharmaceutical Biochemistry (Theory & Practicals), Vallabh Prakashan, New Delhi
5. Pillai KK & Qadry JS, 2008, Biochemistry and Clinical Pathology (Theory & Practicals), CBS Publishers & Distributers, New Delhi.

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## (A65203) PHARMACOGNOSY – II LAB

1. Spotting for identification of crude drugs mentioned in theory.
2. Microscopy and macroscopy of any two glycoside containing crude drugs given in theory.
3. Microscopy and macroscopy of any two alkaloids containing crude drugs given in theory.
4. Microscopy and macroscopy of any two tannin containing crude drugs given in theory.
5. Microscopy and macroscopy of any two resin containing crude drugs and study of their powder characters given in theory.
6. Isolation and Identification of Caffeine from tea leaf powder
7. Isolation of starch from potatoes
8. Isolation of nicotine from tobacco
9. Identification of heavy metals in herbal medicines

**REFERENCES**


1. Kokate, C.K, 2010, Pratical Pharmacognosy, 1-186, 4th ed, Vallabh Prakashan, Delhi.
2. Khandelwal, K.R, 2012, Pratical Pharmacognosy, 1-27.20, 22nd ed, Nirali Prakashan, Pune.
3. Krishnaswamy, N.R, 2012, Chemistry of natural products laboratory manual, 1-206, 2nd ed, University press (India) private limited, Hyderabad.

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## (A65204) PHARMACEUTICAL TECHNOLOGY – I LAB

1. Preparation, physical parameters, labeling (as per Drugs and Cosmetics act) of solutions, suspensions, emulsions, ointments, suppositories, eye drops and ointments.
2. Formulation of various types of cosmetics for skin, hair, dentrifices and manicure preparations.

**REFERENCES**

1. Sindhu Abraham, 2013, Pharmaceutics A practical manual, 2nd ed, pharma med press, Hyderabad.
2.R.S Gaud, G.D Gupta, 2004, Practical Pharmaceutics, CBS publishers, New Delhi.
3. AK Gupta, 1990, Pharmaceutics II, 2nd ed, CBS Publishers, New Delhi.

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| **III Year B. Pharmacy II- Semester** | **L** | **T/P** | **C** |
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| | **3** | **1/-** | **3** |

## (A66001) MEDICINAL CHEMISTRY – I

**Objective**: The basic consideration of drug activity, metabolism and medicinal substances belonging to different categories are discussed in an elaborative manner. The synthesis and the mechanism of action of medicinal compounds are explained in an organized way which helps the student to understand the medicinal uses of the compounds.

**UNIT – I**

Basic considerations of Drug activity: Physico chemical properties of drug molecules in relation to biological activity – Solubility, lipophilicity, partition-coefficient, Ionization, hydrogen bonding, Chelation, redox potential and surface activity, Bioisosterism of drugs. Drug distribution and protein binding.

**Note**: Introduction, definition, nomenclature, chemical classification, structure, synthesis, general mechanism, and mode of action, SAR including physicochemical and stereo chemical aspects, therapeutic uses of the drugs and structural modification leading to control the metabolism from each category shall be studied for the following units. An outline of synthetic procedure of only the drugs mentioned in each category.

**UNIT – II**

**Drugs acting on CNS:** A brief study of the chemistry of neurotransmitters.
Hypnotics and Anxiolytics – Phenobarbital, Diazepam, Alprazolam, Glutethimide.
Anti-psychotics – Chlorpromazine, Haloperidol, Clozapine, Oxypentine

**UNIT-III**

**Drugs acting on CNS**

Anti-epileptics – Phenytoin, Valproic acid, Carbamazepine, Ethosuximide.
Anti-depressants – Imipramine, fluoxetine, doxepine.
Local anesthetic and General anesthetic agents: Benzocaine, Procaine, Dibucaine Lidocaine, Halothane & Thiopental sodium

**UNIT – IV**

**Drugs affecting adrenergic mechanism**:

Indirect acting Sympathomimetics : Isoproterenol, Salbutamol, Amphetamine, Ephedrine.
α blockers – Phenoxybenzamine, Prazosin
ß blockers – Atenolol.

**UNIT – V**

**Drugs affecting cholinergic mechanism**:

Cholinergics - Carbachol, Bethanichol

Anticholinesterase- Neostigmine, Pyridostigmine

Anti-cholinergics: Atropine, Ipratropium bromide, Dicyclomine, Bipyridine, Propanthelene .

Neuromuscular blockers - Succinyl choline.

**Outcome**: The students gain good knowledge about the usage of medicinal substances, the synthesis and drug-drug interactions, so that they can get involved with confidence in the patient counseling.

**TEXT BOOKS**

1. William O. Foye, 2008, Textbook of Medicinal Chemistry, 6th ed, Wolter's Kulwer, Philadelphia.

2. Block JH & Beale JM (Eds), 2004, Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry, 11th ed, Lipcott, Raven, Philadelphia,

3. Pandeya SN, 2003, Textbook of medicinal chemistry, SG Publ, Varanasi.

4. Sriram, Yogeeswari, Medicinal chemistry, 2nd ed , Pearson publications, Hyderabad.

5. Ashutoshkar, Medicinal Chemistry, 5th ed, New age international publishers, New Delhi.

6. Alagarsamy V, Textbook of medicinal chemistry, Volume I & II, Elsevier publications, Haryana.

7. Rama Rao Nadendla, 2013, Medicinal Chemistry, 2nd ed, Pharmamed Press, Hyderabad.

**REFERENCES**

1. Abraham D (Ed), 2003, Burger Medicinal chemistry and Drug discovery, Vol. 1 & 2 6th ed, John Wiley & Sons, New York.

2. Atherden LM, Bentley and Driver's Textbook of Pharmaceutical Chemistry, 1st ed, Oxford University Press, Delhi

3. Hansch C, Comprehensive medicinal chemistry, Vol 1 – 6, Elsevier pergmon press, Oxford

4. Lednicer D, 1998, Strategies for Organic Drug Synthesis and Design, John Wiley, N. Y.

5. Kadam, 2011, Textbook of Medicinal Chemistry, Vol. 1 & 2, 12th ed, NiraliPrakashan, Pune.

6. Nogrady T, Medicinal Chemistry – A Biochemical Approach, Oxford University Press, New York.

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## (A66002) PHARMACEUTICAL TECHNOLOGY - II

**Objective:** Student will know the formulation and evaluation of tablets, coated tablets, capsule, micro-capsules and parentral preparations in laboratories and industrial scale.

**UNIT-I**

**Tablets:** Formulation of different types of tablets, granulation technology on large-scale by various techniques, types of tablet compression machinery, tablet defects and the equipments employed for evaluation of tablets.

**Coating of Tablets:** Types of coating, coating materials and their selection, formulation of coating solution, equipment for coating, coating processes, tablet coating defects and evaluation of coated tablets.

**UNIT-II**

**Capsules:** Advantage and disadvantages of capsule dosage forms, material for production of hard and soft gelatin capsules, sizes of capsules, capsule filling, processing problems in capsule manufacturing, importance of base absorption and minimum/gm factors in soft capsules, quality control, storage of capsule dosage forms.

**UNIT-III**

**Microencapsulation: Introduction,** Types of microencapsulation and importance of microencapsulation in pharmacy, microcapsulation by coacervation phase separation. multi orifice centrifugal separation. Spray drying, spray congealing, polymerization complex emulsion, air suspension technique, and pan coating techniques, evaluation of microcapsules.

**UNIT-IV**

**Parenteral Products**

a. Routes of administration, water for injection, pyrogens and apyrogenicity, non-aqueous vehicles.

**b. Definition, classification, formulation, vehicles, containers, filling, sealing and testing, design of aseptic filling area, quality control of parenterals.**

**UNIT-V**

**Packaging of Pharmaceutical products:** Packaging components, types, specifications and methods of evaluation, Packaging equipments, factors influencing choice of containers, legal and **other official labeling requirements (as per D &C act) for containers.**

**Outcome:** The students shall be exposed to various aspects of pharmaceutical product preparations and evaluations of tablets, capsules etc.

**TEXT BOOKS**

1. L. Lachman, H.A, Lieberman and J.L. Kanig, 1976, Theory & Practice of industrial pharmacy, 3rd ed, Varghese publishing house, Bombay.

2. Loyd V, 2011, Ansel's Pharmaceutical Dosage forms and drug delivery systems, 9th ed, Wolters kluwer pvt ltd, New delhi.

3. CVS. Subramanyam, Pharmaceutical production and management, 2005, New Delhi Vallabh Prakashan.

**REFERENCES**

1. Lippincott, Williams and Wilkins, 2006, Remington the science and practice of pharmacy, vol-2, 21st ed, Wolters kluwer pvt ltd, New delhi.

2. S.H. Willing, M.M Tuckerman and W.S. Hitchings IV, 1998, Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control, 2nd ed , Marcel Dekker, Inc, New York.

3. Gilbert S. Banker and Christopher T Rhodes, 2005, Modern Pharmaceutics, 4th ed, Marcel dekker, USA.

4. Yiew chien, 2003, Novel drug delivery systems, 2nd ed, Marcel Dekker, USA.

5. Robert. A. Nash, 2003, Pharmaceutical Process Validation, 3rd ed, Marcel Dekker, USA.

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| **III Year B. Pharmacy II- Semester** | **L** | **T/P** | **C** |
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**(A66003) PHARMACOLOGY – II**

**OBJECTIVES:-** This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs used in systemic diseases as well as infectious diseases. In addition, emphasizes on the basic concepts of bioassays and principles of toxicology.

**Pharmacology and Pharmacotherapy of drugs acting on following categories.**

**UNIT I :-**

**Cardio-vascular system:**

a. congestive heart failure (CHF)
b. Hypertension
c. coronary artery disease, Angina, Myocardial infraction
d. Cardiac arrhythmias

**UNIT II**:-

**Haematopoietic and urinary system:**

a. Anti-coagulants, Anti-platelets, and thrombolytics
b. Haematinics
c. Fluid and electrolyte balance
**d.** Diuretics and antidiuretics
**e.** Drug induced blood disorders.

**UNIT III :-**

**Endocrine and respiratory system.**

a. Adrenal steroids
b. Thyroid and parathyroid diseases
c. **Diabetes mellitus**, Insulin, oral hypoglycemic agents.
d. Respiratory diseases (COPD, Asthma).
e. Respiratory stimulants

**UNIT IV:-**

**Bioassay:**

a. Definition, Principles and types of bioassay.
b. Study of bioassay methods for following drugs:
   i) HCG ii) Oxytocin iii) Insulin
c. Study of cell based and tissue based bioassay with example

**UNIT-V**

**Principles of Toxicology:**

a) Definitionofpoison,general principles of treatment of poisoning with particular reference to barbiturates opioids, organophosphorus and atropine poisoning.
b) Heavy metals and heavy metals antagonists
c) Diagnostic agents

**OUTCOME**:- Upon completion of the course the student shall be able to -

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Comprehend the principles of toxicology and treatment of various poisonings.
3. Locate and isolate different organs/tissues from the laboratory animals used in pharmacological experiments
4. Demonstrate the various receptor actions using isolated tissue preparation
5. Appreciate correlation of pharmacology with related medical sciences

**TEXT BOOKS**

1. R.S. Satoshkar, Niramala N. Rege and S.D. Bhandarkar, 2011, Pharmacology and pharmacotherapeutics, 22nd ed, Papular Prakashan Pvt.Ltd, Mumbai.
2. Betram G. Katzung, 2012, Basic and Clinical Pharmacology, 9th ed, McGraw hill publication, New Delhi.
3. K D Tripathi, 2013, Essential of Medical Pharmacology, 7th ed, Jaypee publication, New Delhi.
4. Screening Methods in Pharmacology I vol.Set TURNER, Elsevier

**REFERENCES**

1. Richard A Harvey and Pamela C Champe, 2010, Lippincotts illustrated reviews: Pharmacology, 4th ed, Wolters Kluwer (India) Pvt. Ltd, New Delhi
2. Goodman & Gilmann, 2006, The Pharmacological Basis and Therapeutics, 11th ed, McGraw Hill publication, New Delhi.
3. H.P. Rang & M.N. Dale, 2012, Text book of pharmacology, 7th ed, Elsevier Inc, Spain.
4. H.L.Sharma and K.K. Sharma, 2011, Principles of pharmacology, 2nd ed, Paras Medical publisher, Hyderabad.
5. Charles R. Craig and Robert E Stitzel, 2012, Modern Pharmacology and Clinical Application, 6th ed, Wolters Kluwer (India) Pvt. Ltd, New Delhi.

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| | **3** | **1/-** | **3** |

## (A66004) CHEMISTRY OF NATURAL DRUGS

**Objective:** The chemistry including the structure elucidation of the natural products belonging to different groups such as alkaloids, terpenoids, steroids and hormones are discussed in depth.

**UNIT-I**

**Alkaloids:** Definition, General methods of extraction of alkaloids.

**Opium alkaloids**- Structural features of Morphine molecule- Peripheral groups, Modification of structure and Effect on analgesic activity- SAR of Morphine and Morphine like analgesics.

**Tropane alkaloids**- Structure elucidation of Atropine, Pharmacological actions and Uses of Tropane Alkaloids**.**

**Rauwolfia alkaloids-** Structures and Uses of Reserpine, Rescinnamamine, Deserpidine, Ajmaline, Hydrolysis of Reserpine, Rescinnamamine, Mechanism of action of reserpine.

**UNIT-II**

**Terpenoids**- Definition, Classification, Isoprene, Special isoprene & Gem Dialkyl rules.

**Citral**- Sources and Structures of citral, Isomerism in citral, citral-a (geranial), citral-b (neral-b), Reduction of citral to citronellal, citronellol, geraniol, and nerol, Oxidation of citral to geranic acid. Cyclodehydration of citral to p-cymene. Synthesis of vitamin A1 from citral.

**Menthol and Menthone** – Sources, Structure & Uses. Oxidation of Menthol to Menthone. Conversion of Menthol to Thymol, Chemistry & Structure elucidation of menthol.

**Camphor**- Source, Properties, Uses of a-pinene & isoborneol, commercial method of preparation from a- pinene. Oxidation to camphoric & camphoronic acid. Conversion into p-cymene, reduction of camphor to borneol & isoborneol, sources, structure, uses of isoborneol, oxidation of borneol to camphor.

Recent advances in terpenoids: Taxol

**UNIT –III**

**Steroids**- Introduction, Nomenclature of Steroids, Structures, Stereochemistry & Numbering of ring system in Cholesterol, Ergosterol & Stigmosterol. Pharmaceutical importace of sterols.

**Bile acids**- Names, structures and functions.

**Purine and xanthine derivatives:** Chemistry and pharmaceutical importance of Caffeine, Theophylline, Theobromine and Uric acid.

**UNIT-IV**

**Hormones- Sex hormones**: Male and female sex hormones

**Estrogens** - Estradiol, Estrone and Estriol. Structures and their interconversions. Structures, Therapeutic uses & side effects of Synthetic estrogens, Progesterone & selected Progestins.. Preparation of Progesterone from Diosgenin. A Note on steroidal contraceptive agents and regimens.

**Androgens**- Structures, Biological activities, Therapeutic uses of Testosterone & their derivatives.

**UNIT-V**

**Adrenal cortex Hormones:**

**Mineralocorticoids**- Structures, biological activities, therapeutic uses of Aldosterone, Deoxycorticosterone, Fludrocortisone. Aldostreone antagonist- Spiranolactone, clomifen citrate.

**Glucocorticoids-** Structures, biological activities, therapeutic uses of Cortisone and Hydrocortisone.

**Outcome:** The knowledge of the students is enhanced with clear information about the natural products which are having medicinal importance.

**TEXT BOOKS**

1. Agarwal OP, 2011, Natural products, Vol.1 & 2, Goel publications, Meerut.
2. Harborne JB, 1988, Phyto Chemical methods, 3rd ed, Springer, UK.
3. Finar IL, 2009, Organic chemistry, Vol. 1 & 2, 6thed, The English language book society, NewDelhi.

**REFERENCES**

1. William O. Foye, 2008, Priciples of Medicinal Chemistry, 6th ed, Lea Febiger Philadelphia
2. Block JH & Beale JM (Eds), 2011, Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry, 12th ed , Lipincott, Raven, Philadelphia.
3. Kadam, 2011, Textbook of Medicinal Chemistry, Vol. 1 & 2, 12th ed, NiraliPrakashan, Pune.
4. Morrison RT and Boyd RT, 2011, Organic chemistry, 7th ed, Pearson, Boston.
5. Me – Wolf, 1997, Burger's medicinal chemistry, 5thed, J. Wiley & sons, NY.

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## (A66005) PHARMACEUTICAL MICROBIOLOGY

**Objective**: Microbiology is always considered to be an essential component of Pharmacy curriculum because of its relevance to pharmaceutical sciences and more specifically to pharmaceutical industry. This course deals with the various aspects of microorganism their classification morphology, laboratory cultivation, identification, maintenance and control of microorganism, sterility testing and bio safety measures. The course also covers bacterial genetics, drug resistance and microbiological assays.

**UNIT – I**

**a. Introduction to Microbiology**: Origin, scope and discovery of spontaneous generations theory, contributions of Antony Von Lewvonhock, Pasteur, Koch and Lister.

**b. Diversity of Microorganisms**: Prokaryotes versus eukaryotes – eukaryotic and prokaryotic cell structure, three domains of life (bacteria, archea and eukaryotes). Pharmaceutical significance of protozoa, algae, fungi, bacteria and viruses. Characterization and identification of microorganisms.

**UNIT – II**

**Nutrition and Growth of Microbes**: Nutritional requirements, Types of Nutrient media and growth conditions and Nutritional types based on energy source. Isolation, cultivation (aerobic & anaerobic) and preservation of microorganisms, physiology of growth, bacterial growth curve, methods for determining bacterial numbers, mass and cell constituents. Exponential growth and generation time. Bacterial growth in batch and continuous culture (chemostat and turbidostat) synchronous growth.

**UNIT – III**

**a. Control of Microorganisms**: General Concepts, Inhibition of growth and killing, sterilization and disinfection, antisepsis and sanitation, mode of action application & limitation of physical agents (moist and dry heat, radiation and filtration), chemical agents. Various types of disinfectants, factors affecting sterilization and disinfection, evaluation of antimicrobial activity.

Chemotherapeutic agents, mode of action and applications, drug resistance.

**b**. Official methods of sterility testing of pharmaceuticals and biosafety measures.

**UNIT – IV**

**Bacterial Genetics**: Genetic recombination in bacteria, DNA replication, transcription and translation. Gene regulation (lac operon and tryptophan operon). Mutagenesis, chemical and physical mutagens. Application of Microbes in Pharmaceutical Industry.

**Microbiological Assays**: Principles and Methods involved in Assay of Antibiotics, Vitamins, Amino acids & Bio-Sensors in Analysis.

**UNIT – V**

Introduction to microbiology of air, water and milk, Quantitative estimation of microbial contamination.

**Outcome:** Upon completion of the subject student shall be able to –

- Know the anatomy, identification & cultivation of microorganisms
- Perform sterilization of various pharmaceutical products, equipment, culture media etc.
- Perform sterility testing of pharmaceutical products
- Perform microbiological assay of antibiotics, vitamins and aminoacids
- Do microbiological analysis of air, water and milk.

**TEXT BOOKS**

1. Pelczar and Reid, 1993 Text Book of Microbiology , 5th edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Anantha Narayan and Jayram Panikar, 2011, Text Book of Microbiology, 8th edition Orient Longman, Hyderabad.
3. N.K. Jain, 2010 Pharmaceutical Microbiology, M K Jain for VALLABH PRAKASHAN
4. Alcamo, 2009 Microbiology. Tata McGraw-Hill Publishing Company Limited, New Delhi.
5. R.C. Dubey, 2012, A textbook of Microbiology, S.chand & company Ltd, New Delhi.

**REFERENCES**

1. P.Chakraborty, 2013, A textbook of Microbiology, New Central Book Agency (P) Ltd
2. Heritage, 2007, J Introductory Microbiology, Cambridge University Press Pvt Ltd, India.
3. Nester, Anderson, Roberts, Pearsall, Microbiology,: A Human Perspective, 2007 5th revised, McGraw-Hill, New Delhi.
4. Hugo, 2000, W B Pharmaceutical Microbiology, 6th ed, Blackwell scientific publications, NY.
5. Tortora, 2012 Gerard Text Book of Microbiology, 9th ed Pearson Education, Inc.
6. Garg,F C, 2009, Experimental Microbiology , CBS Publishers & Distributors, New Delhi.
7. Gaud, 2000, R.S Practical Microbiology, 6th ed Nirali Prakashan, Pune.

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| **B.Pharmacy III year II Sem** | **L** | **T/P** | **C** |
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**(A66201) MEDICINAL CHEMISTRY – I LAB**

**I. Synthesis of some medicinal compounds and their analogues.**

1. Barbituric acid from Diethyl Malonate.
2. Phenytion from Benzoin or Benzil.
3. Paracetomol from p-nitro phenol or p- aminophenol.
4. Synthesis of ethyl-p-nitrobenzoate
5. Preparation of 3-methyl-1-phenylpyrazol-5-one
6. Preparation of antipyrine from 3-methyl-1-phenylpyrazol-5-one

**II. Qualitative estimation of some functional groups.**

1. Hydroxyl groups (acetylation method)
2. Methoxyl groups (Zeissel's method).
3. Carboxyl groups (silver salt method).

**III. Assay of some drugs from their formulations**:

1.Phenyoin (anticonvulsant)
2.Compound benzoic acid (antifungal)

**REFERENCES**


6. Tatchell AR, Furniss BS, Hannaford AJ, Smith PWG, 2008, Vogel's Textbook of Practical Organic Chemistry, 5th Ed, Pearson Education Ltd, New Delhi.
7. Bansal RK, 2010, Laboratory Manual of Organic Chemistry, 5th Ed, New Age International (P) Ltd, New Delhi.
8. Mann FG, Saunders BC, 2001, Practical Organic Chemistry, 4th Ed, Orient Longman Limited, New Delhi.
4. K.N. Jayveera, Practical Medicinal Chemistry, S.Chand & company pvt ltd, New Delhi.
5. M. Raghu Prasad, 2012, Advanced Medicinal Chemistry, A laboratory guide, PharmaMedplus, Hyderabad

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**III Year B.Pharmacy II-Semester**

| L | T/P | C |
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| 0 | -/3 | 2 |

## (A66202) PHARMACEUTICAL TECHNOLOGY – II LAB

1. Experiments to illustrate preparation, stabilization, physical, chemical evaluation of pharmaceutical products like capsules, tablets, parenterals, microcapsules etc.
2. Evaluation of materials used in pharmaceutical packaging.
3. Evaluation of marketed products- Tablets, capsules, Oral dispersable tablets.

**REFERENCES**

1. Sindhu Abraham, 2013, Pharmaceutics A practical manual, 2nd ed, pharma med press, Hyderabad.
2.R.S Gaud, G.D Gupta, 2004, Practical Pharmaceutics, CBS publishers, New Delhi.
3. AK Gupta, 1990, Pharmaceutics II, 2nd ed, CBS Publishers, New Delhi.

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**III Year B. Pharmacy II-Semester**

| L | T/P | C |
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| 0 | -/3 | 2 |

## (A66203) PHARMACOLOGY – II LAB

**1.** Introduction of experimental pharmacology
a. Introduction to CPCSEA guidelines and GLP
b. Role of physiological salt in experimental pharmacology
c. Use of laboratory animals (Frog, mice, rats, guinea pigs and rabbits) and anaesthetics.
d. Animal handlings and blood collection techniques.
**2.** Animal Experimentation
a. Demonstration of different routes of administration of drugs in mice/rats.
b. Recording of spontaneous motor activity, analgesia, anticonvulsant and anti-inflammatory activity.
c. To study the effect of autonomic drugs on rabbit's eye.
**3.** Experiments on isolated tissue preparation
   a. To study the effect of various agonist and antagonists and their characterization using isolated preparation like frog's rectus abdominus muscle and isolated ileum preparation of rats/guinea pig.
   b. Concentration response curve (CRC ) of acetylcholine.
   c. To study the effect of physostigmine and d-tubocurarine on acetylcholine induced contraction
   d. CRC of histamine on guniea pig ileum.
   e. To calculate the PA2 value of atropine using acetylcholine as an agonist on rat ileum preparation.
   f. To find out the strength of the given sample on (e.g. Acetylcholine, Histamine, 5-HT, Oxytocin etc.) using a suitable isolated muscle preparation by Three point Assay
4. Experiments on isolated frog heart.
5. To study the effect of drug on ciliary motility of frog esophagus.

**(Note: All experiments are demonstrated using computer aided simulated software)**

**REFERENCES:**


**1.** Bikashmedhi and Ajay Prakash, 2010, Practical Manual of Experimental and Clinical Pharmacology, 1st ed, Jaypee Brothers Medical Publishers (P) Ltd, Kundli.
**2.** M.N. Gosh, 2013, Fundamentals of Experimental Pharmacology, 5th ed. Hilton and company publisher, Kolkatta.
**3.** S.R.Kale and R.R.kale, 2005, Practical Pharmacology and Toxicology, 10th ed, Nirali Prakashan, Pune.
**4.** V S Parmar and Shiva Prakash, 2006, Screening methods in pharmacology, 1st ed, Narosa Publishing House, Ahmedabad.

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**III Year B. Pharmacy II-Sem**

| L | T/P | C |
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## (A66204) CHEMISTRY OF NATURAL DRUGS LAB

**A. Preparation of different testing reagents**

**B. Phytochemical extraction from various plant sources**

1. Phytoconstituents extraction from plants by soxhlet apparatus & Preliminary Phytochemical screening.
2. Phytoconstituents extraction from plants by ultra sonic bath sonicator & Preliminary Phytochemical screening.
3. Phytoconstituents extraction from plants by maceration & Preliminary Phytochemical screening.
4. Volatile oil production from lemon grass by steam distillation & Preliminary Phytochemical screening.
5. TLC end examination of alkaloids.
6. TLC end examination of steroids.
7. TLC end examination of steroidal glycosides.
8. TLC end examination of cardiac glycosides.
9. Extraction of lactose from milk.
10. Extraction of lycopene from tomatoes.

**TEXT BOOKS**

1. Praveen kumar, 2011, Natural products A Practical Manual, Pharma med press, Hyderabad.
2. Kokate CK, 2011, Practical Pharmacognosy, 4th ed, Vallabh Prakashan, Delhi.

**REFERENCES**

1. Indian Pharmacopoeia – 2010
2. Khandelwal KR, 2012, Practical Pharmacognosy, 22nd ed, Nirali Prakashan, Pune.

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**III Year B. Pharmacy II-Semester**

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## (A66205) PHARMACEUTICAL MICROBIOLOGY LAB

1. Introduction to equipment and glassware used in microbiology laboratory.
2. Study of Morphology of different microbes.
3. Preparation of various culture media and cultivation of microbes and observation of colony characteristics.
4. Sterilization techniques (Moist and dry heat) and their validations.
5. Aseptic transfer of culture into different types of Medias.
6. Characterization of microbes by staining techniques methods (simple gram's, acid fast and negative staining)
7. Study of motility of bacteria by hanging drop method.
8. Characterization of microbes through bio chemical reactions:
   i) Indole test.
   ii) Methyl red test.
   iii) Voges proskauer test.
   iv) Starch hydrolysis test.
   v) Fermentation of carbohydrates.
9. Enumeration of bacteria by pour plate/spread plate technique.
10. Enumeration of bacteria by direct microscopic count.
11. Isolation of pure cultures by streak plate, spread plate, pour plate.
12. Evaluation of disinfectants by phenol coefficient test.
13. Study of Oligodynamic action(Metals on bacteria).
14. Preseravation of microrganisms (slant and stab cultures)

**REFERENCES**

1. R.S.Gaud, G.D .Gupta, 2012, Practical Microbiology, 8$^{th}$ed, Nirali Prakashan, Pune.
2. Vinita v.kale, 2010, Practical Microbiology,3$^{rd}$ ed, Himalaya publishing house, Mumbai.

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| **B.Pharmacy IV year I Sem** | **L** | **T/P** | **C** |
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**(A67001) PHARMACEUTICAL ANALYSIS-II**

**Objective:** The principle involved in the determination of various bulk drugs and formulations are discussed. Modern methods and instrumental techniques are applied in the study and analysis of pharmaceutical substances.

**UNIT I**
**UV-Visible Spectrophotometry:** Introduction to spectroscopy, Beer-Lambert's Law & Deviations, Principle, Theory, WoodWard-Fieser Rule, Instrumentation, Applications
**Flourimetry:** Principle, Theory, Instrumentation, Applications

**UNIT II**
**Infrared Spectrophotometry:** Principle, Theory, Instrumentation, Applications, Basic principles in Interpretation of IR Spectra
**Atomic Absorption Spectroscopy:** Principle, Theory, Instrumentation, Applications

**UNIT III**
**Nuclear Magnetic Resonance Spectrophotometry:** Principle, Theory, Instrumentation, Applications, Basic principles in Interpretation of NMR Spectra
**Mass Spectrometry:** Principle, Theory, Instrumentation, Applications, Basic principles in Interpretation of Mass Spectra

**UNIT IV**
Flamephotometry: Introduction, study and working principles and instrumentations used for analysis, applications applications in pharmaceutical analysis.
Basic Principles and Applications of
Nephlometry and turbidimetry
**X-Ray Diffraction Spectroscopy**

**UNIT V**
**Gas Chromatography:** Principle, Theory, Instrumentation, Applications
**HPLC:** Principle, Theory, Instrumentation, Applications
**HPTLC:** Principle, Theory, Instrumentation, Applications

**Outcome:** The students are exposed to the modern instrumental techniques for the study of pharmaceuticals to a high level which would be useful for their future in academia and industry.

**TEXT BOOKS**

1. Dr A.V Kasture, DR S.G Wadodkar, Dr K.R Mahadik, Dr H.N More (2011)*Pharmaceutical Analysis*, Vol I&II, 17th edn., Pune: Nirali Prakashan.
2. Dr Gurudeep R. Chatwal, Dr Sham K.Anand (2002) *Instrumental Methods of Chemical Analysis*, 5th edn., Mumbai: Himalaya Publishing House.
3. Doulas A.Skoog, F.James Holler, Stanley R.Crouch (2011) *Instrumental Analysis*, Indian Edition., Cengage Learning
4. Dr B.K. Sharma (2011) *Instrumental Methods of Chemical Analysis*, 27th edn., Meerut: Goel Publishing House.
5. A.H. Beckett & J.B. Stanlake (1997) *Practical Pharmaceutical Chemistry*, Vol I&II, 1st edn., New Delhi: CBS Publishers.

**REFERENCES**

1. Y. R .Sharma (2013) *Elementary Organic Spectroscopy*, 5th edtn., S.Chand & Company PVT Limited.
2. William Kemp (2010*) Organic Spectroscopy*, 3rd edtn., New York: Palgrave.
3. Hobart H.Willard, Lynne L.Merritt. Jr., John A.Dean, Frank A.Settle.Jr. (1986*) Instrumental Methods of Analysis*, 7th edtn., New Delhi: CBS Publishers & Distributors.
4. Indian Pharmacopoeia 2014

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| **B.Pharmacy IV year I Sem** | **L** | **T/P** | **C** |
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## (A67002) BIOPHARMACEUTICS AND PHARMACOKINETICS

**Objective:** This course is designed to impart basic knowledge of Biopharmaceutics and Pharmacokinetics .It also explains how the different fundamental factors are affecting drug absorption, distribution, metabolism, excretion process .it gives the fundamentals of Bioavailability and bioequivalence.

**UNIT-I**

**Introduction, Drug Absorption & Drug Distribution:** Definition of Biopharmaceutics, Pharmacokinetics and Pharmacodynamics, a brief introduction to Clinical Pharmacokinetics, Toxicokinetics, Pharmacogenetics

**Drug Absorption:** Routes of drugs administration, Mechanism of drug absorption in G.I. tract, Factors influencing drugs absorption, Physico-chemical factors, Formulation related and Patient related factors.

**Drug Distribution:** Volume of Distribution, Numericals related to Volume of distribution, Factors affecting drug distribution .Protein-drug binding, factors affecting, significance and kinetics of Protein-drug Binding.

**UNIT-II**

**Drug Metabolism:** Pathways of drug metabolism, Phase-I (oxidative, reductive and hydrolytic reaction) Phase-II reactions (conjugation), factors affecting metabolism, Physico-chemical factors ,Chemical factors and Biological factors

**Drug Excretion:** Glomerular filtration, tubular secretion and reabsorption, Effects of pH and other drugs Clearance concept, Factors affecting renal clearance, Excretion through bile, feces, lungs and skin in brief.

**UNIT-III**

**Bioavailability and Bioequivalence:** Definition, concept of equivalents, definition of various types of equivalents, types of bioavailability studies, measurement of bioavailability, plasma level and urinary excretion studies, Bioequivalent Study design, Latin square design, Cross over design, Randomized block design, bioavailability protocol.

**UNIT-IV**

**Pharmacokinetics:** Basic considerations, compartment modeling, one compartmental open model - i.v bolus, i.v infusion extravascular administration, Method of residual, Wagner – Nelson method ,Urinary excretion studies, Calculation of Pharmacokinetic parameters. Brief overview of nonlinear kinetics, non compartmental model.

**UNIT-V**

**Biostatistics:** A brief introduction to probability, Histogram, standard error, standerd deviation, Linear regression and correlation, coefficient of correlation, t-test, Analysis of variance (ANOVA), non parametric tests(sign test)

**Outcome:** The students shall be able to understand the concept of Bioavailability and Bioequivalence, Biopharmaceutical parameters, Pharmacodynamics and Pharmacokinetics of drug .It also explains the ADME of drug besides non-linear pharmacokinetics.

**TEXT BOOKS**

1. Venkateshwarlu ,Fundamentals of Biopharmaceuticals and Pharmacokinetics ,Pharma Book Syndicate
2. Leon Shargel ,Andy YU,Applied Biopharmaceutics and Pharmacokinetics
3. P.L.Madan ,Biopharmaceutics and Pharmacokinetics ,Jaypee Bros
4. Milo Gibaldi ,Biopharmaceutics and clinical Pharmacokionetics 4th edition ,Pharma Book Syndicate Hyderabad

**REFERENCES**

1. Morden Pharmaceutics by Banker Marcel Dekker Inc , NY
2. Remington's pharmaceutical sciences Mac Pub Co, Easton Pensylvania
3. Robert E notary, Biopharmaceutics and Pharmacokinetics

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| **B. Pharmacy IV Year I-Sem** | **L** | **T/P** | **C** |
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## (A67003) PHARMACOLOGY-III AND CLINICAL PHARMACOTHERAPEUTICS

**Objective:** This course is designed to impart basic knowledge and skills that are required for the practice of pharmacy in both hospital and community settings.

**UNIT – I**

**Pharmacology of Drugs Acting on the Gastrointestinal Tract:**

a. Antacids, Antisecretory and Anti-ulcerDrugs
b. Laxatives and antidiarrhoeal drugs
c. Appetite Stimulants and Suppressants.
d. Emetics and anti-emetics
e. Miscellaneous; Carminatives,demulcents,protectives,adsorbents, astringents, digestants,enzymes and mucolytics.

**UNIT-II**

**Chemotherapeutic agents and their applications:**

a. General principles of chemotherapy.
b.Sulphonamides and Co-trimoxazole.
c. Antibiotics: Penicillins and Cephalosoporins
d.Tetracyclines, Aminoglycosides,Chloramphenicol,Macrolides,Quinolones and Fluroquinolones.

**UNIT-III**

**Chemotherapeutic agents and their applications:**

a. Chemotherapy of tuberculosis & leprosy**.**
b. Chemotherapy of fungal diseases,
c. Chemotherapy of viral diseases,
d. Chemotherapy of urinary tract infections
e. Chemotherapy of sexually transmitted diseases.

**UNIT–IV**

**Clinical pharmacy:**

a) Introduction to Clinical Pharmacy
b) Clinical Pharmacokinetics and individualization of DrugTherapy.
c) Therapeutic drug monitoring
d) Concept of Essential Drugs. Drug and poisoning Information
e) Special precautions in drugs usage during infancy and in the elderly (Pediatrics & Geriatrics).
f) Special precautions in drugs usage during pregnancy & lactation
g) Interpretation of clinical laboratory tests

**UNIT – V**

**Pharmacotherapeutics:**

a) Pharmacotherapy of malignancy and immunosuppressive Agents.
b) Pharmacotherapy of Neoplastic Diseases: Acute leuaemias, Hodgkin's
c) Pharmacotherapy Gastroenteritis

**OUTCOME:-**Upon completion of this course it is expected that students shall be able to –

1. Understand the pharmacology of various drugs and their usage in chemotherapy
2. Understand the elements of pharmaceutical care and provide comprehensive patient care services
3. Understand the concept and practice of the quality use of medicines
4. Summarize the therapeutic approach for management of various diseases including reference to the latest available evidence.

**TEXTBOOKS**

5. R.S. Satoshkar, Niramala N. Rege and S.D. Bhandarkar, 2011, Pharmacology and pharmacotherapeutics, 22nd ed. Papular Prakashan Pvt.Ltd, Mumbai.
6. Betram G. Katzung, 2012, Basic and Clinical Pharmacology, 9th ed, McGraw hill publication, New Delhi.
7. K D Tripathi, 2013, Essential of Medical Pharmacology, 7th ed, Jaypee publication, New Delhi.
8. Roger Walker and Cate Whittlesea Clinical Pharmacy and Therapeutics-5th-Edition Churchill livingstone Elsevier.

**REFERENCEBOOKS**

6. Richard A Harvey and Pamela C Champe, 2010, Lippincotts illustrated reviews: Pharmacology, 4th ed, Wolters Kluwer (India) Pvt. Ltd, New Delhi
7. Goodman & Gilmann, 2006, The Pharmacological Basis and Therapeutics, 11th ed, McGraw Hill publication, New Delhi.
8. H.P. Rang & M.N. Dale, 2012, Text book of pharmacology, 7th ed, Elsevier Inc, Spain.
9. H.L.Sharma and K.K. Sharma, 2011, Principles of pharmacology, 2nd ed, Paras Medical publisher, Hyderabad.
10. Charles R. Craig and Robert E Stitzel, 2012, Modern Pharmacology and Clinical Application, 6th ed, Wolters Kluwer (India) Pvt. Ltd, New Delhi.

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## (A67004) MEDICINAL CHEMISTRY – II

**Objective**: Sufficient information about various antibiotics and their chemotherapeutic agents are studied in depth. The basic consideration of drug activity, metabolism and medicinal substances belonging to different categories are discussed in an elaborative manner. The synthesis and the mechanism of action of medicinal compounds are explained in an organized way which helps the student to understand the medicinal uses of the compounds.

### UNIT – I

**Antibiotics**: Brief historical background, definition, classification of antibiotics.

**Penicillins**: Historical background and biological sources, structures of different penicillins.

Reactions: Hydrolysis of penicillin by cold and hot dilute mineral acid, alkali, enzymatic hydrolysis with penicillinase, amidase.

Classification of penicillins, general methods of synthesis of penicillins from 6-APA, SAR, mechanism of action, therapeutic uses and toxicity. A note on lactamase inhibitors.

### UNIT – II

**Cephalosporins**: Biological sources, structures of some important Cephalosporins and Cephamycins. Acid hydrolysis of Cephalosporin C. Comparision of 6-APA and 7-ACA, penam and cepham

Classification: Generations of Cephalosporins, Oral and parenteral, SAR and advantages over penicillins.

### UNIT – III

**Tetracyclins:** Biological sources, structures of the important tetracyclins, important structural units and the three acidity constants in the tetracycline molecule, amphoteric nature, mechanism of action, spectrum of activity, SAR and toxicity.

**Aminoglycosides**: Structure of streptomycin, acid hydrolysis, mechanism of action, therapeutic uses and toxicity. Dihydrostreptomycin and its importance. A mention of other aminoside glycoside antibiotics.

### UNIT – IV

**Chemotherapeutic Agents:**

**Anticancer drugs:** 5-Flurouracil, 5-Mercaptopurin, Methotrexate, Vincristine, Vinblastine

**Sulpha drugs**- Sulphadiazine, Sulphasalazine, Trimethoprim, Sulphamethoxazole

Diagnostic agents and radioprotective agents.

**UNIT – V**

**Antiviral drugs**- Acyclovir, Zidovudine
**Antifungal agents**- Fluconazole, Itraconazole
**Antitubercular agents:** Isonicotinic acid hydrazide and Ethambutol
**Antileprotic agents**: Dapsone, Clofazemine

**Outcome**: The students would be in a position to participate in the community pharmacy activities with the knowledge they gained through the study of the various topics of the syllabus.

**TEXT BOOKS**

1. William O. Foye, 208, Textbook of Medicinal Chemistry, 6th ed, Wolter's Kulwer, Philadelphia.

2. JH Block & JM Beale (Eds), 2004, Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry, 11th ed, Lipcott, Raven, Philadelphia,

3. S. N. Pandeya, 2003, Textbook of medicinal chemistry, SG Publ, Varanasi.

4. Sriram, Yogeeswari, Medicinal chemistry, 2nd ed , Pearson publications, Hyderabad.

5. Ashutoshkar, Medicinal Chemistry, 5th ed, New age international publishers, New Delhi.

6. V.Alagarsamy, Textbook of medicinal chemistry, Volume I & II, Elsevier publications, Haryana.

7. Rama Rao Nadendla, 2013, Medicinal Chemistry, 2nd ed, Pharmamed Press, Hyderabad.

**REFERENCES**

1. Abraham d (Ed), 2003, Burger Medicinal chemistry and Drug discovery, Vol. 1 & 2 6th ed, John Wiley & Sons, New York

2. Atherden LM, Bentley and Driver's Textbook of Pharmaceutical Chemistry, 1st ed, Oxford University Press, Delhi

3. Hansch C, Comprehensive medicinal chemistry, Vol 1 – 6, Elsevier pergmon press, Oxford.

4. Lednicer D, 1998, Strategies for Organic Drug Synthesis and Design, John Wiley, N. Y.

5. Kadam, 2011, Textbook of Medicinal Chemistry, revised ed, Vol. 1 & 2, Nirali Prakashan, Pune

6. Nogrady T, Medicinal Chemistry – A Biochemical Approach, Oxford University Press, New York.

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## (A67201) PHARMACEUTICAL ANALYSIS-II LAB

### EXPERIMENTS

1 Interpretation of IR Spectra of any two drugs

2. Determination of .λmax of a drug

3. Assay of any two drugs by UV-spectro photometry.

4. Assay of any two drugs by Colorimetric method.

5. Assay of Quinine Sulphate by Flourimetry

6. HPLC Demonstration.

7. Quantitative estimation of drugs by Nephelometer

8. Quantitative estimation of Sodium by Flame photometer

9. Quantitative estimation of Potassium by Flame photometer

10. Quenching effect in flourimetry.

### REFERENCES

1. B.G. Naagavi, Laboratory Handbook of Instrumental Drug Analysis, vallabh Prakashan Publications

2. Indian Pharmacopoeia, 2011

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| **B. Pharmacy IV Year I-Sem** | **L** | **T/P** | **C** |
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## (A67202) BIOPHARMACEUTICS AND PHARMACOKINETICS LAB

1. Experiments designed for the estimation of various pharmacokinetic parameters with given data
2. In –vitro evaluation of different dosage form for drug release
3. Analysis of biological specification for drug content and estimation of pharmacokinetic parameter
4. Absorption studies- in vitro and invivo
5. Statistical treatment of pharmaceutical data

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| **B. Pharmacy IV Year I-Sem** | **L** | **T/P** | **C** |
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## (A67203) MEDICINAL CHEMISTRY – II LAB

**Estimations of the following active pharmaceutical ingredients:**

1. Ascorbic acid.
2. Phosphoric acid by volumetric method.
3. Alkaloid by gravimetry.
4. Lactic acid by volumetric method.
5. Salicylic acid by volumetric method.

**Assay of some drugs from their formulations**:

3. Glibenclamide (hypoglycaemic agent)
4. Metronidazole (antiprotozoal)
5. Ibuprofen (analgesic, anti-inflammatory)
6. Phenobarbitol (Sedative and hypnotic)
7. Diethylcarbamazine (antihelmimtic)

**REFERENCES**

1. Indian Pharmacopoeia -1996, 4th Edition.
2. British Pharmacopoea – 2004.
3. Sethi PD, 2008, Quantitative Analysis of Drugs in Pharmaceutical formulations, 3rd ed, CBS Publishers & Distributors, New Delhi.
4. Nagavi BG, 2012, Lab Handbook of Instrumental Drug Analysis, 4th ed, Vallabh Prakashan, New Delhi.

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## (A68001) NOVEL DRUG DELIVERY SYSTEMS & REGULATORY AFFAIRS

**Objective:** This course is designed to impart knowledge on controlled delivery system including oral, transdermal, mucoadhesive ,Targeted(Liposomes and Nanoparticles).It also helps to know how the regulatory agencies (Indian CDSCO,USFDA Canadian HPFBI Australian TGA )act on release of NDA & ANDA.

**UNIT-I**

**Oral Control Drug Delivery System:**

Fundamental study of different types of oral controlled drug delivery system, Dissolution controlled, diffusion controlled, ion exchange resin, Osmotic pressure based system, pH independent system, altered density systems, detailed study of Matrix system.

**UNIT-II**

**Novel Drug Delivery System**:

**Transdermal Drug Delivery System:** Fundamentals, Different approaches of TDDS, Materials employed, Evaluation and Application of TDDS

**Mucoadhesive Delivery System**: Mechanism of Bioadhesion, mucoadhesive materials, Formulation and evaluation of mucoadhesive drug delivery system.

**UNIT-III**

**Targeted Drug Delivery System:**

Fundamentals of Targeting, a brief introduction about Drug carriers, Formulation, evaluation and application of Liposomes, Nano particles.

**UNIT-IV**

**Introduction to Drug Regulatory Agencies:**

CDSCO, Introduction to Global regulatory authorities (US FDA, Canadian HPFBI, Australian TGA) Introduction to IND, NDA, ANDA submissions of USFDA

Introduction to Quality assurance activities related to warehouse control, manufacturing control, packaging control. Introduction to Quality control.

**Introduction to Good Manufacturing Practices**: Salient features of Schedule –M (India)

**UNIT -V**

**Introduction to Validations**:

Process validation (prospective, retrospective & concurrent), analytical method validation (accuracy, precision, and specificity), and cleaning validation (sampling procedure and acceptance criteria)

**Outcome:** Students shall be able to know the controlled, sustained drug delivery system, their methods of preparation. They also know how regulatory agencies are filing to USFDA; Students shall be able to know the validation of Analytical methods.

**TEXT BOOKS**


1. Shobhan Rani, R Hiremath Text Book of Industrial Pharmacy – Universities Press
2. N.K.Jain ,Control and Novel Drug Delivery
3. Y.Anjaneyulu & Maraiah, Quality Assurance & Quality Management in Pharmaceutical Industry.
4. L.Lachman,H.A Lieberman and J.L.Kanig ,Theory & Practice of Industrial Pharmacy by Lea & Febieger,Philadelphia Latest Edn.


**REFERENCES**


1. S.P.Vyas &R.K.Khar ,Targeted & Controlled Drug Delivery
2. Yiew Chein ,Novel Drug Delivery System ,2nd edition,marcel dekker 2003
3. Leon Shargel Isadore Kanfer,Generic Drug Product Development ,Solid Oral Dosage Forms,Marcel Dekker.
4. Lippincott Williams and Wilkins ,Remington Pharmaceutical Sciences
5. Gilbert S. Banker and Chirstopher T Rhodes ,Morden Pharmaceutics,Vth edition,marcel dekker, USA ,2005
6. Good Manufacturing Practices –Schedule M read with The Drugs and Cosmetic Rules 1945

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| **B. Pharmacy IV Year II- Semester** | **L** | **T/P** | **C** |
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## (A68002) PHARMACEUTICAL BIOTECHNOLOGY

**Objective**: pharmaceutical biotechnology is considered to be a logical extension of pharmaceutical microbiology, thus expected to show a dramatic change in the drug product scenario in future. This course is designed to impart knowledge on isolation of industrially interesting microbes, various techniques employed in biotechnology viz., r-DNA technology, Hybridoma technology, enzyme technology and the products derived using these techniques.

**UNIT - I**

**Fermentation Technology:** Isolation, Selection, Screening of Industrial important microbes, Strain improvement. Types, design & operation of Bioreactor. Types of fermentations, optimization of fermentation process, Principle and Procedure involving in downstream process and effluent treatment.

**Specific Fermentations:** Selection of organism, fermentation & purification of various antibiotics like penicillin, streptomycin, vitamins like riboflavin, vitamin B12, organic acids like lactic acid, alcohol, enzymes and genetically engineered products.

**Microbial Transformations:** Types, Methods of bioconversions & Application in Pharma Industry.

**UNIT – II**

**Recombinant DNA Technology:** Introduction to r-dna technology and genetic engineering, steps involved, isolation of enzymes, vectors, recombination and cloning of genes.

**PCR and its applications in biotechnology.** Production of biotechnology derived therapeutic proteins like humulin, activase, monoclonal antibodies by hybridoma technique, recombivax HB (hepatitis b). Plant and animal tissue culture techniques and its applications.

**UNIT – III**

**Immunology & Immunological Preparations:** Principles of Immunity, Humoral immunity, cell mediated immunity, antigen – antiboby reactions, hypersensitivity and its applications. Active & passive immunizations vaccine preparation, standardization & storage & diagnostic agents..

**UNIT – IV**

**Enzyme Technology:** Techniques of immobilization of enzymes, factors affecting enzyme kinetics. Study of enzymes such as penicillinase, streptokinase, amylase, protease etc. Immobilization of bacteria & plant cells. Advantages of Immobilized enzymes over free enzymes.

**UNIT - V**

Introduction, role, collection, process & storage of blood products, ideal properties of plasma substitutes and sutures & ligatures like whole human blood, human normal ig, dextran, Clinical dextran etc. Introductory study & applications of bioinformatics, proteomics and genomics.

**Outcome:** Upon completion of the subject student shall be able to –

- Know screening of industrially important microorganisms
- Optimize fermentation process parameters.
- Know about preparation, standardization, storage and labelling of biotechnologically derived products
- Know about bioinformatics and its applications in pharmacy
- Know about the regulatory control of biotechnological products.

**TEXT BOOKS**

1. Pharmaceutical biotechnology by Dr.K.Tarakaram and Prof.K.N.Jayaveera, S.Chand & Co.,
2. Wulf Crueger and Anneliese Crueger, Biotechnology, 2nd Ed, Publ- Panima publication co-operation, New Delhi.
3. P. F. Stanbury & A. Whitaker, Principles of fermentation technology, Pergamon Press
4. J. D. Watson, Recombinant DNA technology. 2nd Edition, W.H.Freemann1992.

**REFERENCES**

1. Prescott and Dunne, ―Industrial Microbiology MC Graw Hill BookCompany
2. K. Kielsliched ―Biotechnology Vol 6, Verlegchemic, Switzerland.
3. PF Standury & A. Whitaker, ―Principles of fermentation TechnologyPergamon Press, Oxford
4. A. Wiseman, Handbook of enzyme biotechnology. 3rd Edition Elis Horwood

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## (A68003) MEDICINAL CHEMISTRY-III

**Objective**: The drug discovery and design with respect to the lead molecules and its optimization is clearly discussed. The concept of CADD and combinatorial chemistry is also discussed. The basic consideration of drug activity, metabolism and medicinal substances belonging to different categories are discussed in an elaborative manner. The synthesis and the mechanism of action of medicinal compounds are explained in an organized way which helps the student to understand the medicinal uses of the compounds.

**Note:**

**A study of the following classes of drugs including introduction, classification with examples of structures, mechanism of action, SAR and metabolism, synthesis of compounds specified against each class is to be studied for the following units.**

**UNIT-I**

**Drug discovery and drug design**: Introduction to discovery of lead molecule, lead optimization, pharmacophore identification, general structural activity relationships.

**Computer aided drug design**: Introduction to CADD, parameters in QSAR, applications of Hansch analysis, Free Wilson analysis.

Brief introduction to combinatorial synthesis in solid phase and liquid phase.

**UNIT – II**

**Drugs acting on Cardio-vascular diseases:**

**Antihypertensives**-Methyldopa, Amlodipine, Enalapril, Losartan

**Antiarrhythmics**-Procainamide

**Anticoagulants, Anti-anginals and coronary vasodilators**-Warfarin, Isosorbide dinitrate, Verapamil, Diltiazem

**Diuretics**- Acetazolamide, Hydrochlorthiazide, Furosemide

**Unit-III**

**Antihyperlipidemics** (hypoglycaemic drugs) - Clofibrate. A brief account on statins

**General account on pancreatic and thyroid hormonal malfunctions.**

**Antidiabetics**- Phenformin, Glipizide, Meglitinide analogues.

**Drugs affecting Thyroid Function-** Methimazole, Propylthiouracil, Insulin preparations

**Unit-IV**

**Analgesics and NSAIDS (Non-steriodal anti-inflammatory agents):**

Introduction and types of pain and inflammation

mild analgesics and strong analgesics: Meperidine and Methadone

NSAIDS- Aspirin, Paracetamol, Ibuprofen, Indomethacin, Diclofenac, Meloxicam

A brief account on Cox-2 inhibitors

**UNIT-V**

**Antiamoebics**: Metronidazole, Diloxanid furoate
**Anthelmintics**: Diethyl carbamazine citrate, Pyrantel pamoate, Mebendazole
**Antimalarial drugs**: Chloroquine, Pyrimethamine, Norfloxacin, Ciprofloxacin

**Outcome**: The students gain good knowledge about the usage of medicinal substances, the synthesis and drug-drug interactions, so that they can get involved with confidence in the patient counseling.

**TEXT BOOKS**

1. William O. Foye, 2008, Priciples of Medicinal Chemistry, 6th ed, Lea Febiger Philadelphia.
2. Block JH and Beale JM, 2004, Wilson and Giswold's Textbook of Organic Medicinal Chemistry and Pharmaceutical Chemistry by (Eds), 11th Ed, Lipincott, Raven, Philadelphia.
3. Pandeya SN, 2003, Textbook of Medicinal Chemistry, Vol 1&2, SG Publications, Varanasi.
4. Sriram, Yogeeswari, Medicinal chemistry, 2nd ed , Pearson publications, Hyderabad.
5. Rama Rao Nadendla, 2013, Medicinal Chemistry, 2nd ed, Pharmamed Press, Hyderabad.

**REFERENCES**

1. Abrahan D (Ed), 2013, Burger Medicinal Chemistry and Drug discovery, Vol. 1 & 2, John Wiley & Sons, New York.
2. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences.
3. Atherden LM, Bently and Driver's textbook of Pharmaceutical Chemistry. Oxford University Press, Delhi.
4. Lads BN, Mandel MG and Way FI, Fundamentals of drug metabolism and disposition, William and Welking co, Baltimore, USA.
5. Hansh C, 1991, Comprehensive Medicinal Chemistry, Vol1-6, Elsevier Pergmon press, Oxford.
6. Daniel Lednicer, 1998, Strategies for Organic Drug Synthesis and Design, John Wiley, N. Y.
7. Kadam, 2011, Textbook of Medicinal Chemistry, revised ed, Vol. 1 & 2, Nirali Prakashan, Pune.

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| **B. Pharmacy IV Year II- Semester** | **L** | **T/P** | **C** |
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**(A68004) PHARMACOGNOSY-III**

**Objective:** To learn about the therapeutically important crude drugs and Phytopharmaceuticals under a suitable pharmacognostic scheme and the importance of plant tissue culture in pharmacy. To make the student aware of biologically important molecules from marine sources and neutraceuticals.

**UNIT - I**

**ANALYTICAL PHARMACOGNOSY**

1) Drug adulteration
2) Drug evaluation- Organoleptic, Microscopic, Physical, Chemical and Biological methods of evaluation
3) Qualitative phytochemical screening
    1. Screening for primary metabolites: Carbohydrates, proteins and amino acids, Fats and fixed oils.
    2. Screening for secondary metabolites: Alkaloids, glycosides, steroid and terpenoids, flavonoids and phenolic compounds, tannins and saponins

**UNIT - II**

a) Isolation and identification of the following constituents
    1) Sennosides from senna
    2) Curcumin from turmeric
    3) Lycopene from tomato
b) Applications of chromatographic methods in evaluation of phyto constituents
    1) TLC- evaluation of alkaloids and glycosides
    2) HPTLC- evaluation of steroids and terpenoids
c) Herbal drug research in India
d) Herbal drug industry in India.

**UNIT - III**

**PLANT TISSUE CULTURE**

a) Brief introduction to plant tissue culture
b) Types of cultures: Callus culture, Single cell culture, Suspension culture, Embryo culture
c) Media requirements, Methodology for establishment of cultures, Growth measurements and applications

**STUDY OF TRADITIONAL DRUGS**

Bilva, Brahmi, Guuggul, Menthi, Shatavari, Shankhpushpi.

**UNIT - IV**

**GENERAL INTRODUCTION TO ALTERNATIVE SYSTEMS OF MEDICINE**

1. Ayurveda
2. Homeopathy
3. Unani
4. Sidda
5.

**AYURVEDIC FORMULATIONS**

Aristas, Asavas, Bhasmas, Choornas, Tailams and Lehyas

**UNIT - V**

**HERBAL COSMETICS**

1. Skin cosmetics
2. Hair cosmetics
3. Quality control of herbal cosmetics

**NEUTRACEUTICALS: A MODERN APPROCH**

Defination, Classification, study of fallowing neutraceuticals
Flaxseeds, Tea catechins, Soy isoflavones and Pomegranate

**Outcome:**

Since it is being the last part of Pharmacognosy subject, the student must be enriched with the knowledge on the crude drugs in a systematic way and in the use of crude drugs and Phytopharmaceuticals in various systems of medicine for the treatment of different aliments and in various industries.

**TEXT BOOKS**

1. Mukherjee, P.K, *Quality control of herbal drugs*, 2002, Business horizons, 4th edition, New Delhi, 1-515.
2. Biren Shah et al, *Text book of pharmacognosy and phytochemistry*, 2010, Reed Elsevier India private limited,1st edition, Haryana, India, 1-572.
3. Kashi, R et al, *Text book of industrial pharmacognosy*, 2012, University press India private limited, Hyderabad, 1-572.
4. Agarwal, S.S et al, *Herbal drug technology*, 2012, University press India private limited, Hyderabad, 1-792.
5. Razdan, M.K, *Introduction to plant tissue culture*, 2008, Oxford and IBH publishing company, New Delhi, India, 1-365.
6. Rangari, V.D, *Pharmacognosy and phytochemistry*, 2012, Carrer publications, Maharashtra, India, 3rd edition, Vol-I & Vol- II.
7. Kokate, C.K, et al., *Pharmacognosy* , 2010, Pune, Nirali Prakashan, 45th ed, 0.01 – A104

8. Harborne, J. B., *Phyto chemical methods*, 2011, New Delhi, Springer (India), 7th ed, 1-295.
9. Trease and Evans, *Pharmacognosy*, 2006, New Delhi, Elsevier, 15th ed, 1 – 549.
10. Walls, T. E., Textbook *of Pharmacognosy*, 2005, New Delhi, CBS Publishers and distributors, 5th ed, 1 – 637.

**REFERENCE TEXT BOOKS:**

1. Govt. of India, *The Ayurvedic Pharmacopeia of India*, 2001, New Delhi, The Controller of Publication, Civil Lines, 1st ed, Vol. I & II.
2. Handa and Kapoor, V. K., *Text book of Pharmacognosy*, 2004, New Delhi, Vallabh Prakashan, 3rd ed, 1 – 387.
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| **B. Pharmacy IV Year II-Semester** | **L** | **T/P** | **C** |
|---|---|---|---|
| | **0** | **3** | **2** |

## (A68201) NOVEL DRUG DELIVERY SYSTEMS & REGULATORY AFFAIRS LAB

1. Preparation and Evaluation of matrix Tables.
2. Formulation and Evaluation of film Coated Tables.
3. Formulation and Evaluation of Enteric Coated Tables.
4. Preparation and Evaluation of Transdermal Drug Delivery Systems.
5. Formulation and Evaluation of Mucoadhesive Delivery Systems.
6. Evaluation of Market SR Formulations.
7. Preparation and Evaluation of Alginate Beads.
8. Demonstration of FTIR
9. Analytical Method Validation(Linearity)
10. Assignment on Product development and filling to various regulatory agencies, FDA, MCC, EMEA, TGA.etc (Ref.: www.fda.gov)

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| L | T/P | C |
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| 0 | 3 | 2 |

## (A68202) PHARMACEUTICAL BIOTECHNOLOGY LAB

1. Isolation of antibiotic producing microorganism from soil.
2. Enzyme immobilization by ca-alginate method.
3. Determination of minimum inhibitory concentration of the given antibiotic. Antibiotic assay by cup plate method.
4. Collection, Processing, Storage and Fractionation of blood.
5. Standardization of cultures.
6. Microbiological assay of Antibiotic/Vitamins.
7. Production of alcohol by fermentation.
8. Comparison of efficacy of immobilized cells.
9. Sterility testing of Pharmaceutical Products.
10. Isolation of mutans by gradient plate technique.
11. Preparation of bacterial vaccine and standardization.
12. Extraction of DNA.
13. Separation techniques: Various types of Gel Electro Phoresis, Centrifugation.

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| L | T/P | C |
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| 0 | 3 | 2 |

## (A68203) PHARMACOGNOSY – III LAB

10. Spotting for identification of crude drugs mentioned in theory.
11. Isolation of volatile oil from clove
12. Isolation of volatile oil from lemongrass
13. Isolation of volatile oil from caraway
14. Determination of stomatal number of senna
15. Determination of stomatal index of senna
16. Determination of stomatal number of datura
17. Determination of stomatal index of datura
18. Determination of Total ash values for senna leaf powder
19. Determination of Sulphated ash for senna leaf powder
20. Establishment of thin layer chromatographic profiles of plant extract containing Terpenoids and Flavonoids (secondary metabolites).
21. Establishment of paper chromatographic profiles of plant extract containing Carbohydrates and Proteins (primary metabolites).

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