

15PYU101

SEMESTER-I

**HUMAN ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION– I      3H   3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- 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.
- It also helps in understanding 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.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand the gross morphology, structure and functions of various organs of the human body.
2. Understand the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of the human body.
4. Perform the haematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time, etc and also record blood pressure, ECG, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system.
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of the human body.

**Course Content:****UNIT - I**

**Introduction to anatomy and physiology and health education** with basic terminology- Introduction to Cell physiology-Different type of cells-cell membrane physiology and development of Action potential- impulse transmission-cardiac and skeletal muscles Electrophysiology- Cell stimulation and neuronal functions-Tissues types and characteristics – epithelial –connective-muscular and nervous tissues- **Structure and function of joints and bones** - skeleton- types of joints and their disorders.

**UNIT - II**

**Composition and functions of blood** including their disorders- Blood grouping and its significance- the mechanism of coagulation-bleeding and clotting disorders- Formation of lymph and

its composition-Reticular endothelial system and its functions.

### UNIT - III

**Anatomy and physiology of cardiovascular system**—heart- blood circulation – systemic –hepatic – Pulmonary- fetal and circle of Willis- cardiac cycle-heart rate-blood pressure and its regulation- ECG and heart sounds.

### UNIT - IV

**Gross anatomy of the G.I.T and its physiology** with special reference to liver – pancreas and stomach – Digestion – absorption - movements of intestine and disorders of digestive system – constipation - diarrhea and vomiting.

### UNIT - V

**Anatomy of respiratory tract** - mechanism of respiration lung volumes - transport of oxygen and carbon dioxide - Disorders like cyanosis- mountain sickness and Caisson's disease - Cough and sneezing reflex – Structure and functions of kidney and urinary tract – Physiology of urine formation and acid-base balance.

### TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Anne Waugh and Allison Grant	Ross and Wilson Anatomy and Physiology in Health and illness	Churchill Livingstone Elsevier-UK	2013

### REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.C.Chatterjee	Human Physiology - Vol.-I & II	Medical Allied Agency-Calcutta	1997
2	Gerard J Tortora- Bryan Derrickson	Principles of Anatomy and Physiology	Wiley-USA	2014
3	Cinnamon Van Putte	Seeley's Fundamentals of Human Anatomy and Physiology	Tata Mc GrawHill-New Delhi	2009

### WEBSITES:

- [www.khanacademy.org](http://www.khanacademy.org)
- [www.biologycorner.com](http://www.biologycorner.com)
- [www.gwc.maricopa.edu](http://www.gwc.maricopa.edu)

15PYU111

SEMESTER-I

**HUMAN ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION  
LABORATORY – I****3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- 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.
- It also helps in understanding 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.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand the gross morphology, structure and functions of various organs of the human body.
2. Understand the various homeostatic mechanisms and their imbalances
3. Identify the various tissues and organs of different systems of the human body.
4. Perform the hematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time, etc and also record blood pressure, ECG, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of the human body.

**Course content:**

1. Guidelines in laboratory discipline
2. Introduction to microscope
3. The study of common objects
4. Hemocytometry
5. Estimation of Bleeding time
6. Estimation of Clotting Time
7. Determination of RBC
8. Determination of WBC
9. Estimation of hemoglobin content
10. Determination of ESR

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Anne Waugh and Allison Grant	Ross and Wilson Anatomy and Physiology in Health and illness	Churchill Livingstone Elsevier-UK	2013

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.C.Chattterjee	Human Physiology - Vol.-I & I I	Medical Allied Agency-Calcutta	1997
2	Gerard J Tortora- Bryan Derrickson	Principles of Anatomy and Physiology	Wiley-USA	2014
3	Cinnamon Van Putte	Seeley's Fundamentals of Human Anatomy and Physiology	Tata Mc GrawHill-New Delhi	2009

**WEBSITES:**

- [www.khanacademy.org](http://www.khanacademy.org)
- [www.biologycorner.com](http://www.biologycorner.com)
- [www.gwc.maricopa.edu](http://www.gwc.maricopa.edu)

15PYU102

SEMESTER-I

**PHARMACEUTICAL INORGANIC CHEMISTRY –I****3H****3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- Study about various role of inorganic compounds which having medicinal use.
- This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs.
- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- This subject deals with general methods of preparation and reactions of some organic compounds.
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.
2. Understand the medicinal and pharmaceutical importance of the inorganic compounds.
3. Write the molecular formula and balance chemical equations and understand the development of periodic table.
4. Understand the importance of quality control.
5. Discuss the nuclear reactions and radioactivity.
6. Elaborate the importance of topical agents.

**Course Content:****UNIT – I**

**Learning symbols and valency of elements** –Writing molecular formula- balancing the equation Pharmacopoeia and monograph - Development of periodic table of the modern concept of atomic structure and its importance.

**UNIT – II**

**Importance of quality control** - sources and types of impurities in pharmaceutical substances - Test for purity – Swelling power in bentonite- acid is replacing capacity of antacid- presence of iodates and ferric ion - Limit test – Definition – importance- general procedure for limit test for chloride – sulphate – iron – arsenic - heavy metals and lead - Modified limit test for chloride and

sulphate in potassium permanganate- sodium bicarbonate and sodium salicylate - Modified limit test for chlorinated compounds in sodium benzoate.

### UNIT – III

**Nuclear reactions –radioactivity**–nomenclature – units- detection and measurement of radioactivity- clinical applications and dosage – hazards- precautions and storage- biological effects of radiation - Radio pharmaceutical preparations and standards of radioactive material such as  $^{131}\text{I}$  Iodine- $^{58}\text{Co}$  Cobalt - Radio opaque contrast medium-barium sulfates.

*Method of preparation- assay- identification test-test for purity- storage conditions- official preparations and uses of inorganic compounds in the following categories:*

### UNIT – IV

**Gastrointestinal agents and related compounds** -Acidifiers - Dilute hydrochloric acid – Sodium phosphate – Ammonium chloride - Antacids –Classification- qualities of ideal antacid- side effects – advantages- combination therapy-acid neutralizing capacity-sodium bicarbonate-potassium citrate-aluminium hydroxide gel- dried aluminium hydroxide gel-aluminium phosphate-magnesium hydroxide-light and heavy magnesium trisilicate-lightandheavymagnesiumcarbonate-calciumcarbonate-magaldrate and bismuth carbonate -Adsorbents and protectives - Light kaolin-heavy kaolin and bismuth sub-carbonate –Saline cathartics - Magnesium hydroxide-magnesium sulphate-magnesium carbonate and Sodium phosphate.

### UNIT – V

**Topical Agents** - Protective - Talc-zinc oxide-calamine-zinc stearate-titanium dioxide – kaolin-silicon polymers and Dimethicone - Astringents - Alum- zinc sulfate and zinc chloride - Antimicrobials –Hydrogen peroxide-potassium permanganate-chlorinated lime-iodine-boric acid-silver nitrate-sodium stilbo gluconate –povidone – iodine-selenium sulfide and zinc undecenoate.

### TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	V.N Rajasekaran	Text Book of pharmaceutical Inorganic Chemistry	Sun Publications	2005

### REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dr.B.G.Nagavi	Pharmaceutical Inorganic chemistry	S.Chand	2007
2	Surendra N. Pandeya	A text book Inorganic medicinal chemistry	Sg Publisher	2011

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3	Anand & Chatwal	Inorganic Pharmaceutical Chemistry	Himalaya Pub. House	2010
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	1996

**WEBSITES:**

- [www.slideshare.com](http://www.slideshare.com)
- [www.ucdavis.com](http://www.ucdavis.com)
- [www.chem.tamu.edu](http://www.chem.tamu.edu)

15PYU112

SEMESTER-I

**PHARMACEUTICAL INORGANIC CHEMISTRY LABORATORY-I 3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100  
External Semester Exam: 3 Hours**Course Objectives:**

- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- Study about various role of inorganic compounds which having medicinal use.
- This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs.
- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- This subject deals with general methods of preparation and reactions of some organic compounds.
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
2. Understand the medicinal and pharmaceutical importance of the inorganic compounds
3. Write the molecular formula and balance chemical equations and understand the development of periodic table.
4. Understand the importance of quality control.
5. Discuss the nuclear reactions and radioactivity.
6. Elaborate the importance of topical agents.

**Course Content:**

Limit test for Chloride

1. Limit test for Sulphate
2. Limit test for Iron
3. Preparation of Barium sulphate
4. Preparation of Magnesium sulphate
5. Preparation of Boric acid
6. Test for acid neutralizing capacity of Aluminium hydroxide gel
7. Test for adsorption power in heavy kaolin
8. Systematic qualitative analysis for unknown inorganic mixture (four experiments)

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	V.N Rajasekaran	Text Book of pharmaceutical Inorganic Chemistry	Sun Publications	2005



**REFERENCES:**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	1996

**WEBSITES:**

- [www.slideshare.com](http://www.slideshare.com)
- [www.ucdavis.com](http://www.ucdavis.com)
- [www.chem.tamu.edu](http://www.chem.tamu.edu)

15PYU103

SEMESTER-I

**PHARMACEUTICAL ORGANIC CHEMISTRY –I****3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry.
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds.
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

**Course Outcomes (CO's):**

On successful completion of the course the student will Explain molecular orbital theory.

1. Understand the strain theories.
2. Describe effect of substituents on the reaction.
3. Elaborate the different mechanisms of reaction.
4. Account for the structure, stability, orientation, reaction and its mechanism of Benzene.
5. Explain different Reaction Intermediates & their application in reaction mechanism.
6. How to name the organic compounds?
7. Explain different reaction involve in the formation of aromatic compounds.

**Course Content:****UNIT – I**

**Molecular orbital theory-** wave equations- molecular orbitals – bonding- anti-bonding orbitals- unshared pair of electrons and hybrid orbitals -Intra-molecular and inter-molecular forces- their effect on solubility-boiling point-melting point-covalent bond-polarity of bond-polarity of molecule-dipole moment- bond dissociation energy- energy of activation- solubility of ionic solutes and non ionic solutes.

**UNIT – II**

**Inductive effect- electromeric effect- mesomeric effect-resonance effect –resonance – tautomerism–conjugation –hyper conjugation-types of bond fission- electrophiles and nucleophiles – IUPAC nomenclature of organic compounds.**

**UNIT – III**

**Mechanism of halogenations of alkanes-**  $sp^3$  Hybridization in alkanes- stabilities of alkenes- $sp^2$  Hybridization in alkenes-thermodynamics and kinetics of their actions of methane with a halogen-

Saytzeff's rule-free radical and electrophilic addition on C=C bond- Markownikoff's rule-Peroxide effect – Ozonolysis – mechanism of Diel's - Alder reaction and addition reaction of conjugated dienes.

#### UNIT – IV

**Bayer's strain theory**-Limitations of Bayer's strain theory- Coulson and Moffitt's modification- Sachse Mohr's theory ( Theory of strainless rings).

#### UNIT – V

**Derivation of structure of benzene**-Kekule structure- heat of hydrogenation and stability- C-C bond length in benzene-Resonance structure of benzene-orbital picture-aromatic character-Huckel's rule-Mechanism of electrophilic and nucleophilic aromatic substitution –reaction –Theory of effect of substituent on reactivity and orientation- Preparation and reactions of benzene including Friedel crafts alkylation and acylation.

#### TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Arun Bahl and B.S Bhal	Advanced Organic Chemistry	S. Chand	2012

#### REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	E.I. Elliel.	Stereo Chemistry of Organic Compounds	Wiley Eds	1988
2	Cramand Hammered	Organic chemistry	Pine Hendrickson	2005
3	Jerry March	Advanced Organic Chemistry: Reactions, Mechanisms, and Structure	Wiley: New York, NY	1992

#### WEBSITES:

- [www.pdfbit.com](http://www.pdfbit.com)
- [www.chem.ucla.edu](http://www.chem.ucla.edu)
- [www.chemistrylectures.com](http://www.chemistrylectures.com)

15PYU113

SEMESTER-I

PHARMACEUTICAL ORGANIC CHEMISTRY LABORATORY-I

3H

3C

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Explain molecular orbital theory.
2. Understand the strain theories.
3. Describe effect of substituents on the reaction.
4. Elaborate the different mechanisms of reaction.
5. Account for the structure, stability, orientation, reaction and its mechanism of Benzene.
6. Explain different Reaction Intermediates & their application in reaction mechanism.
7. How to name the organic compounds.
8. Explain different reaction involve in the formation of aromatic compounds.

**Course Content:**

1. Preparation of Salicyclic acid
2. Preparation of Benzamide
3. Preparation of Iodoform
4. Preparation of Phenyl Benzoate
5. Preparation of Dibenzilidene acetone
6. Assay of organic compounds involving acidimetry, alkalimetry (at least 02).
7. Melting point of any synthesized compound
8. Stereo models
9. Systematic qualitative analysis of organic compounds including preparation of derivative (not less than 4 compounds with different functional groups).

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Arthur I Vogel	Practical Organic Chemistry by vogel	Dorling Kindersley	2008

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	E.I. Eliel.	Stereo Chemistry of Organic Compounds	Wiley Eds	1988
2	Cramand Hammered	Organic chemistry	Pine Hendrickson	2005
3	Jerry March	Advanced Organic Chemistry: Reactions, Mechanisms, and Structure	Wiley: New York, NY	1992

**WEBSITES:**

- [www.pdfbit.com](http://www.pdfbit.com)
- [www.chem.ucla.edu](http://www.chem.ucla.edu)
- [www.chemistrylectures.com](http://www.chemistrylectures.com)

**15PYU104****SEMESTER-I****PHARMACOGNOSY AND PHYTO CHEMISTRY –I****3H****3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- To learn and understand the cultivation and production of crude drugs and their usefulness.
- This subject has been introduced for the pharmacy course in order to make the student aware of medicinal uses of various naturally occurring drugs its history, sources, distribution, method of cultivation, active constituents, medicinal uses, identification tests, preservation methods, substitutes and adulterants.
- The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.
- Know the techniques in the cultivation and production of crude drugs.
- To know the crude drugs, their uses and chemical nature.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand basic concepts of Pharmacognosy and their usefulness.
2. Know the History, Present status, Future scope, Development of Pharmacognosy.
3. Understand the classification of crude drugs.
4. Demonstrate the principles and advances in the cultivation and production of drugs.
5. Understand the Different methods of adulteration of crude drugs and evaluation methods.
6. Explain the detailed study of crude drugs like source, cultivation, collection, preparation, storage, diagnostic characters (Macroscopic & Microscopic techniques applied) constituents, chemical tests, substitutes, adulterants & uses.

**Course Content:****UNIT – I**

Definition-History-Present status-Future scope-Development of Pharmacognosy.

**UNIT – II**

Alphabetical –Biological –Chemical –Pharmacological –Taxonomical- Chemotaxonomical and Serotaxonomical classification of crude drugs.

**UNIT – III**

**General principles of cultivation & collection of vegetable drugs** of commercial - Significance from wild & cultivated source-Advantage and disadvantages of cultivation-Soil and soil fertility-Factors influencing cultivation of medicinal plants –Processing – storage-and preservation of crude drugs-Study of natural pesticides.

**UNIT – IV**

Different methods of **adulteration of crude drugs** & their detection by evaluation methods – Introduction – morphological – Microscopical – physical – chemical- biological and spectral analysis of herbal drugs.

**UNIT – V**

**Detailed study of crude drugs** with emphasis on source- cultivation- collection- preparation-storage- diagnostic characters (Macroscopic & Microscopic techniques applied) – constituents-chemical tests– substitutes- adulterants & uses of: **Carbohydrates** and their derived products: Agar- Gum Acacia- Gum tragacanth – Honey – Isapgol – pectin – Starch-Tannins: Gambier- Black Catechu – Gall –Myrobalan- Pale catechu and Tannic acid –**Lipids** -Castor oil- Shark liver oil- Wool fat – Beeswax-Neem oil- Cod liver oil and Bran oil –Proteins –Gelatin -Spirullina and soya -**Volatile oils** Mentha – Coriander – Cinnamon – Cassia – Caraway – Dill – Clove – Fennel – Nutmeg – Cardamom- Lemon grass oil – Eucalyptus – Sandalwood- Palmarosa and Citronella–**Saponins** – Liquorice – Ginseng – Dioscorea -**Cardio active sterols** – Digitalis-Squill and Strophanthus – **Steroid**al -Kurchi- Solasodine -**Alkaloidal amines** -Ephedra and Colchicum –**Glycoalkaloids** – Solanum species.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kokate C.K- Purohit A.P- Gokhale S.B	Text book of Pharmacognosy	Niraliprakashan	2008

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Trease and Evans	Pharmacognosy	W.B Sauders	2002
2	James Robbers- Marilyn K. Speedice and Varro E.- Tyler	Pharmacognosy and Pharmaco biotechnology	Williams and Wilkins	1996
3	TE Wallis	Textbook of Pharmacognosy	CBS publishers and Distributors- New Delhi	2005

**WEBSITES:**

- [www.autorstream.com](http://www.autorstream.com)
- [www.e Pharmacognosy.com](http://www.e Pharmacognosy.com)
- [www.science20.com](http://www.science20.com)



**PHARMACOGNOSY AND PHYTO CHEMISTRY LABORATORY –I 3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- To learn and understand the cultivation and production of crude drugs and their usefulness.
- This subject has been introduced for the pharmacy course in order to make the student aware of medicinal uses of various naturally occurring drugs its history, sources, distribution, method of cultivation, active constituents, medicinal uses, identification tests, preservation methods, substitutes and adulterants.
- The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.
- Know the techniques in the cultivation and production of crude drugs.
- To know the crude drugs, their uses and chemical nature.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the name of crude drugs.
2. Identify the crude drugs by morphological characters.
3. Perform the staining, sectioning of crude drugs.
4. Perform the staining and view the powder characters of crude drugs.
5. Demonstrate macroscopical characters for unorganized crude drugs.
6. Demonstrate chemical tests to identify unorganized crude drugs.

**Course Content:**

1. Identification of crude drugs listed in theory (entire condition) by Morphological characters.
2. Microscopical studies of some selected drugs:
  - a. Datura – Digitalis – Cinnamon – Clove – Ephedra – Liquorice – Fennel- Coriander.
3. Microscopical studies of some selected powdered drugs of single component or mixture of two components:
  - a. Datura –Cinnamon – Digitalis –Ipecac – Clove – Fennel- Coriander.
4. Identification of unorganized drugs by Morphological characters and chemical tests.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.B.Gokale and C.K kokate	Practical Pharmacognosy	Vallabh prakasan	2008

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Khandelwal KR	Practical pharmacognosy	Niraliprakasan	2005

**WEBSITES:**

- [www.autorstream.com](http://www.autorstream.com)
- [www.e pharmacognosy.com](http://www.e pharmacognosy.com)
- [www.science20.com](http://www.science20.com)

15PYU105

SEMESTER-I

**BIOSTATISTICS & COMPUTER APPLICATIONS-I****3H****3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- To learn and understand the computer basics.
- To learn the statistical method of analysis that can apply in the development and use of therapeutic drug.
- This subject deals with the introduction Database, Database Management system.
- This subject deals with the Computer application in clinical studies and use of databases.
- To switch the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.
- To organize, summarize, and display quantitative data.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Able to organize, summarize, and display quantitative data.
2. Comfortable with statistical methods for calculating summary estimates, measures of variability, and confidence intervals
3. Know the various types of application of computers in pharmacy.
4. Know the various types of data bases.
5. Know the various applications of data bases in pharmacy.
6. Switch the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.

**Course Content:****UNIT – I**

**Application of biostatics in medicine and pharmacy** - collection of data - classification and tabulation of statistical data- diagrammatic and graphical representation - measure of central tendency - Mean – Median- mode – geometric Mean.

**UNIT – II**

**Purpose of sampling-** methods of sampling- test significance-Null hypothesis and alternative hypothesis- standard errors-one tailed test and two tailed test-T test.

**UNIT – III**

**Correlation analysis-** application of correlation analysis- types of correlation-Scatter diagram- karl pearson's correlation coefficient- spearman's rank correlation coefficient.

**UNIT – IV**

**Computer application** - Basic computer components of organization- classification of computers-

binary number system conversion- types of memory device - network topology - types of computer networks- internet search engine- computer input and output device – multimedia- MS office package- advantages and application.

### UNIT – V

**Types of computer software and application** - types of operating systems - statistical software tools- DBMS and RDDMS- data abstraction- E- R diagram concept- Client server process- network layers- HTML web pages.

### TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hunt Nand Shelly J	Computers and common sense	Prentice – Hall of India, New Delhi.	1998

### REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Popst and Perrum	Computer aided drug design	Academic Press, New York	2007
2	Writh	Systematic programming an introduction	Prentice hall Englewood Cliff's New Jersey	2006
3	S.C Gupta	Fudamentals of statistics	Pushpa banarje	2000

### WEBSITES:

- [www.biostat.jhsph.edu](http://www.biostat.jhsph.edu)
- [www.stat.ufl.edu](http://www.stat.ufl.edu)
- [www.uwf.edu](http://www.uwf.edu)

**15PYU115****SEMESTER-I****BIOSTATISTICS & COMPUTER APPLICATIONS LABORATORY-I 3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- To learn and understand the computer basics.
- To learn the statistical method of analysis that can apply in the development and use of therapeutic drug.
- This subject deals with the introduction Database, Database Management system.
- This subject deals with the Computer application in clinical studies and use of databases.
- To switch the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.
- To organize, summarize, and display quantitative data.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Able to organize, summarize, and display quantitative data.
2. Comfortable with statistical methods for calculating summary estimates, measures of variability, and confidence intervals
3. Know the various types of application of computers in pharmacy.
4. Know the various types of data bases.
5. Know the various applications of data bases in pharmacy.
6. Switch the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.

**Course Content:**

1. Computer operating systems like MS DOS etc
2. Simple program in C
3. MS office (MS-Word, MS-Excel, M S- power point).

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Johnathan Lightfoot, chris Beckett	Microsoft office 2010 In simple steps	Kogent learning solutions	2011

**REFERENCES:**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Margret Levine Young	Complete reference internet	Osborne/ McGraw-Hill	2007

**WEBSITES:**

- [www.biostat.jhsph.edu](http://www.biostat.jhsph.edu)
- [www.stat.ufl.edu](http://www.stat.ufl.edu)
- [www.uwf.edu](http://www.uwf.edu)

15PYU201

SEMESTER-II

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**HUMAN ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION-II 3H 3C**

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Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- 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.
- It also helps in understanding 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.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand the gross morphology, structure and functions of various organs of the human body.
2. Understand the various homeostatic mechanisms and their imbalances
3. Identify the various tissues and organs of different systems of the human body.
4. Perform the hematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time, etc and also record blood pressure, ECG, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of the human body.

**Course Content:****UNIT – I**

**Endocrine system-** Basic anatomy and physiology of pituitary – thyroid – parathyroid-adrenal and pancreatic hormones and disorders of these glands.

**UNIT – II**

**Reproductive system-** Structure and functions of male and female reproductive systems -Sex hormones- physiology of menstruation- coitus and fertilization -Spermatogenesis and oogenesis- pregnancy and parturition- oral contraceptives.

**UNIT – III**

**Central Nervous system-** Structure and functions of brain and spinal cord –Functions of cerebrum– cerebellum- vital centers of medulla oblongata- cerebral ventricles- cranial nerves and their functions - Reflex arc- cerebrospinal fluid and its functions- meningitis.

**UNIT – IV**

**Autonomic nervous system** – Anatomy - physiology and divisions of ANS - Motor and sensory pathways.

**UNIT – V**

**Sense organs-** Physiology of vision- audition-olfaction- taste and skin -**Health education and Nutrition-** Concepts of health and disease- Disease causing agents and prevention of disease - Balanced diet-deficiency disorders of various nutrients-their prevention and treatment - **Communicable disease-** The causative agents-modes of transmission and prevention of chicken pox– measles – diphtheria- tuberculosis –malaria – poliomyelitis –filariasis –rabies – tetanus- STD and AIDS - Vaccination schedule - Emergency treatment of shock–snakebite–burns– poisoning- fractures and resuscitation methods -**First Aid.**

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Anne Waugh and Allison Grant	Ross and Wilson Anatomy and Physiology in Health and illness	Churchill Livingstone Elsevier-UK	2013

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.C.Chatterjee	Human Physiology - Vol.–I & II	Medical Allied Agency-Calcutta	1997
2	Gerard J Tortora- Bryan Derrickson	Principles of Anatomy and Physiology	Wiley-USA	2014
3	Cinnamon Van Putte	Seeley's Fundamentals of Human Anatomy and Physiology	Tata Mc GrawHill-New Delhi	2009



**WEBSITES:**

- [www.khanacademy.org](http://www.khanacademy.org)
- [www.biologycorner.com](http://www.biologycorner.com)
- [www.gwc.maricopa.edu](http://www.gwc.maricopa.edu)

15PYU211

SEMESTER-II

**HUMAN ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION  
LABORATORY – II****3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- 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.
- It also helps in understanding 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.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand the gross morphology, structure and functions of various organs of the human body.
2. Understand the various homeostatic mechanisms and their imbalances
3. Identify the various tissues and organs of different systems of the human body.
4. Perform the hematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time, etc and also record blood pressure, ECG, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of the human body.

**Course content**

1. Determination of blood count
2. Determination of differential leukocyte count
3. Recording of systematic arterial blood pressure
4. Determination of heart rate
5. Identification of tissues
6. Identification of bones
7. Experimental models
8. Health education

**TEXT BOOKS:**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Godkar P.B and Godkar D.P	Textbook of Medical Laboratory Technology	Bhalani Publishing House, Mumbai	2007

**REFERENCES:**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Mukherjee, K.L	Medical Laboratory Technology	Tata McGraw Hill Publishing Company Ltd. New Delhi	2010

**WEBSITES:**

- [www.khanacademy.org](http://www.khanacademy.org)
- [www.biologycorner.com](http://www.biologycorner.com)
- [www.gwc.maricopa.edu](http://www.gwc.maricopa.edu)

15PYU202

SEMESTER-II

**PHARMACEUTICAL INORGANIC CHEMISTRY –II****3H****3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- Study about various role of inorganic compounds which having medicinal use.
- This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs.
- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- This subject deals with general methods of preparation and reactions of some organic compounds.
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
2. Understand the medicinal and pharmaceutical importance of the inorganic compounds
3. Write the molecular formula and balance chemical equations and understand the development of periodic table.
4. Understand the importance of quality control.
5. Discuss the nuclear reactions and radioactivity.
6. Elaborate the importance of topical agents.

**Course Content****UNIT-I**

**Anti-caries Agents** - Role of fluorides as anti-caries agents-sodium fluoride –**Dentifrices**-Calcium carbonate - dibasic calcium phosphate-strontium chloride- zincs chloride -**Medicinal Gases** – Oxygen- carbon dioxide – helium- nitrogen and nitrous oxide.

**UNIT -II**

**Major Intra and extra cellular electrolytes**- Physiological role of chloride – phosphate – bicarbonate –sodium– potassium-calcium and magnesium-Electrolytes used for replacement therapy - Sodium chloride-potassium chloride-calcium chloride- calcium gluconate- calcium lactate-di basic calcium phosphate- tri basic calcium phosphate -Physiological acid-base balance and its importance – Electrolytes used in the acid –base therapy –Sodium acetate-potassium acetate-sodium bicarbonate-

potassium bicarbonate-sodium citrate-sodium lactate-ammonium chloride – Electrolyte combination therapy- compound sodium chloride solution- sodium chloride injection and oral rehydration salt.

### UNIT – III

**Essential and Trace ions** – Definition - physiological role of iron - copper – zinc – chromium– manganese – molybdenum – selenium-sulphur and iodine – Ferrous fumarate- ferrous gluconate-ferrous sulphate- iron and ammonium citrate -**Official formulation** –Iron dextran injection- strong iodine solution.

### UNIT – IV

**Pharmaceutical Aids**- Sodium bisulphate- sodium metabisulphite –sulphur dioxide –bentonite-magnesium stearate – zinc stearate- aluminium sulphate- sodium carboxymethyl cellulose-sodium formaldehyde sulfoxylate- purified water- water for injection and sterile water for injection.

### UNIT – V

**Miscellaneous**- Sclerosing agents- Hypertonic saline- sodium tetra decyl sulphate– Expectorants – Potassium citrate and potassium iodide – Sedative – Potassium bromide –Antidotes –Sodium nitrite-sodium thiosulphate and charcoal - Respiratory stimulant - Ammonium carbonate.

### TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	V.N Rajasekaran	Text Book of pharmaceutical Inorganic Chemistry	Sun Publications	2005

### REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dr.B.G.Nagavi	Pharmaceutical Inorganic chemistry	S.Chand	2007
2	Surendra N. Pandeya	A text book Inorganic medicinal chemistry	Sg Publisher	2011
3	Anand & Chatwal	Inorganic Pharmaceutical Chemistry	Himalaya Pub. House	2010
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	1996

**WEBSITES:**

- [www.slideshare.com](http://www.slideshare.com)
- [www.ucdavis.com](http://www.ucdavis.com)
- [www.chem.tamu.edu](http://www.chem.tamu.edu)

15PYU212

SEMESTER-II

**PHARMACEUTICAL INORGANIC CHEMISTRY LABORATORY-I 3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- Study about various role of inorganic compounds which having medicinal use.
- This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs.
- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- This subject deals with general methods of preparation and reactions of some organic compounds.
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
2. Understand the medicinal and pharmaceutical importance of the inorganic compounds
3. Write the molecular formula and balance chemical equations and understand the development of periodic table.
4. Understand the importance of quality control.
5. Discuss the nuclear reactions and radioactivity.
6. Elaborate the importance of topical agents.

**Course Content:**

1. Modified limit test for chloride in  $\text{KMnO}_4$
2. Modified limit test for Sulphate in  $\text{KMnO}_4$
3. Modified limit test for chloride in  $\text{NaHCO}_3$
4. Modified limit test for Sulphate in  $\text{NaHCO}_3$
5. Preparation of Calcium Carbonate
6. Preparation of Zinc Oxide
7. Preparation of Potassium citrate
8. Test for Swelling power of bentonite
9. Test for Presence of iodate in potassium iodide

## 10. Systematic qualitative salt analysis (4 compounds)

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	A. H. Beckett and J. B. Stenlake	Practical Pharmaceutical Chemistry Vol-I & II	Harcourt Brace College Publishers, London	1998

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dr.B.G.Nagavi	Pharmaceutical Inorganic chemistry	S.Chand	2007
2	Surendra N. Pandeya	A text book Inorganic medicinal chemistry	Sg Publisher	2011
3	Anand & Chatwal	Inorganic Pharmaceutical Chemistry	Himalaya Pub. House	2010
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	1996

**WEBSITES:**

- [www.slideshare.com](http://www.slideshare.com)
- [www.ucdavis.com](http://www.ucdavis.com)
- [www.chem.tamu.edu](http://www.chem.tamu.edu)



15PYU203

SEMESTER-II

**PHARMACEUTICAL ORGANIC CHEMISTRY –II****3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

**Course Outcomes:**

On successful completion of the course the student will

1. Emphasize the synthesis, reactions and uses of Polyaromatic compounds and its derivatives.
2. Describe the structure, nomenclature, preparation and reaction of alkyl/aryl halides.
3. Discuss the physical and chemical properties of alcohol, ether, epoxide and amines.
4. Explain the preparation and test for purity and use of organic compounds.
5. Analyze the reactive intermediates in a reaction.
6. How to name the organic compounds.
7. Explain different reaction involve in the formation of aromatic compounds.

**Course Content:****UNIT – I**

**Preparation and properties of polyaromatic compounds**–Naphthalene –anthracene –phenanthrene –phenylmethane- triphenylmethane and diphenylethane –Preparation- test for purity and medicinal uses of dicophane –gammexene – saccharin- methyl salicylate –phenindione – ethyl biscoumacetate –vanillin –urethane –carbromal- amphetamine and acetanilide.

**UNIT – II**

General structure – nomenclature- preparation and reaction mechanism of alkyl and aryl halides - (Mechanism of SN<sub>1</sub>-SN<sub>2</sub>, E1 and E2).

**UNIT – III**

**Alcohols – ethers – epoxides- amines** (basicity of amines- influence of substituent on basic property) –aldehydes- ketones- carboxylic acids and functional derivatives of carboxylic acids.

**UNIT – IV**

**Preparation-test for purity** and medicinal uses of Chloroform–Iodoform–Mephenesin- Citric acid- Lactic acid- Benzoic acid-Sodium lauryl sulphate and Glycol.

**UNIT – V**

**Reactive intermediates-** Carbocations– Carbanions – Carbenes- Free radicals – generation- relative stability- fate and applications - Properties of Alpha ( $\alpha$ ) and Beta ( $\beta$ ) unsaturated carbonyl compounds – Preparation and synthetic utility of aceto-acetic ester-malonic ester- Grignard reagent and diazonium salts.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Arun Bahl and B.S Bhal	Advanced Organic Chemistry	S.Chand	2012

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	E.I. Elliel.	Stereo Chemistry of Organic Compounds	Wiley Eds	1988
2	Cramand Hammered	Organic chemistry	Pine Hendrickson	2005
3	Jerry March	Advanced Organic Chemistry: Reactions, Mechanisms, and Structure	Wiley: New York, NY	1992

**WEBSITES:**

- [www.pdfbit.com](http://www.pdfbit.com)
- [www.chem.ucla.edu](http://www.chem.ucla.edu)
- [www.chemistrylectures.com](http://www.chemistrylectures.com)

15PYU213

SEMESTER-II

PHARMACEUTICAL ORGANIC CHEMISTRY LABORATORY-II

3H

3C

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

**Course Outcomes(CO's):**

On successful completion of the course the student will

1. Determine of melting point and boiling point of organic compounds including mixed melting point technology.
2. Prepare of organic compounds.
3. Systematically qualitative analysis of salt.
4. Account for the structure, stability, orientation, reaction and its mechanism of Benzene.
5. Explain different Reaction Intermediates & their application in reaction mechanism.
6. How to name the organic compounds.
7. Explain different reaction involve in the formation of aromatic compounds.

**Course Content:**

1. Determination of melting point and boiling point of organic compounds including mixed melting point technology (3 compounds)
2. Preparation of organic compounds (5 compounds)
3. Systematic Qualitative Salt analysis (4 compounds)

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Arthur I Vogel	Practical Organic Chemistry by Vogel	Dorling Kindersley	2008

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	E.I. Eliel.	Stereo Chemistry of Organic Compounds	Wiley Eds	1988
2	Cram and Hammond	Organic chemistry	Pine Hendrickson	2005
3	Jerry March	Advanced Organic Chemistry: Reactions, Mechanisms, and Structure	Wiley: New York, NY	1992

**WEBSITES:**

- [www.pdfbit.com](http://www.pdfbit.com)
- [www.chem.ucla.edu](http://www.chem.ucla.edu)
- [www.chemistrylectures.com](http://www.chemistrylectures.com)

15PYU204

SEMESTER-II

**PHARMACOGNOSY AND PHYTO CHEMISTRY –II 3H 3C**

Instruction hours/ week: L: 3 T:0 P:0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- To learn and understand the cultivation and production of crude drugs and their usefulness.
- This subject has been introduced for the pharmacy course in order to make the student aware of medicinal uses of various naturally occurring drugs its history, sources, distribution, method of cultivation, active constituents, medicinal uses, identification tests, preservation methods, substitutes and adulterants.
- The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.
- Know the techniques in the cultivation and production of crude drugs.
- To know the crude drugs, their uses and chemical nature.

**Course Outcomes (CO's) :**

On successful completion of the course the student will

1. Explain the detailed study of crude drugs like source, cultivation, collection, preparation, storage, diagnostic characters (Macroscopic & Microscopic techniques) constituents, chemical tests, substitutes, adulterants & uses.
2. Understand the drugs coming under alkaloids and terpenoids.
3. Know the Tumor inhibitors.
4. Explain the Anti-hepatotoxic and oral hypoglycemic agents.
5. Understand Plant fibers used as surgical dressing.
6. Explain the Pharmaceutical aids.

**Course Content:****UNIT – I**

**Detailed study of crude drugs** with emphasis on source – cultivation – collection – preparation – storage- diagnostic characters (Macroscopic & Microscopic techniques applicable) – constituents- chemical tests – substitutes- adulterants & uses of- **Anthraquinone cathartics** –Aloes –Senna- Rhubarb and Cascara -**Pyridine and Piperidine alkaloids** – Areca and Lobelia - **Tropane alkaloids** – Belladonna –Hyoscyamus –Datura –Cocoa -**Quinoline and Isoquinoline alkaloids** –Cinchona- Ipecac and Opium **Indole alkaloids** –Ergot –Rauwolfia –Nuxvomica –Physostigmine –**Imidazole** -Pilocarpus.

**UNIT – II**

**Purines** -Tea-Coffee –**Resins** –Colophony –Cannabis –Capsicum- Balsam of Tolu – Benzoin-Balsam of Peru –Asafoetida- Turmeric and Ginger –**Quinazolidine alkaloids** –Adathoda **Terpenes** -Neem-Artemesia.**Others** –Gentian- Saffron –Ashwagandha.

**UNIT – III**

**Tumor inhibitors** –Taxol- Vinca and Podophyllum.

**UNIT – IV**

**Anti-hepatotoxic and oral hypoglycemic agents** Phyllanthus niruri- Eclipta Alba-Gymnema sylvestre.

**UNIT – V**

**Plant fibers used as surgical dressing** –Cotton – Silk – Wool – Nylon – Rayon- Alginate dressing- Gelatin Sponge- Oxidized cellulose - Sutures and ligatures - **Pharmaceutical aid** - Talc- Kaolin- Bentonite and Natural colours.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kokate C.K- Purohit A.P- Gokhale S.B	Text book of Pharmacognosy	Niraliprakashan	2008

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Trease and Evans	Pharmacognosy	W.B Sauders	2002
2	James Robbers- Marilyn K. Speedice and Varro E.- Tyler	Pharmacognosy and Pharma cobiotechnology	Williams and Wilkins	1996
3	TE Wallis	Textbook of Pharmacognosy	CBS publishers and Distributors- New Delhi	2005

**WEBSITES:**

- [www.autorstream.com](http://www.autorstream.com)
- [www.e Pharmacognosy.com](http://www.e Pharmacognosy.com)
- [www.science20.com](http://www.science20.com)

15PYU214

SEMESTER-II

**PHARMACOGNOSY AND PHYTO CHEMISTRY LABORATORY-II 3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- To learn and understand the cultivation and production of crude drugs and their usefulness.
- This subject has been introduced for the pharmacy course in order to make the student aware of medicinal uses of various naturally occurring drugs its history, sources, distribution, method of cultivation, active constituents, medicinal uses, identification tests, preservation methods, substitutes and adulterants.
- The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.
- Know the techniques in the cultivation and production of crude drugs.
- To know the crude drugs, their uses and chemical nature.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Perform the staining, sectioning of crude drugs
2. Perform the staining and view the powder characters of crude drugs.
3. Demonstrate the microscopical measurements of cells and cell contents.
4. Perform the leaf constants.
5. Demonstrate Lycopodium spore method.
6. Perform chemical tests to identify pharmaceutically important Phytoconstituents.

**Course Content:**

1. Microscopical studies of some selected drugs:  
Senna –Vinca – Cinchona –Nuxvomica –Ephedra –Rauwolfia –Ipecac –Ginger –Neem-  
Phyllanthus
2. Microscopical studies of some selected powdered drugs of single component or mixture of two components:  
Cinchona- Senna–Rauwolfia –Ipecac –Nuxvomica –Rhubarb –Neem –Phyllanthus- Ginger
3. Quantitative microscopy:
  - ❖ Microscopical measurements of cells and cell contents: Starch grains, calcium oxalate crystals and phloem fibres.



- ❖ Determination of leaf constants i.e., stomatal index, stomatal number, vein islet number, vein termination number and palisade ratio.
- ❖ Lycopodium spore method.

4. To do simple chemical tests to identify the pharmaceutically important phytoconstituents based on the theory.

#### TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.B.Gokale and C.K kokate	Practical Pharmacognosy	Vallabh prakasan	2008

#### REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Trease and Evans	Pharmacognosy	W.B Sauders	2002
2	James Robbers-Marilyn K. Speedice and Varro E.- Tyler	Pharmacognosy and Pharmacobotechnology	Williams and Wilkins	1996
3	TE Wallis	Textbook of Pharmacognosy	CBS publishers and Distributors-New Delhi	2005

#### WEBSITES:

- [www.autorstream.com](http://www.autorstream.com)
- [www.e Pharmacognosy.com](http://www.e Pharmacognosy.com)
- [www.science20.com](http://www.science20.com)

15PYU205

SEMESTER-II

**BIostatISTICS & COMPUTER APPLICATIONS-II****3H****3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- To learn and understand the computer basics.
- To learn the statistical method of analysis that can apply in the development and use of therapeutic drug.
- This subject deals with the introduction Database, Database Management system.
- This subject deals with the Computer application in clinical studies and use of databases.
- To switch the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.
- To organize, summarize, and display quantitative data.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Able to organize, summarize, and display quantitative data.
2. Comfortable with statistical methods for calculating summary estimates, measures of variability, and confidence intervals
3. Know the various types of application of computers in pharmacy.
4. Know the various types of data bases.
5. Know the various applications of data bases in pharmacy.
6. Swith the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.

**Course Content:****UNIT – I****Biostatistics** – Dispersion - Theory of sampling -Statistical inference.**UNIT – II**

Regression and correlation -Probabilities.

**UNIT – III****Computer Packages-** MS Office -MS Word-MS Excel MS Power Point - Advantages and use.**UNIT – IV****Introduction to Computer Networks** – Definition - LAN- WAN – Advantages – Internet-Worldwide Web.

**UNIT – V**

**Computer Graphics** – Definition – display devices – graphical input and output devices – multimedia–definition and application.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hunt Nand Shelly J	Computers and common sense	Prentice – Hall of India, New Delhi.	1998

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Popst and Perrum	Computer aided drug design	Academic Press, New York	2007
2	Writh	Systematic programming an introduction	Prentice hall Englewood Cliff's New Jersey	2006
3	S.C Gupta	Fudamentals of statistics	Pushpa banarje	2000

**WEBSITES:**

- [www.biostat.jhsph.edu](http://www.biostat.jhsph.edu)
- [www.stat.ufl.edu](http://www.stat.ufl.edu)
- [www.uwf.edu](http://www.uwf.edu)

15PYU215

SEMESTER-II

**BIOSTATISTICS & COMPUTER APPLICATIONS LABORATORY-I 3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100  
External Semester Exam: 3 Hours**Course Objectives:**

- To learn and understand the computer basics.
- To learn the statistical method of analysis that can apply in the development and use of therapeutic drug.
- This subject deals with the introduction Database, Database Management system.
- This subject deals with the Computer application in clinical studies and use of databases.
- To switch the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.
- To organize, summarize, and display quantitative data.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Able to organize, summarize, and display quantitative data.
2. Comfortable with statistical methods for calculating summary estimates, measures of variability, and confidence intervals
3. Know the various types of application of computers in pharmacy.
4. Know the various types of data bases.
5. Know the various applications of data bases in pharmacy.
6. With the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.

**Course Content:**

1. Computer operating systems like MS DOS, etc.
2. Simple program in C.
3. MS Office (MS-Word, MS-Excel, MS-Access, MS-Powerpoint).

**TEXT BOOKS:**

S.No	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Johnathan Lightfoot, chris Beckett	Microsoft office 2010 In simple steps	Kogent learning solutions	2011

**REFERENCES:**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Popst and Perrum	Computer aided drug design	Academic Press, New York	2007
2	Writh	Systematic programming an introduction	Prentice hall Englewood Cliff's New Jersey	2006
3	S.C Gupta	Fudamentals of statistics	Pushpa banarje	2000

**WEBSITES:**

- [www.biostat.jhsph.edu](http://www.biostat.jhsph.edu)
- [www.stat.ufl.edu](http://www.stat.ufl.edu)
- [www.uwf.edu](http://www.uwf.edu)

15PYU301

SEMESTER-III

**PHYSICAL PHARMACEUTICS-I****3H****3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Physical pharmaceutics is a fundamental course that leads to proper understanding of subsequent courses in Pharmaceutics.
- It integrates knowledge of mathematics, physics and chemistry and applies them to the pharmaceutical dosage form development.
- It focuses on the theories behind the phenomena needed for dosage form design.
- Enables the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions, etc.
- The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations.
- Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Exploit the historical background of pharmacy industry.
2. Recognize about various Pharmacopoeias like IP, BP, USP
3. Acquire the basics of physical pharmaceutics.
4. Interpret about diffusion, dissolution and particle properties.
5. Demonstrate the applications of micromeritics in pharmaceutical industry.
6. Enable the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions.

**Course Content:****UNIT-I**

**Historical back ground and development of profession of pharmacy** industry and organization - Pharmacy as a career – Pharmacopoeias - Introduction to IP – BP - USP and extra pharmacopoeia - Salient features of Indian Pharmacopoeia.

**UNIT-II**

**Diffusion** – definition – Fick's law - steady state diffusion – principles of diffusion involved in biological systems - **Dissolution** – definition – rate of dissolution – theories of dissolution - factors affecting rate of dissolution - Noyes Whitney equation.

**UNIT-III**

**Colloids**– definition – types of colloids – preparation of colloids – purification - dialysis – electrodialysis – ultrafiltration – stabilization of colloids – solubilization – optical properties – electrical properties –kinetic properties.

**UNIT-IV**

**Coarse dispersion**– definition - **Suspension** – definition – preparation – settling of suspension – physical stability – evaluation of suspension - **Emulsion** – definition – types of emulsion – theories involved –instabilities of emulsion – microemulsion – multiple emulsions.

**UNIT-V**

**Micromeritics**– definition – particle shape and size distribution – methods of determining particle size – microscopic method –sieve method – sedimentation technique – particle volume measurement – coulter counter method - shape - surface area and derived properties of powders.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Manavalan and Ramasamy	Physical Pharmaceutics	Pharmamed Press	2015
2.	S.P.Agarwal and Rajesh Khanna	Physical Pharmacy	CBS Publishers	2015

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	H.C. Ansel	Pharmaceutical Dosage form and Drug delivery system	New Delhi	2000
2	Lachmann	Theory and practice of Industrial pharmacy	Churchill Livingston	2002
3	M.E. Aulton	Pharmaceutics- The Science & Dosage Form Design	Churchill Livingstone	2001
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007
5	Remington	Science and Practice of Pharmacy	Philadelphia	2005
6	Carter S.J	Cooper and Gunn's- Dispensing for Pharmaceutical students	CBS publishers	2000

**WEBSITES:**

- [www.picscheme.org](http://www.picscheme.org)
- [www.ijper.org](http://www.ijper.org)
- [www.pharmpress.org](http://www.pharmpress.org)



15PYU311

SEMESTER-III

PHYSICAL PHARMACEUTICS LABORATORY- I

3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Physical pharmaceutics is a fundamental course that leads to proper understanding of subsequent courses in Pharmaceutics.
- It integrates knowledge of mathematics, physics and chemistry and applies them to the pharmaceutical dosage form development.
- It focuses on the theories behind the phenomena needed for dosage form design.
- Enables the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions, etc.
- The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations.
- Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand the physicochemical parameters of a drug
2. Identify methods to enhance solubility of a new drug moiety
3. Discover the importance of stability in pharmaceutical preparations
4. Demonstrate the powder properties and effect of Glidants in powder flow
5. Interpret about diffusion, dissolution and particle properties.
6. Demonstrate the applications of micromeritics in pharmaceutical industry
7. Enable the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions

**Course content:**

1. Determination of particle size and particle size distribution using microscope.
2. Determination of particle size distribution using sieve method.
3. Determination of powder properties,
  - a) Density
  - b) Porosity
4. Determination of powder properties,
  - a) Compressibility
  - b) Angle of repose
5. Determination of effect of glidants or lubricants on angle of repose.
6. Preparation of emulsion.
7. Determination of globule size of emulsions

8. Preparation of various types of suspensions
9. Determination of suspension sedimentation parameters.
10. Experiment on preparation of colloids.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.V.S.Subram anyam- J. Thimmasettee	Laboratory manual of physical pharmaceutics	CVS	2001
2	C.Vijayaragha van	A Practical Handbook Of Physical Pharmaceutics	New Century Book House	2008

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Eugene-Parott	Experimental pharmaceutics	New Delhi	2000
2	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007

**WEBSITES:**

- [www.picscheme.org](http://www.picscheme.org)
- [www.ijper.org](http://www.ijper.org)
- [www.pharmpress.org](http://www.pharmpress.org)

15PYU302

SEMESTER-III

**ADVANCED PHARMACEUTICAL ORGANIC CHEMISTRY-I****4H****4C**

Instruction hours/ week: L: 3 T: 1 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

**Course Outcomes:**

On successful completion of the course the student will

1. Write the structure, name, type of isomerism of the organic compound.
2. Write the reaction, name the reaction and understand orientation of reactions.
3. Understand the stereo chemical aspects of organic compounds and reactions
4. Account for the stability/reactivity/orientation
5. Emphasize the synthesis, reactions and uses of Heterocyclic compounds
6. Know aspects of organic compounds and reactions.

**Course Content:****UNIT I**

**Polynuclear hydrocarbons** –Synthesis - reactions and medicinal uses of following derivatives  
Naphthalene – Phenanthrene - Anthracene - Diphenylmethane and Triphenylmethane.

**UNIT II**

**Reactions of synthetic importance:** Catalytic hydrogenation - metal hydride reduction - Clemmensen reduction - MeerweinPonndorfVerley reduction - Birch reduction - Wolff kishner reduction.

**UNIT III**

**Study of name reaction with its mechanism:** Beckmanns rearrangement, Claisen-Schmidt Condensation- Oppenauer-oxidation- Dakin reaction- cannizaro reaction- crossed cannizaro reaction- Aldol condensation.

#### UNIT IV

**Detailed Study of Heterocyclic Compounds Including Its Synthesis and Medicinal Uses -** Classification and nomenclature of Heterocyclic compounds- Pyrrole- Furan- Thiophene - Relative aromaticity, reactivity, Basicity of pyrrole- Pyrazole- Imidazole- Oxazole- Thiazole.

#### UNIT V

**Detailed Study of Heterocyclic Compounds Including Its Synthesis and Medicinal Uses -** Pyridine and its basicity- Quinoline- Isoquinoline- Acridine- Indole- phenothiazine- azepines and Diazepines- Pyrimidine- Purine.

#### TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Morrison and Boyd	Organic Chemistry	Prentice Hall	1992

#### REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	I.L. Finar	Organic Chemistry by Vol. I & II	Pearson	1956
2	ArunBahl and B.SBhal	Advanced Organic Chemistry	S.Chand	2012
3	Jerry March	Advanced Organic Chemistry: Reactions- Mechanisms- and Structure	Wiley: New York- NY	1992

#### WEBSITES:

- [www.pdfbit.com](http://www.pdfbit.com)
- [www.chem.ucla.edu](http://www.chem.ucla.edu)
- [www.chemistrylectures.com](http://www.chemistrylectures.com)

15PYU312

SEMESTER-III

**ADVANCED PHARMACEUTICAL ORGANIC CHEMISTRY      3H      2C**  
**LABORATORY- I**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100  
External Semester Exam: 3 Hours**Course Objectives:**

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Quantitatively analyze the organic compounds
2. Determine the qualitative parameters of oil.
3. Prepare homocyclic compounds using basic reactions.
4. Write the structure, name, type of isomerism of the organic compound.
5. Write the reaction, name the reaction and understand orientation of reactions.
6. Understand the stereo chemical aspects of organic compounds and reactions

**Course Content:****I. Quantitative determination of following classes of organic compound**

1. Alcohol by acetylation method.
2. Carbonyl compound by hydroxyl amine hydro chloride method.
3. Carboxylic acid by acid base method.
4. Ester by hydrolysis method.

**II. Determination of following oil values**

1. Acid value.
2. Saponification value.

**III. Preparation of homocyclic compounds.**

1. Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol  
/Aniline by acylation reaction. (any two)
- 5- Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction. (any two)

**IV. Preparation of heterocyclic compounds.**

1. Benzimidazole from ortho phenylene diamine.
2. 2,3–diphenyl quinoxaline from benzil

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Morrison and Boyd	Organic Chemistry	Prentice Hall	1992

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	I.L. Finar	Organic Chemistry by Vol. I & II	Pearson	1956
2	ArunBahl and B.SBhal	Advanced Organic Chemistry	S.Chand	2012
3	Jerry March	Advanced Organic Chemistry: Reactions- Mechanisms- and Structure	Wiley: New York- NY	1992

**WEBSITES:**

- [www.pdfbit.com](http://www.pdfbit.com)
- [www.chem.ucla.edu](http://www.chem.ucla.edu)
- [www.chemistrylectures.com](http://www.chemistrylectures.com)

15PYU303

SEMESTER-III

**BIOCHEMISTRY & BIOMOLECULES - I****3H****3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells.
- The scope of the subject is providing biochemical facts and the principles.
- It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.
- To understand metabolism of nutrient molecules in physiological and pathological conditions.
- To understand the mechanism of drug action and fundamental changes occur in diseases.
- Clinical chemistry deals with the study of chemical aspects of human life in health and illness and the application of chemical laboratory methods to diagnosis, control of treatment, and prevention of diseases.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand cell and transport across membrane.
2. Explain the types and importance of biomolecules and bioenergetics
3. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
4. Elaborate the biological oxidation emphasizing electron transport chain and oxidative phosphorylation.
5. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
6. Understand the principles of organ functions tests and their clinical significances.

**Course Content:****UNIT I**

**Introduction to biochemistry** - Cell organelles and its biochemical functions - Transport process across the cell membranes.

**UNIT II**

**Bioenergetics** - Concept of free energy - determination of free energy from equilibrium constant - Redox potential - **Energy rich compounds** – Definition - classification and Production and biological significance of ATP and cyclic AMP.

**UNIT III**

**Enzymes** - Definition – Nomenclature - IUB classification - Properties of enzymes - Factor affecting enzyme activity - Enzyme kinetics (Michaelis plot, Line Weaver Burke plot) - Enzyme inhibitors with examples - Mechanism of enzyme action and theories of enzyme action eg. Allosteric enzymes - Enzyme induction and repression- Isoenzymes and their diagnostic applications - Therapeutic and diagnostic applications of enzymes - Coenzymes –Structure and biochemical role.

**UNIT IV**

**Biological oxidation** - Enzymes and co-enzymes involved in Biological oxidation - Electron transport chain (its mechanism and role) - Oxidative phosphorylation (its mechanism) and substrate level phosphorylation - Inhibitors ETC and Uncouplers or inhibition of oxidative phosphorylation.

**UNIT V**

**Carbohydrate metabolism**–Definition – classification - chemistry and biological role of carbohydrates - Glycolysis – energetics and significance - Citric acid cycle – energetic - amphibolic nature -anaplerosis and significance - HMP shunt and its significance - Glycogen metabolism (Glycogenolysis and glycogenesis) and its regulation - Gluconeogenesis and its significance - Various shuttle systems and its significance - glycerol – phosphate & malate –aspartate -Uronic acid pathway and its significance - Hormonal regulation of carbohydrate metabolism - Disorders of Carbohydrate metabolism - Diabetes mellitus - glycogen storage diseases.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	D. Satyanarayan and U.Chakrapani	Biochemistry	Elsevier Health Sciences	2013

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Robert K. Murry, Daryl K. Granner and Victor W. Rodwell	Harper's Biochemistry	McGraw-Hill Medical	2006



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2	Stryer	Biochemistry	Pine Hendrickson	2005
3	Deb	Textbook of Biochemistry	Wiley: New York, NY	1992

**WEBSITES:**

- [biochemistryquestions.wordpress.com](http://biochemistryquestions.wordpress.com)
- [www.mbmb.siu.edu](http://www.mbmb.siu.edu)
- [www.medicalbiochemistry.org](http://www.medicalbiochemistry.org)

15PYU313

SEMESTER-III

**BIOCHEMISTRY & BIOMOLECULES LABORATORY– I      3H      3C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells.
- The scope of the subject is providing biochemical facts and the principles.
- It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.
- To understand metabolism of nutrient molecules in physiological and pathological conditions.
- To understand the mechanism of drug action and fundamental changes occur in diseases.
- Clinical chemistry deals with the study of chemical aspects of human life in health and illness and the application of chemical laboratory methods to diagnosis, control of treatment, and prevention of diseases.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Explain molecular orbital theory.
2. Understand the strain theories.
3. Describe effect of substituents on the reaction.
4. Qualitatively analyze the biomolecules.
5. Quantitatively analyze biochemical parameters and their importance in diagnosis of disease.
6. Qualitatively analyze the urine for normal and abnormal constituents.

**Course Content:**

1. Qualitative analysis of carbohydrates
2. Qualitative analysis of Proteins
3. Determination of Serum Glutamate Oxaloacetate Transaminase
4. Determination of Serum Glutamate Pyruvate Transaminase
5. Determination of blood and urine sugar to assess metabolic function

6. Determination of serum calcium
7. Qualitative analysis of urine for normal constituents
8. Qualitative analysis of urine for abnormal constituents
9. Determination of serum total proteins
10. Determination of blood Creatinine
11. Determination of urine Creatinine
12. Determination of blood urea

**TEXT BOOKS:**

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	R.C. Gupta and S. Bhargavan	Practical Biochemistry	CBS Publishers & Distributors Pvt. Ltd	2010

**REFERENCES:**

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Pattabiraman and Sitaram Acharya	Laboratory manual of Biochemistry	AITBS Publishers	1994

**WEBSITES:**

- [biochemistryquestions.wordpress.com](http://biochemistryquestions.wordpress.com)
- [www.mbmb.siu.edu](http://www.mbmb.siu.edu)
- [www.medicalbiochemistry.org](http://www.medicalbiochemistry.org)

15PYU304

SEMESTER-III

**TITRIMETRIC METHODS OF PHARMACEUTICAL ANALYSIS      3H      3C**

Instruction hours/ week: L: 3 T: 0 P:0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Titrimetric analysis deals with complete understanding of the various titration methods.
- The scope of the present course is to know the quality, quantity and purity of pharmaceutical products and chemicals.
- Know and understand the various apparatus used in pharmaceutical analysis and their calibrations.
- This course mainly deals with fundamentals of Analytical chemistry and also the study of inorganic pharmaceuticals regarding their monographs and also the course deals with basic knowledge of analysis of various pharmaceuticals.
- Understand the principles and procedures of analysis of drugs and also regarding the application of inorganic pharmaceuticals.
- Know the analysis of the inorganic pharmaceuticals their applications.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. To know the quality control and their importance
2. To know the apparatus used in analysis
3. To know the calibration of volumetric apparatus
4. To know the different types of titrations like neutralization, non- aqueous, complexometric, gravimetric, precipitation and reduction oxidation titrations.
5. To know the concept of titrations
6. To know indicators used in various titration methods.

**Course Content:****UNIT- I**

**Introduction** - Importance of quality control- computation of analytical results- significant figure- concept of error – precision – accuracy- standard deviation- normal distribution curve- calibration of volumetric apparatus- titration - concepts and different types of titration.

**UNIT- II**

**Acid-base titrations** - Acid-base concepts, Henderson–Hasselbalch equation, theory of indicators, neutralization curves- **Non aqueous titration** -Introduction- Solvents for Non- Aqueous Titrations- Indicators for Non- Aqueous Titrations-Titrations of Weak Base.

**UNIT- III**

**Precipitation titrations** -Principles of precipitation titrations- factors affecting solubility of precipitate- Argentimetric titration including, Mohr's method, Volhard's method, Fajan's method and Gay Lussac method - **Complexometric titration** -principle of complexometric titration- types of titrations-endpoint determination-masking and demasking agents.

**UNIT- IV**

**Oxidation Reduction titrations** - concept of oxidation reduction titrations-redox reactions-theory of redox titrations-Oxidation reduction curves- Iodometry and Iodimetry- Titrations involving ceric ammonium sulphate and potassium permanganate - **Diazotization titration**- principle-application.

**UNIT-V**

**Gravimetric analysis** - Basic concepts - precipitation techniques - various steps involved in gravimetric analysis - **Miscellaneous methods of analysis**- Kjeldahl methods- oxygen flask combustion method-**gasometry**- assay of oxygen, carbon dioxide, nitrous oxide.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Parimoo	Pharmaceutical Analysis	CBS Publisher & Distributors P Ltd;	2012

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	V. Alexysev	Quantitative analysis	University Press of the Pacific	2000
2	Skoog West and James Holler.	Fundamentals of Analytical Chemistry	Cengage Learning India	2013
3	G.H. Jeffery J, Bassett J. Mendham R.C. Denney	Vogel's Textbook of Quantitative Chemical Analysis	John Wiley & Sons Inc	1989

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4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007
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**WEBSITES:**

- [www.jpr.info.com](http://www.jpr.info.com)
- [www.sciencedomain.org](http://www.sciencedomain.org)
- [www.pharmaresearchlibrary.com](http://www.pharmaresearchlibrary.com)

15PYU314

SEMESTER-III

**TITRIMETRIC METHODS OF PHARMACEUTICAL ANALYSIS****LABORATORY – I****3H****2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Titrimetric analysis deals with complete understanding of the various titration methods.
- The scope of the present course is to know the quality, quantity and purity of pharmaceutical products and chemicals.
- Know and understand the various apparatus used in pharmaceutical analysis and their calibrations.
- This course mainly deals with fundamentals of Analytical chemistry and also the study of inorganic pharmaceuticals regarding their monographs and also the course deals with basic knowledge of analysis of various pharmaceuticals.
- Understand the principles and procedures of analysis of drugs and also regarding the application of inorganic pharmaceuticals;
- Know the analysis of the inorganic pharmaceuticals their applications.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand the quality control and their importance
2. Understand the apparatus used in analysis
3. Perform the calibration of volumetric apparatus
4. Describe the different types of titrations like neutralization, non- aqueous, complexometric, gravimetric, precipitation and reduction oxidation titrations.
5. Discuss the concept of titrations
6. Standardize the analytical weights and calibrate volumetric apparatus

**Course Content:**

1. Standardization of analytical weights and calibrating of volumetric apparatus
2. Assay of citric acid by alkalimetry
3. Assay of ammonium chloride by alkalimetry
4. Assay of sodium hydroxide by acidimetry
5. Standardization of perchloric acid

6. Assay of copper sulphate by iodometry
7. Assay of calcium gluconate by complexometry
8. Assay of magnesium sulphate by complexometry
9. Assay of hydrogen peroxide by permanganometry
10. Assay of potassium iodide by potassium iodate titration
11. Assay of ferrous sulphate by ceriometry
12. Assay of silver nitrate by precipitation titration

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	A.H. Beckett and J.B. Stenlake	Practical Pharmaceutical Chemistry	Bloomsbury Academic	2001

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	1996

**WEBSITES:**

- [www.jpr.info.com](http://www.jpr.info.com)
- [www.sciencedomain.org](http://www.sciencedomain.org)
- [www.pharmaresearchlibrary.com](http://www.pharmaresearchlibrary.com)



15PYU305

SEMESTER-III

**PHARMACEUTICAL TECHNOLOGY-I****3H****3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This course is designed to impart a fundamental knowledge on the art and science of various machines and their handling in pharmaceutical industry.
- This course focuses on various topics like unit operations, material handling, pharma plant construction, corrosion, industrial pollution etc.
- Enables the pharmacist to make rational decisions on scientific basis concerning the art and technology of pharmaceutical equipments.
- To carry out various test to prevent environmental pollution.
- To appreciate and comprehend significance of plant lay out design for optimum use of resources.
- To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Exploit various unit operations used in Pharmaceutical Industries.
2. Understand the material handling techniques.
3. Appreciate and comprehend significance of plant lay out design for optimum use of resources.
4. Perform various processes involved in pharmaceutical manufacturing process.
5. Appreciate the various preventive methods used for corrosion control in Pharmaceutical Industries.
6. Carry out various tests to prevent environmental pollution.

**Course Content:****UNIT I**

**Materials of Pharmaceutical Plant Construction** - General study of composition – corrosion – resistance - properties and applications of the materials of construction with special reference to stainless steel and glass.

**UNIT II**

**Industrial Hazards and Safety Precautions** –Mechanical – Chemical – Electrical - Fire and Dust hazards - Industrial dermatitis - Accident records - **Fluid Flow** -Types of flow - Reynold's number –

Viscosity - Concepts of boundary layer - Basic equation of fluid flow – Valves – Pumps - Flow meters - Manometers and Measurement of flow and pressure.

### UNIT III

**Filtration and Centrifugation** -Theory of filtration - filter aids - filter media - industrial filters including filter press - rotary press - rotary filter - edge filter - Factors affecting filtration - mathematical problems on filtration – optimum- cleaning cycle in batch filters - Principles of centrifugation - industrial centrifugal filters & centrifugal sedimenters.

### UNIT IV

**Crystallization** - Characters of crystals like purity - size - shape - geometry - habit, forms, size and factors affecting them - Solubility curves and calculation of yields - Material and heat balances around Swenson Walker crystalliser - Super saturation theory - its limitations - nucleation mechanism and crystal growth - Study of various types of crystallisers - Caking of crystals and its prevention and numerical problems on yields.

### UNIT V

**Dehumidification and Humidity Control** -Basic concepts – definition - wet bulb and adiabatic saturation temperatures - psychrometric chart and measurement of humidity - application of humidity measurement in pharmacy -Equipments for dehumidification operations.

### TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.V.S.Subrahmanyam et al	Pharmaceutical Engineering principles and practices	Vallabh prakashan	2002

### REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Lachman	Theory and practice of Industrial Pharmacy	Lea & Febiger	1986
2	MaCabe WL and Smith J.C.	Unit operations of Chemical Engineering	McGraw-Hill Education	2004
3	Walter J. Badger.	Introduction to Chemical Engineering	McGraw-Hill Education	1955

4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007
5	Remington	Science and Practice of Pharmacy	Philadelphia	2005

**WEBSITES:**

- [www.picscheme.org](http://www.picscheme.org)
- [www.ijper.org](http://www.ijper.org)
- [www.pharmpress.org](http://www.pharmpress.org)

15PYU401

**PHYSICAL PHARMACEUTICS - II****SEMESTER-IV****3H 3C**

Instruction hours/ week: L: 3 T:0 P:0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Physical pharmaceutics is a fundamental course that leads to proper understanding of subsequent courses in Pharmaceutics.
- It integrates knowledge of mathematics, physics and chemistry and applies them to the pharmaceutical dosage form development.
- It focuses on the theories behind the phenomena needed for dosage form design.
- Enables the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions, etc.
- The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations.
- Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand the physicochemical parameters of a drug
2. Identify methods to enhance solubility of a new drug moiety
3. Discover the importance of stability in pharmaceutical preparations
4. Demonstrate the powder properties and effect of Glidants in powder flow
5. Interpret about diffusion, dissolution and particle properties.
6. Demonstrate the applications of micromeritics in pharmaceutical industry
7. Enable the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions

**Course Content:****UNIT-I**

**Kinetics** – definition – rate and order of reaction – zero order reactions – first order reactions – second order reactions – determination of orders – factors influencing rate of reaction – decomposition and stabilization study of medicinal agents – accelerated stability studies.

**UNIT-II**

**Interfacial phenomenon** – definition – measurement of surface and interfacial tension - surface active agent – hydrophilic lipophilic balance – spreading coefficient – theory of micelle formation – factors influencing critical micelle concentration – electrical properties at interface.

**UNIT-III**

**Rheology** – definition – Newtonian and non Newtonian system - flow characteristics – thixotropy – determination of rheological properties – capillary viscometer – falling and rising body apparatus – rotational viscometers – application of rheology in pharmacy.

**UNIT-IV**

**pH, buffer and isotonic solutions** - definition – buffer action - pH determination – applications – buffer equation – buffer capacity – factors affecting buffer capacity – buffers in pharmaceutical - biological systems and buffered isotonic solutions.

**UNIT-V**

**Complexation** – definition – types of complexes – metal complexes – inorganic complexes – chelates – olefin complexes – aromatic complexes – organic molecular complexes - inclusion complexes – methods of analysis of complexes - Protein binding – definition – binding equilibria.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Manavalan and Ramasamy	Physical Pharmaceutics	Pharmamed Press	2015
2.	S.P.Agarwal and Rajesh Khanna	Physical Pharmacy	CBS Publishers	2015

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	H.C. Ansel	Pharmaceutical Dosage form and Drug delivery system	New Delhi	2000
2	Lachmann	Theory and practice of Industrial pharmacy	Churchill Livingstone	2002
3	M.E. Aulton	Pharmaceutics- The Science & Dosage Form Design	Churchill Livingstone	2001
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007
5	Remington	Science and Practice of Pharmacy	Philadelphia	2005

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6	Carter S.J	Cooper and Gunn's- Dispensing for Pharmaceutical students	CBS publishers	2000
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**WEBSITES:**

- [www.picscheme.org](http://www.picscheme.org)
- [www.ijper.org](http://www.ijper.org)
- [www.pharmpress.org](http://www.pharmpress.org)

15PYU411

SEMESTER-IV

**PHYSICAL PHARMACEUTICS LABORATORY-II****3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Physical pharmaceutics is a fundamental course that leads to proper understanding of subsequent courses in Pharmaceutics.
- It integrates knowledge of mathematics, physics and chemistry and applies them to the pharmaceutical dosage form development.
- It focuses on the theories behind the phenomena needed for dosage form design.
- Enables the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions, etc.
- The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations.
- Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand the physicochemical parameters of a drug.
2. Identify methods to enhance solubility of a new drug moiety.
3. Discover the importance of stability in pharmaceutical preparations.
4. Demonstrate the powder properties and effect of Glidants in powder flow.
5. Interpret about diffusion, dissolution and particle properties.
6. Demonstrate the applications of micromeritics in pharmaceutical industry.
7. Enable the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions.

**Course content:**

1. Determination of half life of pseudo first order reaction.
2. Determination of rate constant and order of reaction.
3. Determination of surface tension.
4. Determination of CMC of surfactant.
5. Determination of HLB value
6. Study of rheological properties of various systems using viscometer.
7. Preparation of pharmaceutical buffers.

8. Determination of buffer capacity.
9. Determination of partition coefficient of benzoic acid in benzene and distilled water.
10. Accelerated stability studies.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.V.S.Subramanyam- J. Thimmasetty	Laboratory manual of physical pharmaceuticals	CVS	2001
2	C.Vijayaraghavan	A Practical Handbook of Physical Pharmaceutics	New Century Book House	2008

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	H.C. Ansel	Pharmaceutical Dosage form and Drug delivery system	New Delhi	2000
2	Lachmann	Theory and practice of Industrial pharmacy	Churchill Livingstone	2002
3	M.E. Aulton	Pharmaceutics- The Science & Dosage Form Design	Churchill Livingstone	2001
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007
5	Remington	Science and Practice of Pharmacy	Philadelphia	2005
6	Carter S.J	Cooper and Gunn's- Dispensing for Pharmaceutical students	CBS publishers	2000

**WEBSITES:**

➤ [www.picscheme.org](http://www.picscheme.org)



- [www.ijper.org](http://www.ijper.org)
- [www.pharmpress.org](http://www.pharmpress.org)

15PYU402

SEMESTER-IV

**ADVANCED PHARMACEUTICAL ORGANIC  
CHEMISTRY-II****4H 4C**

Instruction hours/ week: L: 3 T: 1 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Study the isomerism of the organic compound
2. Understand the stereo chemical aspects of organic compounds and reactions
3. To study the three dimensional structural formulae of certain compounds.
4. Account for the stability/reactivity/orientation
5. Emphasize the synthesis, reactions and uses of Heterocyclic compounds
6. Know aspects of organic compounds and reactions.

**Course Content:****UNIT I**

**Study about stereochemistry - Optical isomerism** - Optical activity – enantiomerism – diastereoisomerism - meso compounds - Elements of symmetry – chiral – achiral- molecules - DL system of nomenclature of optical isomers - sequence rules - RS system of nomenclature of optical isomers.

**UNIT II**

**Optical isomerism** - Reactions of chiral molecules - Racemic modification - resolution of racemic mixture -Asymmetric synthesis – partial – absolute.

**UNIT III**

Geometrical isomerism - Nomenclature of geometrical isomers (Cis Trans- EZ- Syn Anti system)- Methods of determination of configuration of geometrical isomers- Conformational isomerism in alkanes Cyclopentane - Cyclohexane.

**UNIT IV**

Stereo isomerism in biphenyl compounds (Atropisomerism) - conditions for optical activity - Stereospecific and stereoselective reactions.

**UNIT V**

**Fats and Oils** - Fatty acids – Reactions – Hydrolysis – hydrogenation - saponification and rancidity-of oils - drying oils - **Analytical constants** – Acid value - saponification value - ester value - iodine value - acetyl value - Reichert Meissl (RM) value –significance and principle involved in the determination.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Morrison and Boyd	Organic Chemistry	Prentice Hall	1992

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	I.L. Finar.	Organic Chemistry by Vol. I & II	Pearson	1956
2	Cramand Hammered	Organic chemistry	Pine Hendrickson	2005
3	Jerry March	Advanced Organic Chemistry: Reactions- Mechanisms- and Structure	Wiley: New York- NY	1992

**WEBSITES:**

- [www.pdfbit.com](http://www.pdfbit.com)
- [www.chem.ucla.edu](http://www.chem.ucla.edu)
- [www.chemistrylectures.com](http://www.chemistrylectures.com)

15PYU412

SEMESTER-IV

**ADVANCED PHARMACEUTICAL ORGANIC  
CHEMISTRY LABORATORY -II****3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Study the isomerism of the organic compound
2. Understand the stereo chemical aspects of organic compounds and reactions
3. To study the three dimensional structural formulae of certain compounds.
4. Account for the stability/reactivity/orientation
5. Emphasize the synthesis, reactions and uses of Heterocyclic compounds
6. Know aspects of organic compounds and reactions.

**Course Content:**

- I. Quantitative determination of following classes of organic compounds (2 compounds)
- II .Determination of following oil values (2 compounds)
- III. Preparation of homocyclic compounds.(2 compounds)
- IV. Preparation of heterocyclic compounds. (4 compounds)
- V. Partition coefficient. (2 compounds)

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mann and Saunders	Practical Organic Chemistry	Longman	1960

**REFERENCES:**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Arthur I. Vogel	Vogel's text book of Practical Organic Chemistry	Pearson	1996

**WEBSITES:**

- [www.pdfbit.com](http://www.pdfbit.com)
- [www.chem.ucla.edu](http://www.chem.ucla.edu)
- [www.chemistrylectures.com](http://www.chemistrylectures.com)

15PYU403

SEMESTER-IV

**BIOCHEMISTRY & BIOMOLECULES – II    3H    3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells.
- The scope of the subject is providing biochemical facts and the principles.
- It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.
- To understand metabolism of nutrient molecules in physiological and pathological conditions.
- To understand the mechanism of drug action and fundamental changes occur in diseases.
- Clinical chemistry deals with the study of chemical aspects of human life in health and illness and the application of chemical laboratory methods to diagnosis, control of treatment, and prevention of diseases.

**Course Outcomes:**

On successful completion of the course the student will

1. Understand cell and transport across membrane.
2. Explain the types and importance of biomolecules and bioenergetics
3. Understand the catalytic role of enzymes- importance of enzyme inhibitors in design of new drugs- therapeutic and diagnostic applications of enzymes.
4. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
5. Understand the genetic organization of mammalian genome- functions of DNA and RNA in protein synthesis.
6. Understand the principles of organ functions tests and their clinical significances

**Course Content:****UNIT I**

**Lipid metabolism** – Definition – classification- chemistry and biological role of lipids- $\beta$ -Oxidation of saturated (Palmitic acid) and unsaturated fatty acids(linolenic acid)-Ketone bodies metabolism (Ketogenesis and ketolysis) ketosis and ketoacidosis d - *De novo* -Biosynthesis of fatty acids

(Palmitic acid)-Metabolism of cholesterol (Biosynthesis and degradation)-Biosynthesis and significance of Phospholipids- Disorders of lipid metabolism – Hypercholesterolemia-atherosclerosis and fatty liver.

## UNIT II

**Amino acid metabolism** – Definition- classification and biological role of amino acids - General reactions of amino acid metabolism - Transamination- deamination & decarboxylation-Urea cycle and its metabolic disorders-Metabolism of sulfur containing amino acids their metabolic disorders- Catabolism of tyrosine – tryptophan- phenylalanine and their metabolic disorders- Synthesis and significance of biological substances – creatine – histamine- 5-hydroxy- Tryptophan (5-HT) – dopamine – noradrenaline – adrenaline-Metabolism of Heme and its disorders Porphyria-as-hyperbilirubinemia and jaundice.

## UNIT III

**Nucleic acid metabolism** – Definition- chemistry and biological role of nucleosides - nucleotides - Biosynthesis of purine and pyrimidine nucleotides-Catabolism of purine and pyrimidine nucleotides - Disorders of nucleotide metabolism - Gout disease.

## UNIT IV

**Replication and Protein synthesis** -Organization of mammalian genome-Structure of DNA and significance as genetic material– RNA – structure- types and significance in protein synthesis-DNA replication- types and details on semi conservative model-Mutation and consequences of mutation-DNA Damage and repair mechanism-Transcription or RNA synthesis-Genetic code-Translation or Protein synthesis and its regulation and inhibition.

## UNIT V

**Clinical biochemistry**-Role of the kidney - routine performed Laboratory tests - serum creatinine-creatinine clearance- serum urea and serum uric acid- Liver functions – Metabolic – synthetic-excretion & detoxification - Tests to evaluate the liver function- Composition and significance of lipoproteins - Lipid profile tests.

## TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	D. Satyanarayan and U.Chakrapani	Biochemistry	Elsevier Health Sciences	2013

**REFERENCES:**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Robert K. Murry, Daryl K. Granner and Victor W. Rodwell	Harper's Biochemistry	McGraw-Hill Medical	2006
2	Stryer	Biochemistry	Pine Hendrickson	2005
3	Deb	Textbook of Biochemistry	Wiley: New York- NY	1992

**WEBSITES:**

- [biochemistryquestions.wordpress.com](http://biochemistryquestions.wordpress.com)
- [www.mbmb.siu.edu](http://www.mbmb.siu.edu)
- [www.medicalbiochemistry.org](http://www.medicalbiochemistry.org)



**15PYU413****SEMESTER-IV****BIOCHEMISTRY & BIOMOLECULES LABORATORY– II****3H****3C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells.
- The scope of the subject is providing biochemical facts and the principles.
- It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.
- To understand metabolism of nutrient molecules in physiological and pathological conditions.
- To understand the mechanism of drug action and fundamental changes occur in diseases.
- Clinical chemistry deals with the study of chemical aspects of human life in health and illness and the application of chemical laboratory methods to diagnosis, control of treatment, and prevention of diseases.

**Course Outcomes:**

On successful completion of the course the student will

1. Explain molecular orbital theory.
2. Understand the strain theories.
3. Describe effect of substituents on the reaction.
4. Qualitatively analyze the biomolecules.
5. Quantitatively analyze biochemical parameters and their importance in diagnosis of disease.
6. Qualitatively analyze the urine for normal and abnormal constituents.

**Course Content:**

1. Determination of serum cholesterol
2. Determination of serum triglycerides
3. Determination of Salivary amylase activity
4. Study the effect of pH on salivary amylase activity.
5. Study the effect of Temperature on Salivary amylase activity.
6. Study the effect of substrate concentration on salivary amylase activity.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	R.C. Gupta and S. Bhargavan	Practical Biochemistry	CBS Publishers & Distributors Pvt. Ltd	2010

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Pattabiraman and Sitaram Acharya	Laboratory manual of Biochemistry	AITBS Publishers	1994

**WEBSITES:**

- [biochemistryquestions.wordpress.com](http://biochemistryquestions.wordpress.com)
- [www.mbmb.siu.edu](http://www.mbmb.siu.edu)
- [www.medicalbiochemistry.org](http://www.medicalbiochemistry.org)

**15PYU404****SEMESTER-IV****PHARMACY PRACTICE AND PATHOPHYSIOLOGY 4H 4C**

Instruction hours/ week: L: 3 T: 1 P:0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This course is designed to impart basic knowledge and skills that are required for the practice of pharmacy in both hospital and community settings.
- To develop practical clinical skills that will enable the student to enhance the quality of life of patients and advance pharmaceutical care in the community setting.
- To understand prescription handling, dispensing of dosage forms and calculation of dosage forms.
- Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes.
- This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms.
- Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

**Course Outcomes:**

On successful completion of the course the student will

1. Understand the various drug distribution system- BMI & BP
2. Handle the prescriptions.
3. Manage community pharmacies.
4. Understand the elements of pharmaceutical care and provide comprehensive patient care services
5. Understand the concept and practice of the quality use of medicines.
6. Summarize the therapeutic approach for management of various diseases including reference to the latest available evidence.

**Course Content:****UNIT I**

**Prescription** -Parts of prescription- handling of prescription- source of errors in prescription- care required in dispensing procedures including labeling of dispensed products..

**UNIT II**

**Pharmaceutical calculations** -Latin terms used in prescription – posology- factors determining doses of drug- calculation of doses for infants- adults and elderly patients - enlarging and reducing recipes- percentage solutions –allegation - alcohol dilution- proof spirit- isotonic solutions.

### UNIT III

**Dosage form** -introduction - classifications of dosage forms - **Principles involved and procedures adopted in dispensing** -Typical prescription like mixtures – emulsions – powders – pastilles – lozenges – pills – lotions – liniments – inhalations – mouthwashes – gargles – douches – paints- sprays and tablet triturates.

### UNIT IV

**Basic principles of cell injury and adaptation** -Causes of cellular injury- Pathogenesis and morphology of cell injury - Intercellular alterations in lipids- proteins and carbohydrates- cellular adaptation- atrophy and hypertrophy.

### UNIT V

**Basic mechanism involved in the process of inflammation and repair** - alteration in vascular permeability and blood flow- migration of WBC's- acute and chronic inflammation and mediators of inflammation - Brief outline of the process of repair.

### TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.J. Carter.	Cooper and Gunn's Dispensing for Pharmaceutical students	CBS publishers	2000

### REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	University of the Sciences in Philadelphia	Remington's Pharmaceutical Sciences	LWW	2005
2	H.C. Ansel	Pharmaceutical Dosage form and Drug delivery system	New Delhi	2000
3	William E. Hassan	Hospital Pharmacy	Lea & Febiger	1974
4	The Indian Pharmacopoeia	Indian Pharmacopoeia	Press of IPC under Ministry of Health	2007

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	Commission		& Family Welfare, Govt. of India	
5	Goodman and Gilman	The Pharmacological basis of therapeutics	Mc Grill	2008

**WEBSITES:**

- [www.jpp.sagepub.com](http://www.jpp.sagepub.com)
- [www.jrpp.net](http://www.jrpp.net)
- [www.pharmacypractice.com](http://www.pharmacypractice.com)

15PYU414

SEMESTER-IV

**PHARMACY PRACTICE AND PATHOPHYSIOLOGY  
LABORATORY****3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This course is designed to impart basic knowledge and skills that are required for the practice of pharmacy in both hospital and community settings.
- To develop practical clinical skills that will enable the student to enhance the quality of life of patients and advance pharmaceutical care in the community setting.
- To understand prescription handling, dispensing of dosage forms and calculation of dosage forms.
- Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes.
- This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms.
- Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

**Course Outcomes:**

On successful completion of the course the student will

1. Understand the various drug distribution system- BMI & BP
2. Handle the prescriptions.
3. Manage community pharmacies.
4. Understand the elements of pharmaceutical care and provide comprehensive patient care services
5. Understand the concept and practice of the quality use of medicines.
6. Summarize the therapeutic approach for management of various diseases including reference to the latest available evidence.

**Course Content:**

1. Dispensing of prescription falling under the following categories:
  - Syrups
  - Mixtures

- Elixirs
- Emulsions
- Powders
- Mouthwashes
- Gargles
- Lotions

2. Dispensing procedures involving pharmaceutical calculation, dosage calculation for paediatric.

### TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Guyton A- Hall J.E.	Textbook of Medical Physiology- WB Saunders Company.	Saunders	2015

### REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Joseph DiPiro- Robert L. Talbert	Pharmacotherapy: A Pathophysiological Approach	McGraw-Hill Education	2014
2	The Indian Pharmacopoei a Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007

### WEBSITES:

- [www.jpp.sagepub.com](http://www.jpp.sagepub.com)
- [www.jrpp.net](http://www.jrpp.net)
- [www.pharmacypractice.com](http://www.pharmacypractice.com)





15PYU405

SEMESTER-IV

**PHARMACEUTICAL TECHNOLOGY-II****3H****3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This course is designed to impart a fundamental knowledge on the art and science of various machines and their handling in pharmaceutical industry.
- This course focuses on various topics like unit operations, material handling, pharma plant construction, corrosion, industrial pollution etc.
- Enables the pharmacist to make rational decisions on scientific basis concerning the art and technology of pharmaceutical equipments.
- To carry out various test to prevent environmental pollution.
- To appreciate and comprehend significance of plant lay out design for optimum use of resources.
- To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. To know various unit operations used in Pharmaceutical Industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various tests to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical Industries

**Course Content:****UNIT I**

**Evaporation** -basic concepts of phase equilibria – factors affecting evaporation – evaporators – film evaporators – single effect and multiple effect evaporators - **Heat transfer** - source of heat – mechanism of heat flow – steam as heating source.

**UNIT II**

**Distillation** -Raoult'slaw - phase diagrams- volatility - simple steam flash distillation - principles of rectification - method for calculation of number of theoretical plates - Azeotropic and extractive

distillation.

### UNIT III

**Drying** - Moisture content - mechanism of drying - rate of drying - time of drying - calculations - classification - types of dryers - dryers used in pharmaceutical industries - special drying methods - mathematical problems on drying.

### UNIT IV

**Size reduction and Size separation** -Definition - objective of size reduction - factors affecting size reduction - laws governing energy and power requirement of mills - including ball mill - hammer mill - fluid energy mill.

### UNIT V

**Mixing** - definition - solid-solid mixing – mixing process steps – classification of equipments for solid mixing - solid-liquid mixing - mechanism of liquid mixing – mixing vessels or tanks - liquid-liquid mixing – equipments used in mixing.

### TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.V.S.Subrahmanyam et al	Pharmaceutical Engineering principles and practices	Vallabh prakashan	2002

### REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Lachman	Theory and practice of Industrial Pharmacy	Lea & Febiger	1986
2	MaCabe WL and Smith J.C.	Unit operations of Chemical Engineering	McGraw-Hill Education	2004
3	Walter J. Badger.	Introduction to Chemical Engineering	McGraw-Hill Education	1955
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007
5	Remington	Science and Practice of Pharmacy	Philadelphia	2005

## **WEBSITES**

- **[www.picscheme.org](http://www.picscheme.org)**
- **[www.ijper.org](http://www.ijper.org)**
- **[www.pharmpress.org](http://www.pharmpress.org)**

**15PYU501****ADVANCED PHARMACOGNOSY – I****SEMESTER-V****3H 3C**

Instruction hours/ week: L: 3 T:0 P:0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The department is to acquaint the students with the basic knowledge of the natural products.
- Students engaged in pharmacy and in other health professionals should know the role of natural products in discovery of drugs and their use and application in eradicating ailments.
- The students are given sufficient knowledge to be able to describe the modern methods of extraction and purification of crude drugs.
- To learn and understand the techniques involved in the herbal drug-cosmetic preparation and their Standardization.
- The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.
- To know the techniques in the cultivation and production of crude drugs.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Explain the basic principles of extraction and various modern extraction techniques.
2. Understand the biogenesis of secondary metabolites.
3. Elaborate the plant based industries and institutions involved in work on medicinal and aromatic plants in India.
4. Demonstrate the Industrial production and estimation of Phytoconstituents.
5. Perform the Herbal formulation and standardization.
6. Explain the Nutraceuticals.

**Course Content:****UNIT I**

**Modern methods of extraction-** application of latest techniques like Spectroscopy, types and applications– various types and applications of chromatography, and electrophoresis in the isolation-purification and identification of crude drugs.

**UNIT II**

**Introduction to plant biochemistry** with special reference to basic metabolic pathways - Introduction to biogenesis of secondary metabolites like Atropine –Ergotamine-Morphine

and Steroidal glycosides -Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

### UNIT III

**A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India** - Introduction – classification of medicinal plant based industry – production and utilization of medicinal plants and their products in India –manufacturers of herbal formulations manufacturers of standardized herbal extracts, phytoconstituents and essential oils – list of government institution involved in the development of plant based industrial technology.

### UNIT IV

**Industrial production and estimation of the following phytoconstituents** –production – estimations–uses of Forskolin –Sennoside– Artemisinin – Diosgenin-Tropane alkaloids – Curcumin –Rutin –Phyllanthin –Asiaticoside-Andrographolides and Gymnemic acid.

### UNIT V

**Herbal formulation development and standardization** –Preparation-stability testing of Herbal extracts and formulations- **Role of Herbs in Cosmetics** – Hair care preparation–Henna–Amla-Hibiscus – **Skin Care preparation**- Aloe vera–Turmeric-Sandalwood – **Nutraceuticals**

### TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kokate C.K- Purohit A.P- Gokhale S.B	Text book of Pharmacognosy	Nirali prakasan	2008

### REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Trease and Evans	Pharmacognosy	W.B Sauders	2002
2	James Robbers- Marilyn K. Speedice and Varro E.- Tyler	Pharmacognosy and Pharmacobiotechnology	Williams and Wilkins	1996
3	TE Wallis	Textbook of Pharmacognosy	CBS publishers and Distributors-	2005

			New Delhi	
4	K.N.Kalia	Industrial Pharmacognosy	CBS publishers and Distributors- New Delhi	2005
5	The Indian Pharmacopoeia Commission		Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007

**WEBSITES:**

- [www.authorstream.com](http://www.authorstream.com)
- [www.epharmacognosy.com](http://www.epharmacognosy.com)
- [www.science20.com](http://www.science20.com)

15PYU511

**ADVANCED PHARMACOGNOSY LABORATORY – I****SEMESTER-V****3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The department is to acquaint the students with the basic knowledge of the natural products.
- Students engaged in pharmacy and in other health professionals should know the role of natural products in discovery of drugs and their use and application in eradicating ailments.
- The students are given sufficient knowledge to be able to describe the modern methods of extraction and purification of crude drugs.
- To learn and understand the techniques involved in the herbal drug-cosmetic preparation and their Standardization.
- The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.
- To know the techniques in the cultivation and production of crude drugs.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Describe the isolation of the Phytoconstituents.
2. Prepare the hair care preparation.
3. Prepare the skin care the preparation.
4. Demonstrate the Amino acid by ascending chromatography.
5. Perform the Thin layer chromatography of Curcumin.
6. Understand the isolation and formulation procedure.

**Course content:**

1. Caffeine – from tea dust
2. Quinine – from Cinchona bark
3. Citric acid – from Lemon.
4. Casein – from Milk.
5. Starch – from Potato
6. Pectin – from Orange peel
7. Curcumin from turmeric
8. Hair care preparation
  - I. Amla
  - II. Hibiscus
9. Skin Care preparation
  - I. Aloe vera

10. Determination of Aminoacid by Ascending chromatography  
Thin layer chromatography of curcumin

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.B.Gokale and C.K kokate	Practical Pharmacognosy	Vallabh prakasan	2008

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Khandelwal KR	Practical pharmacognosy	Nirali prakashan	2005

**WEBSITES:**

- [www.authorstream.com](http://www.authorstream.com)
- [www.e pharmacognosy.com](http://www.e pharmacognosy.com)
- [www.science20.com](http://www.science20.com)



15PYU502

**PHARMACEUTICAL BIOTECHNOLOGY – I****SEMESTER-V****3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100  
External Semester Exam: 3 Hours**Course Objectives:**

- This paper has been designed to provide the advanced knowledge to the Pharmacy students in valuable areas of advanced Biotechnology.
- To play a crucial role in determining its future use and applications in medicine- drug discovery and in pharmaceutical industry.
- It also emphasize the study of microbiological and biotechnological processes.
- To know modern technology aspects to useful products and to correct the alternative ways to prevent the occurrence and the treatment of disease related to microorganisms and techniques.
- To understand methods of identification- cultivation and preservation of various microorganisms.
- To understand Genetic engineering applications in relation to production of pharmaceuticals.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the importance of immunological reactions and preparations of immunological products.
2. Do sterilization of various equipments/products and bacterial sensitivity testing against antibiotics and disinfectants.
3. Know the anatomy, identification, growth factors and sterilization of microorganisms;
4. Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
5. Do estimation of RNA and DNA and there by identifying the source;
6. Do cultivation and identification of the microorganisms in the laboratory;
7. Do identification of diseases by performing the diagnostic tests; and
8. Appreciate the behavior of motility and behavioral characteristics of microorganisms.

**Course Content:****UNIT I**

**Introduction to Microbiology-** Scope of Microbiology- Microbes of Medicinal interest- study of mode of Transmission & treatment of Microbial diseases like Cholera – Typhoid – Tuberculosis – Diphtheria – Tetanus- Syphilis & AIDS –Classification- Morphology and fine structure Bacteria –

Fungi- Viruses -Methods of isolation and identification of bacteria - staining techniques and biochemical reactions - Total & viable counting techniques of bacteria - Growth and cultivation- Their Nutritional requirements -Media-differential enriched selective - Maintenance of lab culture.

## UNIT II

**Detail study of different methods of sterilization** including their merits and Demerits-Detailed study of sterility testing of different pharmaceutical preparations – Disinfectant - study of disinfectant. Factors affecting their action and evaluation of bactericidal & Bacteriostatic -Principles and methods of different microbiological assays including sensitivity testing with references to ciprofloxacin-streptomycin & vitamin B -12.

## UNIT III

**Genetic organization of Eukaryotes and Prokaryotes** - Microbial genetics including transformation – transduction – conjugation- plasmids and transposons - Introduction to Microbial biotransformation- Biotransformation of steroids and production of single cell protein.

## UNIT IV

**Molecular Biology and Engineering** -Study of cloning vectors- restricted endonucleases and DNA ligase -Application of rDNA technology and genetic engineering in the products- **Interferon Vaccines**- hepatitis- B –**Hormones**- Insulin.

## UNIT V

**Access to Molecular Biology Data Bases**-Nucleic Acid Sequences – Genomes- Protein Sequence and Structures – Entrez- Sequence RetrievalSystem (SRS) - Protein Identification Resource (PIR) - Sequence Alignment- Software's (BLAST- FASTA- CLUSTAL-W)-Construction of Phylogenetic Tree -Protein Structure Prediction- Applications of Bioinformatics.

## TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ananthanarayan and Paniker	Text Book of Microbiology	Orient black swam	2015

**REFERENCES:**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Pelzer- Krieg and Chan	Microbiology	ABE books	1986
2	John A Wiley	Prescott's Microbiology	Prescott's	2011
3	R.Y. Stainer	General Microbiology	Mac mallion	1952

**WEBSITES:**

- [www.microbiology.org](http://www.microbiology.org)
- [www.microworld.org](http://www.microworld.org)
- [www.neomed.edu](http://www.neomed.edu)

15PYU512

SEMESTER-V

**PHARMACEUTICAL BIOTECHNOLOGY LABORATORY-I      3H      2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This paper has been designed to provide the advanced knowledge to the Pharmacy students in valuable areas of advanced Biotechnology.
- To play a crucial role in determining its future use and applications in medicine- drug discovery and in pharmaceutical industry.
- It also emphasize the study of microbiological and biotechnological processes.
- To know modern technology aspects to useful products and to correct the alternative ways to prevent the occurrence and the treatment of disease related to microorganisms and techniques.
- To understand methods of identification- cultivation and preservation of various microorganisms.
- To understand Genetic engineering applications in relation to production of pharmaceuticals.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the importance of immunological reactions and preparations of immunological products.
2. Do sterilization of various equipments/products and bacterial sensitivity testing against antibiotics and disinfectants.
3. Know the anatomy, identification, growth factors and sterilization of microorganisms;
4. Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
5. Do estimation of RNA and DNA and there by identifying the source;
6. Do cultivation and identification of the microorganisms in the laboratory;
7. Do identification of diseases by performing the diagnostic tests; and
8. Appreciate the behavior of motility and behavioral characteristics of microorganisms.

**Course Content:****Microbiology**

1. Study of apparatus used in experimental microbiology.
2. Sterilization techniques – Glasswares- media- Room.
3. Preparation and sterilization of Media.
4. Isolation techniques– Streak plate- Pour plate
5. Staining techniques- Simple staining Gram's staining- Acid fast staining-
6. Spore staining- flagella staining - Capsule staining.

7. Total and viable count of Microorganisms.
8. Motility of the microorganism by Hanging drop method.
9. Sterility testing for Pharmaceutical products.
10. Microbiological assay of antibiotics.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	James G. Cappuchino	Microbiology – A laboratory manual	Pearson	2013

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mackie and McCartney	Practical Medical Microbiology	Elsevier	1996

**WEBSITES:**

- [www.microbiology.org](http://www.microbiology.org)
- [www.microworld.org](http://www.microworld.org)
- [www.neomed.edu](http://www.neomed.edu)

15PYU503

SEMESTER-V

**CHEMISTRY OF NATURAL PRODUCTS****3H****3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject is designed to provide detail knowledge about chemistry of medicinal compounds from natural origin and general methods of structural elucidation of such compounds.
- It also emphasizes on isolation, purification and characterization of medicinal compounds from natural origin.
- To know the modern extraction techniques- characterization and identification of the herbal drugs.
- To know the different types of natural compounds and their chemistry and medicinal importance
- Importance of natural compounds as a lead molecules for new drug discovery.
- The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents.
2. To understand the preparation and development of herbal formulation.
3. To understand the herbal drug interactions.
4. To carryout isolation and identification of phytoconstituents.
5. Know the modern extraction techniques- characterization and identification of the herbal drugs.
6. Know the different types of natural compounds and their chemistry and medicinal importance

**Course Content:****UNIT I****Terpenoids** – Classification - chemistry and uses of citral – menthol – thymol – camphor - alpha-terpineol and alpha-pinene**UNIT II****Alkaloids** – Classification - chemistry and pharmacological activity of Atropine and related compounds – Papaverine – Ephedrine**UNIT III****Glycosides** - Basic ring system - nomenclature and stereochemistry of steroid nucleus - Chemistry of Digitoxin – Digoxin – Lanatosides - Diosgenin and Sennosides.

**UNIT IV**

**Vitamins** - Chemistry - medicinal and pharmaceutical uses of vitamin A- D- E- K- B<sub>1</sub> - B<sub>2</sub> - B<sub>6</sub> - B<sub>12</sub> and Folic acid – **Flavonoids** - Classification and chemistry of hesperidine

**UNIT V**

**Purines** - A brief account of chemistry and structural elucidation of uric acid - interrelation between caffeine - theophylline and theobromine.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Agarwal	Chemistry of Natural Products- I and Vol I & II.	Krishan Prakashan	2014

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Chatwal	Chemistry of Natural Products- Vol I & II.	Himalaya Publishing House	2010
2	I.L. Finar	Organic Chemistry Vol I and II	Pearson Education;	2002
3	Nakanishi Gggolo	Natural Product Chemistry	University Science Books-U.S	1991

**WEBSITES:**

- [www.pdfbit.com](http://www.pdfbit.com)
- [www.chem.ucla.edu](http://www.chem.ucla.edu)
- [www.chemistrylectures.com](http://www.chemistrylectures.com)

15PYU513

SEMESTER-V

**CHEMISTRY OF NATURAL PRODUCTS LABORATORY 3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject is designed to provide detail knowledge about chemistry of medicinal compounds from natural origin and general methods of structural elucidation of such compounds.
- It also emphasizes on isolation, purification and characterization of medicinal compounds from natural origin.
- To know the modern extraction techniques- characterization and identification of the herbal drugs.
- To know the different types of natural compounds and their chemistry and medicinal importance
- Importance of natural compounds as a lead molecules for new drug discovery.
- The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially.

**Course Outcomes:**

On successful completion of the course the student will

1. To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents.
2. To understand the preparation and development of herbal formulation.
3. To understand the herbal drug interactions.
4. To carryout isolation and identification of phytoconstituents.
5. Know the modern extraction techniques- characterization and identification of the herbal drugs.
6. Know the different types of natural compounds and their chemistry and medicinal importance

**Course Content:**

1. Isolation of active principles from natural sources including volatile oils, terpenoids etc (6).
2. Estimation of number of functional groups in organic compounds (3 compounds)
3. Chromatographic techniques. (3 compounds)



**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Prof. R.R Wadekar and Prof. M.C Kuchekar	Pharmacognosy and Phytochemistry II	Everest Publishing House;	2006

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Peech and M.V.Tracey	Modern Methods Of Plant Analysis- 7volume Sets	Springer/bsp Books	2006

**WEBSITES:**

- [www.pdfbit.com](http://www.pdfbit.com)
- [www.chem.ucla.edu](http://www.chem.ucla.edu)
- [www.chemistrylectures.com](http://www.chemistrylectures.com)

15PYU504

SEMESTER-V

**PHARMACOLOGY & THERAPEUTICS –I      3H      3C**

Instruction hours/ week: L: 3 T: 1 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The main purpose 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-physicochemical 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.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

**Course Outcomes(CO's):**

On successful completion of the course the student will

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/subcellular/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. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.
6. Comprehend the principles of toxicology and treatment of various poisonings.

**Course Content:****UNIT I**

**General Pharmacology** - Introduction to Pharmacology- Definition and various branches of pharmacology – **Pharmacodynamics**-Principles and mechanisms of drug action -Classification of receptors-Signal transduction mechanisms of ligand gated ion channels-G Protein–coupled receptors-Kinase linked receptors and receptors that regulate transcription factors –Drug receptors interactions-combined effects of drugs and factors modifying drug action.

**UNIT II**

**Pharmacokinetics**- Detail study of various factors influencing drug absorption- distribution- metabolism and excretion - **Pharmacogenetics**-Adverse drug reactions – Discovery and development of new drugs-Preclinical and clinical studies.

**UNIT III**

**Pharmacology of Peripheral Nervous System** – Organization and function of ANS-Neurohumoral transmission – Parasympathomimetics –Parasympatholytics-Sympathomimetics and Sympatholytics.

**UNIT IV**

**Pharmacology of Peripheral Nervous System**-Neuromuscular blocking agents and skeletal muscle relaxants (peripheral)-Local anesthetic agents-Drugs used in Myasthenia Gravis.

**UNIT V**

**Drugs acting on Urinary System**-Diuretics and anti-diuretics.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	K.D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Satoskar R.S and Bhandarkar S.D.	Pharmacology and Pharmacotherapeutics	Popular Prakasan	2009
2	Mycek M.J-Gelnet S.B and Perper M.M.	Lippincott's illustrated Reviews-Pharmacology	Harvery	1992
3	Lawrence L brunton	Goodman and Gilman's- The Pharmacological basis of therapeutics	CBS Publishers- Delhi.	2011

**WEBSITES:**

- [www.libguides.utep.edu](http://www.libguides.utep.edu)
- [www.pharmacology2000.com](http://www.pharmacology2000.com)
- [www.pharmacologycorner.com](http://www.pharmacologycorner.com)

15PYU514

SEMESTER-V

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**PHARMACOLOGY & THERAPEUTICS LABORATORY – I    3H    2C**

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Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The main purpose 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-physicochemical 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.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

**Course Outcomes (CO's):**

On successful completion of the course the student will

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/subcellular/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. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.
6. Comprehend the principles of toxicology and treatment of various poisonings.

**Course Content:**

1. Commonly used Apparatus/instruments in experimental pharmacology.
2. Commonly used laboratory animals and their handling.
3. Maintenance of laboratory animals- regulations of animal use and Ethical requirements according to CPCSEA.
4. Some common laboratory techniques: Blood withdrawal –plasma and serum separation-
5. Anesthetics used for animal studies-procedures for rendering animal unconscious and chemical euthanasia.

6. Study of different routes of drugs administration in mice/rats.
7. To study the effect of hepatic microsomal enzyme inhibitors and inducers on the Phenobarbitone sleeping time in mice.
8. Experiments on Central nervous system: Recording of spontaneous motor activity- stereotype activity -anti-catatonic activity-analgesic activity-anti convulsant
9. Local anesthetic activity of drugs by suitable animal model.
10. Effect of autonomic drugs on rabbit's eye.
11. Diuretic activity of drugs in rats.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M. N. Ghosh.	Fundamentals of Experimental Pharmacology	Hilton and company	2015

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kulkarni.S.K. Easton.	Handbook of Experimental Pharmacology	Elsevier	2006

**WEBSITES:**

- [www.libguides.utep.edu](http://www.libguides.utep.edu)
- [www.pharmacology2000.com](http://www.pharmacology2000.com)
- [www.pharmacologycorner.com](http://www.pharmacologycorner.com)

**15PYU505****BIOPHARMACEUTICS & PHARMACOKINETICS****SEMESTER-V****3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Course enables the student to understand and appreciate the absorption, distribution, metabolism and excretion of drugs and to overcome various incompatibilities.
- This subject places emphasis on the dependence of drug absorption on the physical and chemical nature of drug substances, the effect of dosage form in which it is designed.
- To understand the factors related to the physiologic and pathologic conditions of the subjects to which it is administered.
- This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arising there in.
- To know the drug molecule gets absorbed, distributed, metabolized and excreted.
- To know pharmacokinetic parameters.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know various incompatibilities and to overcome incompatibilities.
2. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
3. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
4. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
5. Understand various pharmacokinetic parameters, their significance & applications.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical Industries.
7. Understand various physicochemical properties of drug molecules in the designing the dosage forms.

**Course Content:****UNIT-I**

**Bio pharmaceutics** - definition – introduction- **Absorption** – definition – rate of drug absorption after administration - drug concentration in blood - biological factors in drug absorption - physico-chemical factors - dosage form consideration for gastrointestinal absorption.

**UNIT-II**

**Distribution of drugs** - definition - distribution in blood and other fluids - **Biotransformation of drugs** - definition - Phase I and Phase II reactions - Factors affecting biotransformation.

**UNIT-III**

**Excretion of drugs** - definition - renal excretion of drugs – glomerular filtration – tubular secretion – tubular reabsorption - factors affecting renal excretion – dialysis and haemoperfusion - non- renal routes of drug excretion.

**UNIT-IV**

**Pharmacokinetics** - Compartment models- a brief study of parameters like biological half life - apparent volumes of distribution - renal clearance - total body clearance – absorption - elimination rate constants and significance of the data.

**UNIT-V**

**Bioavailability and bio-equivalency testing** - Definitions - dosage forms - dissolution rate and bio-equivalency testing – biopharmaceutical classification system - **Incompatibilities** -definition – physical – chemical - therapeutic incompatibility – reason and correction of incompatibility – role of pharmacist in overcoming incompatibilities.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	D. M. Brahmanekar and Sunil B.Jaiswal-	Bio pharmaceuticals and Pharmacokinetics- A Treatise	Vallabh Prakashan Pitampura- Delhi	2011

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Lieberman and Lachman.	Pharmaceutical dosage forms: Disperse systems Vol-1-Vol-2- Vol-3	Informa healthcare	2008
2	Milo Gibaldi.	Biopharmaceutics and Clinical Pharmacokinetics	Lea and febiger	1991



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3	Leon Shargel and Andrew B.C.YU	Applied biopharmaceutics and pharmacokinetics-	Appleton & Lange	2004
4	Robert. E. Notari. B	Biopharmaceutics and Pharmacokinetics.	CBS publisher	2010

**WEBSITES:**

- [www.picscheme.org](http://www.picscheme.org)
- [www.ijper.org](http://www.ijper.org)
- [www.pharmpress.org](http://www.pharmpress.org)

15PYU515

SEMESTER-V

**BIOPHARMACEUTICS & PHARMACOKINETICS LABORATORY 3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Course enables the student to understand and appreciate the absorption, distribution, metabolism and excretion of drugs and to overcome various incompatibilities.
- This subject places emphasis on the dependence of drug absorption on the physical and chemical nature of drug substances, the effect of dosage form in which it is designed.
- To understand the factors related to the physiologic and pathologic conditions of the subjects to which it is administered.
- This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arising there in.
- To know the drug molecule gets absorbed, distributed, metabolized and excreted.
- To know pharmacokinetic parameters.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know various incompatibilities and to overcome incompatibilities.
2. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
3. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
4. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
5. Understand various pharmacokinetic parameters, their significance & applications.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical Industries.
7. Understand various physicochemical properties of drug molecules in the designing the dosage forms.

**Course Content:**

1. Determination of pseudo first order kinetics and half life.
2. Determination of second order kinetics.
3. Dissolution studies of any marketed drug.
4. Improvement of dissolution characteristics of slightly soluble drugs.

5. Protein binding studies of a highly protein bound drug and poorly protein bound drug.
6. Calculation of  $k_a$ ,  $k_e$ ,
7. Calculation of  $t_{1/2}$ ,  $C_{max}$ .
8. Calculation of bioavailability from urinary excretion data for drugs.
9. Calculation of bioavailability from systemic circulation data for drugs.
10. Calculation of AUC and bioequivalence from the given data for drugs.

**TEXT BOOKS:**

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	D. M. Brahmankar and Sunil B.Jaiswal-	Bio pharmaceuticals and Pharmacokinetics- A Treatise	Vallabh Prakashan Pitampura- Delhi	2011

**REFERENCES:**

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Remington	The science and practice of pharmacy- 20th edition Pharmaceutical Science	Lippincott williamson	2000

**WEBSITES:**

- [www.picscheme.org](http://www.picscheme.org)
- [www.ijper.org](http://www.ijper.org)
- [www.pharmpress.org](http://www.pharmpress.org)

15PYU601

SEMESTER-VI

**ADVANCED PHARMACOGNOSY – II****3H****3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The department is to acquaint the students with the basic knowledge of the natural products.
- Students engaged in pharmacy and in other health professionals should know the role of natural products in discovery of drugs and their use and application in eradicating ailments.
- The students are given sufficient knowledge to be able to describe the modern methods of extraction and purification of crude drugs.
- To learn and understand the techniques involved in the herbal drug-cosmetic preparation and their Standardization.
- The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.
- To know the techniques in the cultivation and production of crude drugs.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand the preparation and development of herbal drugs as per GMP guidelines.
2. Explain the plant toxins and their adverse drug reactions.
3. Understand the different types of plant tissue culture.
4. Perform the isolation and purification of enzymes.
5. Understand the preparations and standardization of ayurvedic formulations.
6. Elaborate the Herbal-Drug interaction, Edible Vaccine.

**Course Content:****UNIT I**

**WHO Guidelines for the assessment of Herbal Medicine and Cosmetics** – introduction – standardization involving ash and extractives values – foreign matter – volatile matter – moisture content determination – evaluation – classification of evaluation methods of herbal medicine and cosmetics.

**UNIT II**

**Basic principles involved in the alternative system of medicine** viz–Ayurveda–Siddha–Unani and Homeopathy– Preparation and standardization of Ayurvedic formulations – Aristas –Asawas – Ghutika– Churna–Leha and Bhasma.

**UNIT III**

**Plant Toxins and adverse drug reactions** – Natural allergens–Hallucinogens- Teratogens - Industrial production and pharmaceutical application of phytoconstituents such as – Sennosides - Cardiac glycosides - Vinca alkaloids - Quinoline alkaloids – Menthol - Citric acid – Podophyllotoxin – Diosgenin - Solasodine, and Tropane alkaloids.

**UNIT IV**

**Plant tissue culture** -Historical development- nutritional requirements -growth and their maintenance-applications of plant tissue culture and types of cultures related to cell suspension culture-callus culture-hairy root culture and protoplast culture.

**UNIT V**

**Enzyme Biotechnology** - Introduction-general methods of isolation-purification and application of immobilized enzymes – Biological sources-methods of preparation-chemical nature and uses of - Papain-Pepsin- Trypsin- Pancreatin– Asparaginase- urokinase –Herbal-Drug interaction -Edible Vaccine.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kokate C-K- Purohit A-P- Gokhale S-B	Text book of Pharmacognosy	Nirali prakasan	2008

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Trease and Evans	Pharmacognosy	W-B Saunders	2002
2	James Robbers- Marilyn K- Speedice and Varro E-- Tyler	Pharmacognosy and Pharmacobiotechnology	Williams and Wilkins	1996
3	TE Wallis	Textbook of Pharmacognosy	CBS publishers and Distributors- New Delhi	2005
4	A.N.Kalia	Textbook of industrial Pharmacognosy	CBS publishers and Distributors- New Delhi	2005

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4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007
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**WEBSITES:**

- [www.autorstream.com](http://www.autorstream.com)
- [www.e Pharmacognosy.com](http://www.e Pharmacognosy.com)
- [www.science20.com](http://www.science20.com)

**15PYU611****ADVANCED PHARMACOGNOSY LABORATORY – II****SEMESTER-VI****3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The department is to acquaint the students with the basic knowledge of the natural products.
- Students engaged in pharmacy and in other health professionals should know the role of natural products in discovery of drugs and their use and application in eradicating ailments.
- The students are given sufficient knowledge to be able to describe the modern methods of extraction and purification of crude drugs.
- To learn and understand the techniques involved in the herbal drug-cosmetic preparation and their Standardization.
- The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.
- To know the techniques in the cultivation and production of crude drugs.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Describe the isolation of the Phytoconstituents.
2. Prepare the hair care preparation.
3. Prepare the skin care the preparation.
4. Demonstrate the Amino acid by ascending chromatography.
5. Perform the Thin layer chromatography of Curcumin.
6. Understand the isolation and formulation procedure.

**Course content:**

1. Preparation and standardization of Herbal medicine
  - I. Turmeric
  - II. Garlic
2. Preparation and standardization of Herbal cosmetics
  - I. Shampoos
  - II. Creams
  - III. Lipsticks
3. Preparation and standardization of Ayurvedic formulation leghya
4. Demonstration experiment on plant tissue culture
5. Extraction of volatile oils
  - I. Menthol oil
  - II. Coriander oil
  - III. Fennel oil

## 6. Isolation of a plant enzyme

- I. Papain
- II. Pepsin

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.K. Kokate.	Practical Pharmacognosy- III edition-	Nirali prakashan	2011

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vinod. D. Rangari	Pharmacognosy and Phytochemistry I edition- vol- I &II	Carrier publications	2009

**WEBSITES:**

- [www.authorstream.com](http://www.authorstream.com)
- [www.e Pharmacognosy.com](http://www.e Pharmacognosy.com)
- [www.science20.com](http://www.science20.com)



15PYU602

**PHARMACEUTICAL BIOTECHNOLOGY – II****SEMESTER-VI****3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This paper has been designed to provide the advanced knowledge to the Pharmacy students in valuable areas of advanced Biotechnology.
- To play a crucial role in determining its future use and applications in medicine- drug discovery and in pharmaceutical industry.
- It also emphasize the study of microbiological and biotechnological processes.
- To know modern technology aspects to useful products and to correct the alternative ways to prevent the occurrence and the treatment of disease related to microorganisms and techniques.
- To understand methods of identification- cultivation and preservation of various microorganisms.
- To understand Genetic engineering applications in relation to production of pharmaceuticals.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the importance of immunological reactions and preparations of immunological products.
2. Do sterilization of various equipments/products and bacterial sensitivity testing against antibiotics and disinfectants.
3. Know the anatomy, identification, growth factors and sterilization of microorganisms;
4. Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
5. Do estimation of RNA and DNA and there by identifying the source;
6. Do cultivation and identification of the microorganisms in the laboratory;
7. Do identification of diseases by performing the diagnostic tests; and
8. Appreciate the behavior of motility and behavioral characteristics of microorganisms.

**Course Content:****UNIT I**

**Bio process technology- Introduction to fermentation technology-** study- design and operation of Fermenter -Bioprocess of the following metabolites – Alcohol- Citric acid- Penicillin - Vitamin B12- and Glutamic acid.

**UNIT II**

**Enzyme biotechnology** – Introduction- classification and uses -Techniques of immobilization - Application- biosensors and their application.

**UNIT III**

**Immunology and Immune Biotechnology**– Introduction- types of Immunity- antigen and haptens- antibodies – antigen- antibody reactions- complementary systems- structure and function of MHC- antigen recognition and presentation – hypersensitivity- Hypersensitivity response-immuno stimulation and suppression and Auto immune disorders –**Immunization** - Definition – types – preparation- standardization and application of official vaccines – containerization- storage conditions and stability of official vaccines -Hybridoma technology.

**UNIT IV**

**Monoclonal antibodies** - Introduction- Techniques of production and purification of monoclonal antibodies- Application of monoclonal antibodies -Immuno blotting techniques such ELISA- Western Blot- Southern Blot- Northern blot.

**UNIT V**

**Animal Biotechnology** - Introduction to animal tissue culture – characters- general procedure for the maintenance of cell culture- Nutritional requirements- Primary and established cell culture and application of animal tissue culture.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ananthanarayanan and Paniker--	Text Book of Microbiology	Orient black swam	2015

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Pelzer- Krieg and Chan	Microbiology	ABE books	1986
2	John A Wiley	Prescott's Microbiology	Prescott's	2011
3	R-Y- Stainer	General Microbiology	Mac millan	1952

**WEBSITES:**

- [www.msbiotech.edu](http://www.msbiotech.edu)
- [www.biotechinstitute.org](http://www.biotechinstitute.org)
- [www.biospace.org](http://www.biospace.org)

15PYU612

SEMESTER-VI

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**PHARMACEUTICAL BIOTECHNOLOGY LABORATORY-II      3H      2C**

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Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This paper has been designed to provide the advanced knowledge to the Pharmacy students in valuable areas of advanced Biotechnology.
- To play a crucial role in determining its future use and applications in medicine- drug discovery and in pharmaceutical industry.
- It also emphasize the study of microbiological and biotechnological processes.
- To know modern technology aspects to useful products and to correct the alternative ways to prevent the occurrence and the treatment of disease related to microorganisms and techniques.
- To understand methods of identification- cultivation and preservation of various microorganisms.
- To understand Genetic engineering applications in relation to production of pharmaceuticals.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the importance of immunological reactions and preparations of immunological products.
2. Do sterilization of various equipments/products and bacterial sensitivity testing against antibiotics and disinfectants.
3. Know the anatomy, identification, growth factors and sterilization of microorganisms;
4. Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
5. Do estimation of RNA and DNA and there by identifying the source;
6. Do cultivation and identification of the microorganisms in the laboratory;
7. Do identification of diseases by performing the diagnostic tests; and
8. Appreciate the behavior of motility and behavioral characteristics of microorganisms.

**Course Content:**

1. Production of alcohol and wine by fermentation process.
2. Immobilization techniques – Whole cells- Enzymes
3. Solid media inoculation – streak plate, pour plate.
4. Motility study by hanging drop method.
5. Staining preparation – negative staining.
6. Microbiological assay – well plate method.
7. Biochemical test
8. Determination of minimum inhibitory concentration.

**TEXT BOOKS:**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	James G-Cappuchino	Microbiology – A laboratory manual	Pearson	2013

**REFERENCES:**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Mackie and McCartney	Practical Medical Microbiology	Elsevier	1996

**WEBSITES:**

- [www.msbiotech.edu](http://www.msbiotech.edu)
- [www.biotechinstitute.org](http://www.biotechinstitute.org)
- [www.biospace.org](http://www.biospace.org)

15PYU603

SEMESTER-VI

MEDICINAL CHEMISTRY- I

3H

3C

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Course Outcomes:**

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Know the Structural Activity Relationship (SAR) of different class of drugs.
6. Write the chemical synthesis of some drugs.

**Course Content:**

*Study of classification - mechanism of action (biochemical and molecular basis) - structure activity relationship including stereo chemical aspects - physiochemical properties and synthesis of selected drugs (only drugs marked with asterisk) on the following categories of drugs.*

**UNIT I**

**Drugs acting on Autonomic Nervous System- Neurotransmitters- Sympathomimetic agents-SAR of Sympathomimetic agents-Direct acting-**Nor-epinephrine- Epinephrine- Phenylephrine\*- Dopamine- Methyldopa- Clonidine\*- Salbutamol\*- Oxymetazoline and Xylometazoline-**Indirect acting agents:** Hydroxyamphetamine **Adrenergic Antagonists- Alpha adrenergic blockers-**Tolazoline\*- Phentolamine\*- **-Beta adrenergic blockers:** SAR of beta blockers- Propranolol\*- **Cholinergic neurotransmitters-**Biosynthesis and catabolism of acetylcholine-Cholinergic receptors system (muscarinic & nicotinic) and their distribution-**Parasympathomimetic agents-SAR of Parasympathomimetic agents-Direct acting agents:** Acetylcholine- Carbachol\*- Pilocarpine- **Indirect acting/Cholinesterase inhibitors (Reversible & Irreversible):** Physostigmine- Neostigmine- Pyridostigmine\*- Isofluorophate- **Cholinesterase reactivators:** Pralidoxime chloride- **Cholinergic Blocking agents- SAR of cholinolytic agents-**Solanaceous alkaloids and analogues- -

Ipratropium bromide\*. **Synthetic cholinergic blocking agents:** Dicyclomine hydrochloride\*- Biperidine hydrochloride- Procyclidine hydrochloride\*- Tridihexethyl chloride- **-Ganglionic blocking agents**-Trimethaphan camsylate- mecamlamine-**Neuromuscular blocking agents:** Metocurine Iodide- pancuronium bromide- **Local Anesthetics-** SAR of Local anaesthetics-**Benzoic Acid derivatives**-Cocaine- **Amino Benzoic acid derivatives** Benzocaine\*- Butamben- Procaine\*- Butacaine- Propoxycaine- Tetracaine- Benoxinate-**Lidocain/Anilide derivatives-** Lignocaine\*- Mepivacaine- Prilocaine- Etidocaine- **Miscellaneous-** Dibucaine\*

## UNIT II

**Drugs acting on Central Nervous System - General anesthetics - Inhalation anesthetics-** Halothane\*- Methoxyflurane\*- **Dissociative anesthetics -** Ketamine hydrochloride\*- **Sedatives and Hypnotics – Benzodiazepines -**SAR of Benzodiazepines- Chlordiazepoxide\*- Diazepam **Barbiturates -**SAR of barbiturates- Barbitol\*- Phenobarbital – Mephobarbital –Amobarbital – Butobarbital – Pentobarbital – Secobarbital –**Miscellaneous - Amides & imides –** Glutethimide - **Alcohol & their carbamate derivatives –** Meprobamate-**Aldehyde & their derivatives -** Triclofos sodium\*- Paraldehyde.

**Skeletal Muscle relaxants –** Methocarbamol – **Antipsychotics – Phenothiazines -** SAR of Phenothiazines - Chlorpromazine hydrochloride\*- Prochlorperazine maleate\*- Trifluoperazine hydrochloride- **Chlorprothixene–** Thiothixene- Loxapine succinate – Clozapine- **Fluorobutyrophenones –** Haloperidol – Droperidol – Risperidone- **Beta amino ketones –**MolindoneHcl– **Benzamides–** Sulpieride.

## UNIT III

**Drugs acting on Central Nervous System - Anticonvulsants -**SAR of Anticonvulsants - mechanism of anticonvulsant action **Hydantoins -**Phenytoin\*- Mephenytoin – Ethotoin - **Oxazolindione diones -**Trimethadione\*- Paramethadione – **Succinimides –**Phensuximide- Ethosuximide\* - **Urea and monoacylureas-** Carbamazepine\* - **Benzodiazepines-** Clonazepam**Miscellaneous –**Primidone- Valproic acid\* - **CNS stimulants – Analeptics-** Nikethamide\*- Caffeine – Theophylline – Theobromine- **Psychomotor stimulants –**Amphetamine- Dextroamphetamine sulphate\*- Methamphetamine – Chorphentermine- **MAO inhibitors-** Phenelzine sulphate – Isocarboxazid – Tranlycypromine- Pargyline hydrochloride- **Tricyclic anti-depressants -** Amitriptyline hydrochloride\*- Nortriptyline- Imipramine hydrochloride\*

## UNIT IV

**Drugs acting on Cardiovascular System- Anti-anginal- Vasodilators -**Amyl nitrite- Nitroglycerin\*- Pentaerythritol tetranitrate- Isosorbide dinitrite\*- Dipyridamole - **Calcium channel blockers –**Verapamil- Bepridil hydrochloride- Diltiazem hydrochloride – Nifedipine – Amlodipine – Felodipine – Nicardipine – Nimodipine – **Cardiotonics –**Digoxin – Digitoxin - Deslanoside - **Anti-arrhythmic Drugs-** Quinidine sulphate- Procainamide hydrochloride- Disopyramide phosphate\*- Phenytoin sodium- Lidocaine hydrochloride- Tocainide hydrochloride Mexiletine hydrochloride- Lorcaïnide hydrochloride- amiodarone and Sotalol - **Anti-hypertensive Agents–** timolol – Captopril – Lisinopril – Enalapril- Benazepril hydrochloride- Quinapril hydrochloride - Methyldopate

hydrochloride\* - Clonidine hydrochloride- Guanethidine monosulphate\*- Guanabenz acetate- Sodium nitroprusside – Diazoxide – Minoxidil – Reserpine- Hydralazine hydrochloride.

## UNIT V

**Drugs acting on Cardiovascular System - Diuretics-Carbonic anhydrase inhibitors - Acetazolamide\*- Methazolamide – Dichlorphenamide - Thiazides-Chlorthiazide\*- Hydrochlorothiazide\*- Hydroflumethiazide – Cyclothiazide-Loop diuretics -Furosemide\*- Bumetanide- Ethacrynic acid - Potassium sparing Diuretics– spironolactone – Triamterene- Amiloride\*- Miscellaneous –Mannitol- and Theophylline-Anti-hyperlipidemic agents – Clofibrate – lovastatin - cholestamine and cholestipol - Coagulant & Anticoagulants – menodione – acetomenadione - Warferin\*- phenindione - Oral hypoglycemic agents – tolbutamide – metformin – glipizide – pioglitazone – acarabose - Thyroid & Antithyroid - L-Thyroxine - L-Thyronine – Propylthiouracil - Methimazole.**

## TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William Foye	Foye's Principles of Medicinal Chemistry- 5th edition-	LWW	2002

## REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Wilson and Gisvold's	Wilson and Gisvold's Organic medicinal and Pharmaceutical Chemistry-	11th edition	2003
2	Burger	Burger's Medicinal Chemistry Vol I to IV	Wiley	2010
3	K-D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

## WEBSITES:

- [www.rsc.org](http://www.rsc.org)
- [www.acs.org](http://www.acs.org)
- [www.medicinalchemistry.org](http://www.medicinalchemistry.org)



**15PYU613****SEMESTER-VI****MEDICINAL CHEMISTRY LABORATORY– I****3H****2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Course Outcomes:**

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Know the Structural Activity Relationship (SAR) of different class of drugs.
6. Write the chemical synthesis of some drugs.

**Course Content:**

- I. Preparation of medicinally important compounds or intermediates required for synthesis of drugs (5 compounds)
- II. Monograph analysis of selected drugs from course content (2 compounds)
- III. Assay of Selected drugs from course content prescribed as per I-P or B-P (2 compounds)

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	A-I-Vogel	Text book of practical organic chemistry	Dorling Kindersely	2008

**REFERENCES:**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Ashutoshkar	Ashutoshkar's Medicinal Chemistry	New Age International	2007

**WEBSITES:**

- [www.rsc.org](http://www.rsc.org)
- [www.acs.org](http://www.acs.org)
- [www.medicinalchemistry.org](http://www.medicinalchemistry.org)

15PYU604

SEMESTER-VI

**PHARMACOLOGY & THERAPEUTICS –I      3H      3C**

Instruction hours/ week: L: 3 T: 1 P:0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The main purpose 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-physicochemical 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.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

**Course Outcomes:**

On successful completion of the course the student will

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. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.
6. Comprehend the principles of toxicology and treatment of various poisonings.

**Course Content:****UNIT I**

**Pharmacology of Central Nervous System** – Neurohumoral transmission in the CNS with special emphasis on pharmacology of various neurotransmitters like histamine-serotonin –dopamine– gaba-

glutamate and glycine- **general anesthetics**- alcohol and disulfiram- sedatives-hypnotics and centrally acting muscle relaxants.

## UNIT II

**Pharmacology of Central Nervous System - Psychopharmacological agents**–Anti psychotics– antidepressants- anti-anxiety agents-anti-manics and hallucinogens-**Anti-epileptic drugs**- Drugs used in Parkinsonism and Alzheimer's disease-**Narcotic analgesics and antagonists**-CNS stimulants and Nootropics- Drug addiction-drug abuse-tolerance and dependence.

## UNIT III

**Pharmacology of Cardiovascular System** - Introduction to hemodynamic and Electrophysiology of heart- **Anti-hypertensive drugs**-**Anti-anginal drugs**-**Anti-arrhythmic drugs**.

## UNIT IV

**Drugs acting on Cardiovascular System** – Drugs used in congestive heart failure- **Anti-hyperlipidemic drugs** –Haematinics- anticoagulants and haemostatic agents- Fibrinolytics and antiplatelet drugs- Blood and plasma volume expanders.

## UNIT V

**Drugs acting on Respiratory System** -anti-asthmatic drugs- Anti-tussives and expectorants- Respiratory stimulants – Mucolytics and nasal decongestants.

### TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	K-D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

### REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Satoskar R-S and Bhandarkar S-D	Pharmacology and Pharmacotherapeutics	Popular Prakashan	2009
2	Mycek M-J- Gelnet S-B and	Lippincott's illustrated Reviews-Pharmacology	Harvery	1992

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	Perper M-M			
3	Lawrence L brunton	Goodman and Gilman's- The Pharmacological basis of therapeutics	CBS Publishers- Delhi-	2011

**WEBSITES:**

- [www.libguides.utep.edu](http://www.libguides.utep.edu)
- [www.pharmacology2000.com](http://www.pharmacology2000.com)
- [www.pharmacologycorner.com](http://www.pharmacologycorner.com)

15PYU614

SEMESTER-VI

**PHARMACOLOGY & THERAPEUTICS –I LABORATORY****3H****2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The main purpose 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-physicochemical 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.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

**Course Outcomes:**

On successful completion of the course the student will

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. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.
6. Comprehend the principles of toxicology and treatment of various poisonings.

**Course Content:**

1. Recording of spontaneous motor and anti-inflammatory activity.
2. Evaluation of skeletal muscle relaxant activity of drugs in animals.
3. Recording of analgesic and anti-convulsant activity.
4. Statistical calculations in experimental pharmacology such as Students-t-test.
5. Statistical calculations in experimental pharmacology such as ANOVA.
6. Study of different routes of drugs administration in mice.

7. Study of different routes of drugs administration in rat.
8. To study the effect of hepatic microsomal enzyme inhibitors in mice.
9. To study the effect of hepatic microsomal enzyme inducers on the Phenobarbitone sleeping time in mice.
10. Local anesthetic activity of drugs by suitable animal model.
11. Effect of autonomic drugs on rabbit's eye.
12. Diuretic activity of drugs in rats.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M-N-Ghosh	Fundamentals of Experimental Pharmacology	Hilton and company	2015

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kulkarni-S-K- Easton	Handbook of Experimental Pharmacology	Elsevier	2006

**WEBSITES:**

- [www.libguides.utep.edu](http://www.libguides.utep.edu)
- [www.pharmacology2000.com](http://www.pharmacology2000.com)
- [www.pharmacologycorner.com](http://www.pharmacologycorner.com)

15PYU605

SEMESTER-VI

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**PHARMACEUTICAL JURISPRUDENCE  
AND DRUG BUSINESS MANAGEMENT    3H    3C**

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Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The subject deals with several important legislations related to the profession of pharmacy in India.
- The Drugs and Cosmetics Act- along with its amendments is the core of this course- Other acts- which are covered- include the Pharmacy Act- dangerous drugs- medicinal and toilet preparation Act etc- Besides this the new drug policy- professional ethics- DPCO- patent and design Act will be discussed.
- This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, and drug products in regulated markets of India & other countries like US, EU, Japan, Australia, UK etc.
- It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products.
- The pharmaceutical industry not only needs highly qualified researchers, chemists and, technical people, but also requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry.
- The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know and understand the Pharmaceutical legislations and their implications in the development and marketing .
2. Understand and follow the code of ethics during the pharmaceutical practice.
3. Know and understand various Indian pharmaceutical acts and laws.
4. Know about the process of drug discovery and developments.
5. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals.
6. Know the regulatory approval process and their registration in Indian and international markets.

**Course Content:****UNIT I**

**Definition and scope of Forensic Pharmacy-** Pharmacist's role in drug treatment- drug usage and pharmacist as a member of health care team.



**UNIT II**

**Pharmaceutical legislation in India** - Historical development of Pharmaceutical education in India and its present status- Professional ethics in Pharmacy practice- legal and ethical responsibilities of Pharmacists.

**UNIT III**

**Concept of Management**-Administrative management (Planning- Organizing- Staffing- Directing and Controlling)- Entrepreneurship Development and Operative Management- (Personnel- Materials- Production- Financial Marketing- Time/Space Margin / Morale).

**UNIT IV**

**Pharmaceutical marketing**– Functions – buying – selling – transportation – storage – finance – insurance – feedback – information- channels of distribution – wholesale- retail departmental store- multiple shops and mail order business.

**UNIT-V**

**Salesman ship** -Principles of sales promotion – advertising- ethics of sales merchandising – literature – detailing – recruitment – training- evaluation and compensation to the pharmacist.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	N-K- Jain	A text book of Forensic Pharmacy	Vallbh Prakashan	2011

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	B-M- Mithal	Text book of Forensic Pharmacy	Vallabh Prakashan- Delhi	2010
2	-	Narcotic drugs and psychotropic substances act	Govt- of India publications	2014
3	M-L- Mehra	Hand book of drug law	<u>Universal Book Traders, Delhi</u>	2002

**WEBSITES:**

- [www.pvbooks.in](http://www.pvbooks.in)
- [www.pharmacy.nz](http://www.pharmacy.nz)
- [www.schoolsoup.in](http://www.schoolsoup.in)

**15PYU606****HOSPITAL AND CLINICAL PHARMACY****SEMESTER-VI****3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This course is designed to impart basic knowledge and skills that are required for the practice of pharmacy in both hospital and community settings.
- Conduct sufficiently thorough and accurate patient assessments
- Explain and properly dispense commonly used medications, formulations, and drug products.
- Identify and assess drug related problems relative to specific patient cases.
- The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.
- The purpose of this course is to introduce to students a number of health issues and their challenges.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand the various drug distribution system
2. Handle the prescriptions and manage community pharmacies
3. Understand the elements of pharmaceutical care and provide comprehensive patient care services
4. Understand the concept and practice of the quality use of medicines
5. Summarize the therapeutic approach for management of various diseases including Reference to the latest available evidence.
6. Evaluate alternative ways of solving problems related to health and pharmaceutical issues.

**Course Content:****UNIT-I****Organisation and structure** -Organisation of a hospital- hospital pharmacy- Responsibilities of a hospital pharmacist- Pharmacy and Therapeutic committee- Budget preparation and Implementation.**UNIT-II****Hospital formulary** – Contents- drug profile- preparation and revision of hospital formulary.**UNIT-III****Purchase-Distribution and inventory control of drugs in hospitals** - Purchasing Procedures - Dispensing of drugs to outpatients and inpatients - Types of distribution of drugs and charging policies in Hospital- Dispensing of Controlled drugs.

**UNIT-IV**

**Central sterile supply unit and their management** -Types of materials for sterilization- packing of materials prior to sterilization- sterilization equipments and supply of sterile materials.

**UNIT-V**

**Drug information services**-Drug information centre- sources of information on drugs- disease treatment schedules- procurement of information- computerized services (e-g- MEDLINE)- retrieval of information.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S-H- Merchant and J-S- Qadry	A textbook of Hospital Pharmacy	Mc Graw hill New Delhi	2004

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Malcom	Clinical Pharmacokinetics concepts and Application	Lippincotts Williams and wilcoms	2007
2	G- Parthasarathy- Karin Nyfort- Hansen- Milap C- Nahara	A text book of clinical Pharmacy Practice- Essential concepts and skills	Orient Black swam	2004
3	Sartaray Hiage	Textbook of Biopharmaceutics and Clinical Pharmacokinetics	CRC Book House	2014

**WEBSITES:**

- [www.jpp.sagepub.com](http://www.jpp.sagepub.com)
- [www.jrpp.net](http://www.jrpp.net)
- [www.pharmacypractice.com](http://www.pharmacypractice.com)

15PYU701

SEMESTER-VII

FORMULATIVE &amp; INDUSTRIAL PHARMACY –I 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.
- This gives a knowledge of preformulation studies and stability studies
- Different machinery used for various steps in manufacture of various dosage forms. Formulation and evaluation of dosage forms and their advantages over other dosage forms.
- This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market.
- To know the various pharmaceutical dosage forms and their manufacturing techniques.
- To know various considerations in development of pharmaceutical dosage forms.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid and novel drug delivery system .
4. Know evaluation of pharmaceutical dosage forms.
5. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation
6. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

**Course Content:****UNIT I**

**Preformulation studies**-Study of physical properties of drugs like physical form- particle size – shape – density – wetting- dielectric constant – solubility –dissolution - organoleptic property and their effect on formulation- stability and bioavailability.

**UNIT II**

**Stability studies** -Study of chemical properties of drugs like hydrolysis – oxidation – reduction – racemisation – polymerization - their influence on formulation and stability of products-Stabilization and stability testing protocol for various pharmaceutical products.

**UNIT III**

**Liquid Dosage forms** – Introduction - types of additives used in formulations – vehicles – stabilizers – preservatives - suspending agents - emulsifying agents – solubiliser – colours – flavours – manufacturing - packaging and evaluation of clear liquids - **Semisolid dosage form** - definition – types – general formulation - evaluation and packaging of semisolids.

#### UNIT IV

**Cosmeticology and cosmetic preparation** - Fundamentals of cosmetic science - Structure and functions of skin and hair – Formulation – Evaluation - packaging of cosmetics for skin – hair - dentifrices and manicure preparations - nail polish – lipsticks - eye lashes - baby care products - **Pharmaceutical Aerosols** – Definition – propellants - general formulation – manufacturing - packaging methods - pharmaceutical applications and evaluation.

#### UNIT V

**Sterile pharmaceutical products** -Formulation – requirements - evaluation of injectable solutions - suspensions and sterile powders - containers and closures - Total parenteral nutrition (TPN) & IV additives -**Ophthalmic preparations** – Requirements – formulation - methods of preparation - containers and evaluation.

#### TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Liberman and Lachman.	Pharmaceutical dosage forms- Disperse systems Vol-1-Vol-2- Vol-3	Informa healthcare	2008

#### REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Banker and Gilberts	Modern pharmaceutics	Marcel dekker	2002
2	Liberman and Lachman.	Pharmaceutical dosage forms- parenteral medication Vol-1 & Vol-2	Informa healthcare	2008
3	H.C. Ansel	Pharmaceutical Dosage form and Drug delivery system	New Delhi	2000
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007
5	Remington	Science and Practice of Pharmacy	Philadelphia	2005

## **WEBSITES**

- **[www.picscheme.org](http://www.picscheme.org)**
- **[www.ijper.org](http://www.ijper.org)**
- **[www.pharmpress.org](http://www.pharmpress.org)**

15PYU711

SEMESTER-VII

**FORMULATIVE & INDUSTRIAL PHARMACY LABORATORY –I    3H    2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.
- This gives a knowledge of preformulation studies and stability studies
- Different machinery used for various steps in manufacture of various dosage forms. Formulation and evaluation of dosage forms and their advantages over other dosage forms.
- This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market.
- To know the various pharmaceutical dosage forms and their manufacturing techniques.
- To know various considerations in development of pharmaceutical dosage forms.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid and novel drug delivery system.
4. Know evaluation of pharmaceutical dosage forms.
5. To understand the criteria for selection of drugs and polymers for the development of
6. Novel drug delivery systems, their formulation and evaluation
7. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

**Course content:****Preformulation studies**

1. Determination of flowability of powder by assessing compressibility index
2. Determination of flow property by assessing angle of repose.
3. Determination of effect of glidants
4. Determination of effect of different concentration of glidants.
5. Evaluation of liquid dosage forms.
6. Evaluation of semi solid dosage form.

**Cosmetic preparations**

7. Formulation of face powder.
8. Formulation of shampoo.



9. Formulation of lipstick.
10. Manufacture of parenterals.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Lieberman & Lachman	Theory And Practice Of Industrial Pharmacy	Lea and febiger	1986

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Remington	The science and practice of pharmacy- 20th edition Pharmaceutical Science	Lippincott Williamson	2000
2	The Indian Pharmacopoei a Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007

**WEBSITES**

- [www.picscheme.org](http://www.picscheme.org)
- [www.ijper.org](http://www.ijper.org)
- [www.pharmpress.org](http://www.pharmpress.org)

15PYU702

SEMESTER-VII

**INSTRUMENTAL METHODS OF PHARMACEUTICAL ANALYSIS – I 4H 4C**

Instruction hours/ week: L: 3 T: 1 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject is designed to impart a fundamental knowledge on the testing of drugs by various instrumental methods of analysis.
- This focuses on various modern instruments that are used for testing the purity of drugs in various dosage forms.
- course also gives knowledge about modern instruments that are used for drug testing like NMR- IR- Mass- HPLC- HPTLC etc.
- This course deals with the fundamentals of analytical chemistry and principles of electro chemical analysis of drugs.
- To know the principle and applications of instrumentation
- To understand the components and working of various analytical instruments.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the principle and applications of instrumentation
2. Understand the components and working of various analytical instruments.
3. Understand the different modern techniques of drug analysis.
4. Appreciate the advantages of instrumental methods of drug analysis.
5. Understand the principles of volumetric and electro chemical analysis.
6. Carry out various volumetric and electro chemical titrations.
7. Develop analytical skills.

**Course Content:****UNIT I**

**UV/Visible spectroscopy**-Theory of atomic and molecular spectra- Electronic transitions- Beer and Lambert's law- Derivation and deviations- Applications of Beer law to single and multi component systems – Chromophores – Auxochromes- Spectral shifts- Solvent effect on absorption spectra - Instrumentation - Sources of radiation- wavelength selectors- sample cells – Detectors- Barrier layer cell- Photo tube- Photomultiplier tube- Silicon Photodiode -Applications - Spectrophotometric titrations- Measurement of equilibrium constant and rate constant -**Fluorimetry** – Theory- Concepts of singlet- doublet and triplet electronic states- internal and external conversions- factors affecting fluorescence – quenching - Instrumentation and applications.

**UNIT II**

**IR spectroscopy** – Introduction- Fundamental modes of vibrations in poly atomic molecules - Sample handling- Instrumentation - Sources of radiation- wavelength selectors- sample cells- Detectors – Golay cell- Bolometer – Thermocouple – Thermister- Pyrroelectric detector - Structure – frequency correlation with examples.

**UNIT III**

**Atomic absorption spectroscopy** –Introduction- Theory- instrumentation- and applications-**Flame emission spectroscopy** – Introduction – Theory – Instrumentation-Interferences and applications-**Nephelometry and Turbidimetry** – Theory- Instrumentation and applications.

**UNIT IV**

**NMR Spectroscopy** - Principles- Instrumentation and applications.

**UNIT V**

**Mass Spectroscopy** - Principles- Fragmentation- Instrumentation- applications - Introduction to MALDI and ICPMS.

**TEXT BOOKS**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Y.R. Sharma.	Organic Spectroscopy	S.chand	2010

**REFERENCES**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	K.A. Connors	Textbook of Pharmaceutical Analysis	Wiley-Interscience	1982
2	Gurdeep Chatwal	Instrumental methods of analysis	Mrs. Meena Pandey Himlaya Publishing house	1979
3	William Kemp	Spectroscopy	Palgrave Mc millon	2008

**WEBSITES**

- [www.jpr.info.com](http://www.jpr.info.com)
- [www.sciencedomain.org](http://www.sciencedomain.org)
- [www.pharmaresearchlibrary.com](http://www.pharmaresearchlibrary.com)

15PYU712

SEMESTER-VII

### INSTRUMENTAL METHODS OF PHARMACEUTICAL ANALYSIS LABORATORY – I

3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject is designed to impart a fundamental knowledge on the testing of drugs by various instrumental methods of analysis.
- This focuses on various modern instruments that are used for testing the purity of drugs in various dosage forms.
- course also gives knowledge about modern instruments that are used for drug testing like NMR- IR- Mass- HPLC- HPTLC etc.
- This course deals with the fundamentals of analytical chemistry and principles of electro chemical analysis of drugs.
- To know the principle and applications of instrumentation
- To understand the components and working of various analytical instruments.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the principle and applications of instrumentation
2. Understand the components and working of various analytical instruments.
3. Understand the different modern techniques of drug analysis.
4. Appreciate the advantages of instrumental methods of drug analysis.
5. Understand the principles of volumetric and electro chemical analysis.
6. Carry out various volumetric and electro chemical titrations.
7. Develop analytical skills.

**Course Content:**

1. Chromatographic analysis of some pharmaceutical products.
2. Exercises involving
  - a. Nephelo-turbidimeter
  - b. colorimeter
  - c. spectrophotometer
  - d. flamephotometer
3. Infra Red spectra peak identification for different functional groups.

**TEXT BOOKS**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Beckett and Stenlake	Practical Pharmaceutical Analysis	A & C Black	1988

**REFERENCES**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	R.M. Silverstein- John Wiley and Sons Inc.	Spectrometric identification of organic compounds	Heyden & sons Ltd	1969

**WEBSITES**

- [www.jpr.info.com](http://www.jpr.info.com)
- [www.sciencedomain.org](http://www.sciencedomain.org)
- [www.pharmaresearchlibrary.com](http://www.pharmaresearchlibrary.com)

15PYU703

SEMESTER-VII

**MEDICINAL CHEMISTRY- II****4H****4C**

Instruction hours/ week: L: 3 T: 1 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Course Outcomes:**

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Know the Structural Activity Relationship (SAR) of different class of drugs.
6. Write the chemical synthesis of some drugs.

**Course Content:**

*Study of classification - mechanism of action (biochemical and molecular basis) - structure activity relationship including stereo chemical aspects - physicochemical properties and synthesis of selected drugs (only drugs marked with asterisk) on the following categories of drugs.*

**UNIT I**

**Introduction to Drug Design- Principles of Drug Design**-Various approaches used in drug design- Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient- Hammett's electronic parameter- Taft's steric parameter and Hansch analysis- **Pharmacophore and docking technique**- **Prodrugs**- Basic concepts and application of prodrugs design -**Combinatorial Chemistry**- Concept and applications of combinatorial chemistry- solid phase and solution phase synthesis.

**UNIT II**

**Anti-infective agents- Local anti-infective agents**-Ethyl alcohol- Isopropyl alcohol – Formaldehyde-Sodium glutaraldehyde solution- Liquefied phenol- Hexachlorophene\*- Eugenol-

Hexyl resorcinol Anthralin- Hydrous benzoylperoxide- Halazone\*- Benzalkonium chloride Methylbenzethonium chloride\*- Cetylpyridinium chloride- Chlorhexidinegluconate\*- Gentianviolet- Methylene blue – Thiomersal- Methyl paraben and Sodium benzoate - **Antifungal agents- Antifungal antibiotics-** Amphotericin-B – Nystatin- Natamycin and Griseofulvin- **Synthetic Antifungal agents** –Clotrimazole- Econazole nitrate – Butoconazole- Oxiconazole nitrate – Tioconazole- Miconazole\*- Ketoconazole – Terconazole – Itraconazole – Fluconazole- Naftifine hydrochloride- Tolnaftate\*- Cyclopiroxolamine.

### UNIT III

**Anti-infective agents- Urinary tract anti-infective agents–Quinolones-** SAR of quinolones- Nalidixic Acid\*- Cinoxacin – Norfloxacin – Enoxacin – Ciprofloxacin – Ofloxacin- Lomefloxacin – Sparfloxacin – **Miscellaneous** –Furazolidine- Nitrofurantoin\* and Methanamine-**Antitubercular Agents- Synthetic anti tubercular agents-** INH\*- Ethionamide – ethambutol – Pyrazinamide- Para amino salicylic acid\*-**Anti tubercular antibiotics** –Rifampicin – Rifabutin- Cycloserine\* and sterile Capreomycin sulphate-**Anti-protozoal Agents-** Metronidazole\*- Diloxanide\*- Iodoquinol- Pentamidine Isethionate – Atovaquone – Eflornithine-**Anthelmintics-** Piperazine salts\*- Diethylcarbamazine citrate\*- Thiabendazole\*- Mebendazole\*- Albendazole – Niclosamide – Oxamniquine- Praziquantel and Ivermectin- **Anti-scabious and Anti-pedicular Agents-** Benzyl Benzoate\*- Lindane\* (Gamaxene)- Crothamiton\* and Permethrin.

### UNIT IV

**Anti-infective agents-Antimalarials-** Etiology of malaria- SAR-**Quinolines-** Quinine sulphate- Chloroquine phosphate\*- Hydroxy chloroquine sulphate- Amodiaquine hydrochloride\*- Primaquine phosphate- Quinacrine hydrochloride – Mefloquine- **Biguanides and dihydro triazines-**Cycloguanil pamoate – Proguanil-**Miscellaneous** –Pyrimethamine- Trimethoprim and Sulfadoxine.

### UNIT V

**Antibiotics-**Historical background – Nomenclature – stereochemistry- Structure activity relationship- chemical degradation classification and important products of the following classes-**β-Lactam antibiotics** –Penicillin – Cephalosporins- β- Lactamase inhibitors – Monobactams-**Aminoglycosides** –Streptomycin – Neomycin- **Tetracyclines** –Tetracycline – Chlortetracycline – Minocycline – Doxycycline **Macrolide-** Erythromycin and Azithromycin –**Miscellaneous-** Chloramphenicol\*- Clindamycin.

### TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William Foye	Foye's Principles of Medicinal Chemistry- 5th edition.	LWW	2002

**REFERENCES**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Wilson and Gisvold's	Wilson and Gisvold's Organic medicinal and Pharmaceutical Chemistry-	11th edition	2003
2	Burger	Burger's Medicinal Chemistry Vol I to IV	Wiley	2010
3	K.D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

**WEBSITES**

- [www.rsc.org](http://www.rsc.org)
- [www.acs.org](http://www.acs.org)
- [www.medicinalchemistry.org](http://www.medicinalchemistry.org)



15PYU713

SEMESTER-VII

MEDICINAL CHEMISTRY LABORATORY– I 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100  
External Semester Exam: 3 Hours**Course Objectives:**

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Course Outcomes:**

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Know the Structural Activity Relationship (SAR) of different class of drugs.
6. Write the chemical synthesis of some drugs.

**Course Content:**

- I. Preparation of medicinally important compounds or intermediates required for synthesis of drugs (5 compounds)
- II. Monograph analysis of selected drugs from course content. (2 compounds)
- III. Assay of Selected drugs from course content prescribed as per I.P or B.P. (5 compounds)

**TEXT BOOKS**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	A.I.Vogel	Text book of practical organic chemistry	Dorling Kindersely	2008

**REFERENCES**

<b>S.No</b>	<b>Author(s) Name</b>	<b>Title of the book</b>	<b>Publisher</b>	<b>Year of Publication</b>
1	Ashutoshkar	Ashutoshkar's Medicinal Chemistry	New Age International	2007

**WEBSITES:**

- [www.rsc.org](http://www.rsc.org)
- [www.acs.org](http://www.acs.org)
- [www.medicinalchemistry.org](http://www.medicinalchemistry.org)

15PYU704

SEMESTER-VII

**PHARMACOLOGY & THERAPEUTICS –III      3H      3C**

Instruction hours/ week: L: 3 T: 0 P:0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The main purpose 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-physicochemical 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.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

**Course Outcomes:**

On successful completion of the course the student will

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

**Course Content:****UNIT I**

**Pharmacology of Endocrine System**-Basic concepts in endocrine pharmacology- Hypothalamic and pituitary hormones-Thyroid hormones and anti thyroid drugs – Parathormone- Calcitonin and Vitamin-D.

**UNIT II**

**Insulin**- Oral Hypoglycemic agents and glucagon-ACTH and corticosteroids-Androgens and Anabolic steroids – Estrogens- progesterone and oral contraceptives-**Drugs acting on the uterus.**

**UNIT III**

**Pharmacology of Drugs acting on the Gastrointestinal Tract** –Antacids- anti-secretary and anti ulcer drugs- Laxatives and anti-diarrheal drugs- Appetite stimulants and suppressants-Digestants and carminatives-Emetics and anti-emetics.

**UNIT IV**

**Bioassay**-Principles and methods of bioassay - Bioassay of insulin- oxytocin-vasopressin- ACTH- histamine and 5-HT.

**UNIT V**

**Immunopharmacology**-Immunostimulants and immunosuppressants.

**TEXT BOOKS**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rang M.P- Dale M.M- Reter J.M	Rang M.P- Dale M.M- Reter J.M- Pharmacology	Elsevier	2012

**REFERENCES**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Craig C.R. and Stitzel R.R-	Craig C.R. and Stitzel R.R- Modern Pharmacology	LWW	2003
2	Lawrence L brunton	GoodmanandGilman's- ThePharmacologicalbasis oftherapeutics	CBS Publishers- Delhi.	2011
3	K.D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

**WEBSITES**

- [www.libguides.utep.edu](http://www.libguides.utep.edu)
- [www.pharmacology2000.com](http://www.pharmacology2000.com)
- [www.pharmacologycorner.com](http://www.pharmacologycorner.com)

15PYU714

SEMESTER-VII

**PHARMACOLOGY & THERAPEUTICS –III LABORATORY****3H****2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The main purpose 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-physicochemical 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.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

**Course Outcomes:**

On successful completion of the course the student will

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. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.
6. Comprehend the principles of toxicology and treatment of various poisonings.

**Course Content:**

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. To record CRC of acetylcholine by using suitable muscle preparations.
3. To record the CRC of 5HT on rat fundus preparation.
4. To record CRC of Nor adrenaline on rat anococcygeus muscle

5. Estimation of bioavailability parameters viz AUC from blood sample.
6. Estimation of bioavailability parameters viz  $T_{max}$  from blood sample.
7. Estimation of bioavailability parameters viz  $K_{el}$  from blood sample.
8. Estimation of bioavailability parameters viz AUC from urine sample.
9. Estimation of bioavailability parameters viz  $T_{max}$  from urine sample.
10. Estimation of bioavailability parameters viz  $K_{el}$  from urine sample.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M.N.Ghosh.	Fundamentals of Experimental Pharmacology	Hilton and company	2015

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kulkarni.S.K. Easton	Handbook of Experimental Pharmacology	Elsevier	2006

**WEBSITES:**

- [www.libguides.utep.edu](http://www.libguides.utep.edu)
- [www-pharmacology2000-com](http://www-pharmacology2000-com)
- [www.pharmacologycorner.com](http://www.pharmacologycorner.com)

15PYU705

SEMESTER-VII

**SOCIAL & BEHAVIOURAL SCIENCE****3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Social Pharmacy and Behavioral Science course will prepare the young pharmacy student to fit into the social role as Pharmacist. Interaction of pharmacist with doctors- nurses- dentists- physiotherapists and other health workers is to develop team spirit in pharmacist.
- Rational drug use and essential drugs concepts can be realized with meaningful interaction of pharmacists with other health care providers.
- At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.
- This course also introduced a number of national health programmes. The roles of the pharmacist in these contexts are also discussed.
- In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care.
- In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling for improved patient care in the community set up.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical Operation
2. Communicate effectively (Verbal and Non Verbal)
3. Effectively Manage the team as a team player
4. Manage the time effectively
5. Develop Leadership Qualities and Essentials
6. Know pharmaceutical care services

**Course Content:****UNIT I****Social Pharmacy and Behavioral Science**-The Concept and context of social pharmacy**UNIT II****Pharmacy Profession**-Introduction to profession of Pharmacy-Pattern of entry and employment in pharmacy-Employment position and job responsibilities of a pharmacist-Role of pharmacist in health

care-Pharmacy ethics.

### UNIT III

**Professionalization of community pharmacy-** Introduction – professional status of community pharmacy- Patients medication records and pharmacist's extended role-Health screening services in community pharmacy.

### UNIT IV

**Role of hospital pharmacist in a hospital–** Introduction– Manufacturing – purchasing- inventory management- distribution and promoting the rational view of medicine-Definition and concept of clinical pharmacy.

### UNIT V

**Time Management-**Value of Time- How to Track the action items-Goal setting-Using SMART Objective concept– Goals – Tasks- Sub Tasks-Resource Management- Mile Stone- Mapping and Gantt chart application.

### TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Harding Jeoffrey	Social Pharmacy – Innovation & development	Pharmaceutical Press- London	1994

### REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	World Health Organization	Use of Essential Drugs	WHO expert committee	1997
2	Darrin Salle	Inspired- Organized & Effective	Darrin Salle	2012
3	Ken Blanchard	The One Minute Manager Meets- The Monkey	Quill	1991

### WEBSITES

- [www.publichealth.org](http://www.publichealth.org)
- [www.web.arizona.org](http://www.web.arizona.org)
- [www.umass.org](http://www.umass.org)



**15PYU801****SEMESTER-VIII****FORMULATIVE & INDUSTRIAL PHARMACY –II      3H      3C**

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.
- This gives a knowledge of preformulation studies and stability studies
- Different machinery used for various steps in manufacture of various dosage forms. Formulation and evaluation of dosage forms and their advantages over other dosage forms.
- This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market.
- To know the various pharmaceutical dosage forms and their manufacturing techniques.
- To know various considerations in development of pharmaceutical dosage forms.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid and novel drug delivery system .
4. Know evaluation of pharmaceutical dosage forms.
5. To understand the criteria for selection of drugs and polymers for the development of
6. Novel drug delivery systems, their formulation and evaluation
7. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

**Course Content:****UNIT I**

**Tablets**-Classification of different types of tablets- tablet excipients- granulation technology on large scale by various techniques- different types of tablet compression machinery and equipment employed- processing problems of tablets and evaluation of tablets.

**UNIT II**

**Capsules** -definition -advantages and disadvantages of capsule - material for production of hard gelatine capsules - size of capsules - method of capsule filling. Soft gelatin capsule, capsule shell – manufacturing - quality control – stability testing.

**UNIT III**

**Micro-encapsulation** - Types of microcapsules - importance of micro encapsulation in pharmacy - micro encapsulation by Co-acervation phase separation - multi-orifice centrifugation - spray drying - spray congealing – polymerisation - air suspension technique - pan coating and other techniques - Evaluation of microcapsules.

**UNIT IV**

**Novel Drug delivery systems**– definition - advantages - disadvantages -Transdermal delivery systems- Osmotic drug delivery systems – Liposomes–microsomes – Nanoparticles – applications in pharmaceutical field .

**UNIT V**

**Prolonged action pharmaceuticals** -benefits – limitations – oral products terminology –types and construction of products – evaluation – applications in pharmaceutical field.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Liberman & Lachman	Theory And Practice Of Industrial Pharmacy	Lea and febiger	1986

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Remington	The science and practice of pharmacy- 20th edition Pharmaceutical Science	Lippincott williamson	2000
2.	Leon Shargel and Andrew B.C.YU	Applied biopharmaceutics and pharmacokinetics-	Appleton & Lange	2004
3.	H.C. Ansel	Pharmaceutical Dosage form and Drug delivery system	New Delhi	2000
4.	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007

**WEBSITES:**

- [www.picscheme.org](http://www.picscheme.org)
- [www.ijper.org](http://www.ijper.org)
- [www.pharmpress.org](http://www.pharmpress.org)

**15PYU811****SEMESTER-VIII****FORMULATIVE & INDUSTRIAL PHARMACY LABORATORY –II    3H    2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.
- This gives a knowledge of preformulation studies and stability studies
- Different machinery used for various steps in manufacture of various dosage forms. Formulation and evaluation of dosage forms and their advantages over other dosage forms.
- This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market.
- To know the various pharmaceutical dosage forms and their manufacturing techniques.
- To know various considerations in development of pharmaceutical dosage forms.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid and novel drug delivery system.
4. Know evaluation of pharmaceutical dosage forms.
5. To understand the criteria for selection of drugs and polymers for the development of
6. Novel drug delivery systems, their formulation and evaluation
7. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

**Course content:****Formulation of tablets**

1. Preparation of sodium bicarbonate tablets.
2. Preparation of Phenobarbitone tablets.
3. Preparation of aspirin effervescent tablets.

4. Preparation of ferrous sulphate tablets.

**Evaluation test for tablets**

5. Test for Weight variation of tablets.
6. Test for Friability of tablets.
7. Test for Hardness of tablets.
8. Test for thickness of tablets.
9. Test for disintegration of tablets.
10. Test for dissolution of tablets.
11. Filling of capsules and evaluation tests.
12. Preparation of novel drug delivery system.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Liberman & Lachman	Theory And Practice Of Industrial Pharmacy	Lea and febiger	1986

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Remington	The science and practice of pharmacy- 20th edition Pharmaceutical Science	Lippincott Williamson	2000
2	The Indian Pharmacopoei a Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007

**WEBSITES**

- [www.picscheme.org](http://www.picscheme.org)
- [www.ijper.org](http://www.ijper.org)
- [www.pharmpress.org](http://www.pharmpress.org)

**15PYU802****SEMESTER-VIII****INSTRUMENTAL METHODS OF PHARMACEUTICAL ANALYSIS – II      3H      3C**

Instruction hours/ week: L: 3 T: 1 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject is designed to impart a fundamental knowledge on the testing of drugs by various instrumental methods of analysis.
- This focuses on various modern instruments that are used for testing the purity of drugs in various dosage forms.
- course also gives knowledge about modern instruments that are used for drug testing like NMR- IR- Mass- HPLC- HPTLC etc.
- This course deals with the fundamentals of analytical chemistry and principles of electro chemical analysis of drugs.
- To know the principle and applications of instrumentation
- To understand the components and working of various analytical instruments.

**Course Outcomes (CO's):**

Upon completion of this course the student will:

1. Know the principle and applications of instrumentation
2. Understand the components and working of various analytical instruments.
3. Understand the different modern techniques of drug analysis.
4. Appreciate the advantages of instrumental methods of drug analysis.
5. Understand the principles of volumetric and electro chemical analysis.
6. Carry out various volumetric and electro chemical titrations.
7. Develop analytical skills.

**Course Content:****UNIT I**

**X- Ray diffraction studies** – Introduction- diffraction methods and applications-**Electro chemical methods of analysis- Conductometry** – Introduction- Conductivity cell- Conductometric titrations – applications-**Potentiometry** – Electrochemical cell-construction and working of reference and indicator electrodes- methods to determine end point of titration.

**UNIT II**

**Thermal Methods of Analysis** – Theory- Instrumentation and applications of Differential Scanning Calorimetry (DSC).

**UNIT III**

**Chromatography-Adsorption and partition column chromatography** – Methodology– advantages-disadvantages and applications- **Thin layer chromatography** -Introduction – Principle – Methodology- Stahl's triangle- Rf values – advantages- disadvantages and applications- **High Performance Thin Layer Chromatography (HPTLC)** – Introduction –instrumentation – advantages – application- **Paper chromatography** – Introduction – Principle – Methodology-developmental techniques – advantages – disadvantages – applications-**Ion exchange chromatography** – Introduction – Definition – classification- ion exchange resins – properties-mechanism of ion exchange process- Factors affecting ion exchange – methodology- applications.

**UNIT IV**

**High Performance Liquid Chromatography (HPLC)** – Introduction – theory – instrumentation- advantages and applications - Introduction to UPLC and supercritical fluid chromatography-**Gas Chromatography** –Introduction – theory – instrumentation – derivatization- temperature programming – advantages- disadvantages and applications-**Electrophoresis** - Principle of separation – classification- equipment for moving boundary electrophoresis – gel- paper electrophoresis and applications-**Gel Filtration Chromatography** – Introduction – technique- factors affecting- Applications.

**UNIT V**

**Quality assurance- Calibration and validation of following Instruments**-UV-Visible spectrophotometer- pH meter- HPLC- Electronic balance- Conductivity meter- IR spectrophotometer – Fluorimeter- Flame Photometer-**Introduction to analytical method development.**

**TEXT BOOKS**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Y.R. Sharma.	Organic Spectroscopy	S.chand	2010

**REFERENCES**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	K.A. Connors	Textbook of Pharmaceutical Analysis	Wiley-Interscience	1982

2	Gurdeep Chatwal	Instrumental methods of analysis	Mrs. Meena Pandey Himlaya Publishing house	1979
3	William Kemp	Spectroscopy	Palgrave Mc million	2008

**WEBSITES**

- [www.jpr.info.com](http://www.jpr.info.com)
- [www.sciencedomain.org](http://www.sciencedomain.org)
- [www.pharmaresearchlibrary.com](http://www.pharmaresearchlibrary.com)



15PYU812

SEMESTER-VIII

**INSTRUMENTAL METHODS OF PHARMACEUTICAL ANALYSIS  
LABORATORY – II****3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject is designed to impart a fundamental knowledge on the testing of drugs by various instrumental methods of analysis.
- This focuses on various modern instruments that are used for testing the purity of drugs in various dosage forms.
- course also gives knowledge about modern instruments that are used for drug testing like NMR- IR- Mass- HPLC- HPTLC etc.
- This course deals with the fundamentals of analytical chemistry and principles of electro chemical analysis of drugs.
- To know the principle and applications of instrumentation
- To understand the components and working of various analytical instruments.

**Course Outcomes (CO's):**

On successful completion of the course the student will

1. Know the principle and applications of instrumentation
2. Understand the components and working of various analytical instruments.
3. Understand the different modern techniques of drug analysis.
4. Appreciate the advantages of instrumental methods of drug analysis.
5. Understand the principles of volumetric and electro chemical analysis.
6. Carry out various volumetric and electro chemical titrations.
7. Develop analytical skills.

**Course Content:**

1. Chromatographic analysis of some pharmaceutical products.
2. Exercises involving
  - fluorimeter
  - conductometric
  - potentiometric
  - polarographic
  - amperometric titrations

3. Infra Red spectra peak identification for different functional groups.

#### TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Beckett and Stenlake	Practical Pharmaceutical Analysis	A & C Black	1988

#### REFERENCES-

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	R.M. Silverstein- John Wiley and Sons Inc.	Spectrometric identification of organic compounds	Heyden & sons Ltd	1969

#### WEBSITES

- [www.jpr.info.com](http://www.jpr.info.com)
- [www.sciencedomain.org](http://www.sciencedomain.org)
- [www.pharmaresearchlibrary.com](http://www.pharmaresearchlibrary.com)

15PYU803

SEMESTER-VII

MEDICINAL CHEMISTRY- III

3H

3C

Instruction hours/ week: L: 3 T: 0 P: 0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Course Outcomes:**

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Know the Structural Activity Relationship (SAR) of different class of drugs.
6. Write the chemical synthesis of some drugs.

**Course Content:**

***Study of classification - mechanism of action (biochemical and molecular basis) - structure activity relationship including stereo chemical aspects - physicochemical properties and synthesis of selected drugs (only drugs marked with asterisk) on the following categories of drugs.***

**UNIT I**

**Non Steroidal Anti-inflammatory Drugs & antigout- Anti-inflammatory agents-** Sodium salicylate – Aspirin- Salsalate\*- Mefenamic acid- Meclofenamate sodium Indomethacin\*- Sulindac- Tolmetin sodium- Zomepirac sodium- Diclofenac sodium – Ketorolac- Ibuprofen\*- Naproxen\*- Piroxicam Phenacetin – Acetaminophen – Antipyrine- Aminopyrine- Phenylbutazone\* and Oxyphenbutazone-**Antiviral agents**-Types of virus- stages of viral infection- targets for prevention of viral infections - Amantadine hydrochloride- Rimantadine hydrochloride- Idoxuridine

trifluoride- Acyclovir\*- Gancyclovir – Zidovudine- Didanosine – Zalcitabine – Lamivudine – Ribavirin – Saquinavir- Indinavir and Ritonavir.

## UNIT II

**Anti-neoplastic agents-Alkylating agents-** Mecllorethamine\*- Cyclophosphamide – Melphalan – Chlorambucil – Busulfan- Thiotepa-**Antimetabolites-** Mercaptopurine\* Thioguanine – Fluorouracil – Floxuridine – Cytarabine- Methotrexate\*- Azathioprine-**Antibiotics** –Dactinomycin – Daunorubicin –hydrochloride- Doxorubicin hydrochloride – Bleomycin-**Plant products** – Etoposide- Vinblastin sulphate- Vincristin sulphate-**Miscellaneous-** Cisplatin and Mitotane.

## UNIT III

**Sulphonamides and Sulphones-**Historical development – chemistry- classification and SAR of Sulfonamides – Sulphamethizole – Sulfisoxazole – Sulphamethizine- Sulfacetamide Sodium\*- Sulphapyridine- Sulfamethoxazole\*- Sulphadiazine- Mixed Sulfonamides-Mefenide Acetate- Silver Sulfadiazine – Sulfasalazine- **Folate reductase inhibitors** -Trimethoprim\* Cotrimoxazole – **Sulfones** -Dapsone\*-**Sex hormones** – **Androgens** – testosterone– **Estrogens** –Esterodiol – Estrone- Estriol- Diethyl Stilbestrol-**Progesterone and Oral contraceptives.**

## UNIT IV

**Antihistaminic agents–** Histamine- receptors and their distribution in the human body-**H1 – antagonists-Amino alkyl ethers-** Diphenhydramine\*- Dimenhydrinate – Doxylamine-**Ethylene diamines** –Tripeleminamine – Thonzylamine-**Piperazine derivatives** –Meclizine – Buclizine – Chlorcyclizine – Cetirizine-**Propylamine derivatives**-Chlorpheniramine\*- Pheniramine-**Tricyclic derivatives-** Promethazine\*- Trimeprazine – Phenidamine – Cyproheptadine – Azatidine-**Second generation non sedating** – Astemizole – Loratadine – Cetirizine – Acrivastine-**H2-antagonists-** Development of selective H2 antagonists - Cimetidine\*- Famotidine – Ranitidine-**Gastric Proton pump inhibitors**-Omeprazole and Lansoprazole.

## UNIT V

**Prostaglandins and other eicosanoids-**History and discovery- eicosanoid biosynthesis- drug action mediated by eicosanoids- design of eicosanoid drugs- eicosanoids approved for human clinical use-**Narcotic analgesic-Morphine and related drugs-**SAR of Morphine analogues- Morphine sulphate- Codeine phosphate- Hydromorphone hydrochloride- Meperidine hydrochloride\*- Alphaprodine hydrochloride- Anilerdine hydrochloride- Diphenoxylate hydrochloride- Loperamide hydrochloride- Fentanyl citrate\*- Methadone hydrochloride\*- Propoxyphene hydrochloride – Pentazocine- Levorphanol tartarate-**Narcotic antagonists-** Nalorphine hydrochloride- Levallorphan tartarate and Naloxone hydrochloride-**Anti-tussives** – Noscapine- Dextromethorphan hydrobromide and Benzonatate- Carbetapentane.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William Foye	Foye's Principles of Medicinal Chemistry- 5th edition.	LWW	2002

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Wilson and Gisvold's	Wilson and Gisvold's Organic medicinal and Pharmaceutical Chemistry-	11 <sup>th</sup> edition	2003
2	Burger	Burger's Medicinal Chemistry Vol I to IV	Wiley	2010
3	K.D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

**WEBSITES:**

- [www.rsc.org](http://www.rsc.org)
- [www.acs.org](http://www.acs.org)
- [www.medicinalchemistry.org](http://www.medicinalchemistry.org)

**15PYU813****SEMESTER-VIII****MEDICINAL CHEMISTRY LABORATORY– II****3H****2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Course Outcomes:**

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Know the Structural Activity Relationship (SAR) of different class of drugs.
6. Write the chemical synthesis of some drugs.

**Course Content:**

- I. Assay of medicinal compounds (5 compounds)
- II. Monograph analysis of selected drugs from course content. (2 compounds)
- III. Preparation of medicinally important compounds or intermediates required for synthesis of drugs. (5 compounds)

**TEXT BOOKS**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	A.I.Vogel	Text book of practical organic chemistry	Dorling Kindersely	2008

**REFERENCES**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ashutoshkar	Ashutoshkar's Medicinal Chemistry	New Age International	2007

**WEBSITES:**

- [www.rsc.org](http://www.rsc.org)
- [www.acs.org](http://www.acs.org)
- [www.medicinalchemistry.org](http://www.medicinalchemistry.org)

**15PYU804****SEMESTER-VIII****PHARMACOLOGY & THERAPEUTICS –IV****3H 3C**

Instruction hours/ week: L: 3 T: 0 P:0

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The main purpose 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-physicochemical 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.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

**Course Outcomes:**

On successful completion of the course the student will

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

**Course Content:****UNIT I**

**Chemotherapy**-General Principles of Chemotherapy-Sulfonamides and co-trimoxazole – Antibiotics – Penicillins- Cephalosporins – Chloramphenicol – Erythromycin- Quinolones and Fluoroquinolones- tetracycline and aminoglycosides.



**UNIT II**

**Chemotherapy of tuberculosis** – leprosy- fungal diseases- viral diseases-anti protozoal drugs – anthelminitics- urinary tract infections and sexually transmitted diseases.

**UNIT III**

**Histamine-** 5-HT and their antagonists – Prostaglandins- Thromboxanes and Leukotrienes – Pentagastrin – Cholecystikinin – Angiotensin- Bradykinin and Substance P-Analgesic- anti-pyretic- anti-inflammatory and anti-gout drugs.

**UNIT IV**

Definition of poison- general principles of treatment of poisoning-Heavy metals and heavy metal antagonists-Definition for acute- sub acute and chronic toxicity – genotoxicity – **Carcinogenicity**- teratogenicity and mutagenicity studies.

**UNIT V**

**Chronopharmacology**-Definition of rhythm and cycles- Biological clock and their significance leading to chronotherapy.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rang M.P- Dale M.M- Reter J.M-	Rang M.P- Dale M.M- Reter J.M- Pharmacology	Elsevier	2012

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Craig C.R. and Stitzel R.R-	Craig C.R. and Stitzel R.R- Modern Pharmacology	LWW	2003
2	Lawrence L brunton	GoodmanandGilman's- ThePharmacologicalbasis oftherapeutics	CBS Publishers- Delhi.	2011

3	K.D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014
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**WEBSITES:**

- [www.libguides.utep.edu](http://www.libguides.utep.edu)
- [www.pharmacology2000.com](http://www.pharmacology2000.com)
- [www.pharmacologycorner.com](http://www.pharmacologycorner.com)

**15PYU814****SEMESTER-VIII****PHARMACOLOGY & THERAPEUTICS –IV LABORATORY****3H****2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

**Course Objectives:**

- The main purpose 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-physicochemical 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.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

**Course Outcomes:**

On successful completion of the course the student will

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. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.
6. Comprehend the principles of toxicology and treatment of various poisonings.

**Course Content:**

1. To record the agonistic and antagonistic response by using suitable muscle preparations.
2. To estimate the strength of the test sample of agonist/ drug (e.g. Acetylcholine- Histamine- 5HT- Oxytocin etc) using a suitable isolated muscle preparation employing matching bioassay- interpolation.
3. bioassay- three point bioassay and four point bioassay.
4. Alternate methods for animal experimentation for both efficacy and toxicity studies.
5. Estimation of serum biochemical parameters by using semi- auto analyzer.

**TEXT BOOKS:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M.N.Ghosh	Fundamentals of Experimental Pharmacology	Hilton and company	2015

**REFERENCES:**

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kulkarni.S.K. Easton.	HandbookofExperimental Pharmacology	Elsevier	2006

**WEBSITES:**

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- [www.pharmacology2000.com](http://www.pharmacology2000.com)
- [www.pharmacologycorner.com](http://www.pharmacologycorner.com)