

# **MAHAMAYA TECHNICAL UNIVERSITY, NOIDA**



## **Syllabus For SECOND YEAR OF BACHELOR OF PHARMACY**

**(Effective from the Session: 2013-14)**

## **ABOUT PHARMACY**

Pharmacy - Branch of medical and engineering concerned with synthesis, analysis, quality control, administrative control, research of drugs and pharmaceuticals. Pharmacy is the art & science of manufacturing drugs & pharmaceuticals & also provides valuable drug information as a member of health care team.

A career in pharmacy unfolds a vista full of opportunities leading to a global future for young career aspirant. Furthermore, the job opportunities, working conditions, job satisfaction and monetary benefits are excellent. Excellent global opportunities galore for qualified pharmacy professionals (B.Pharm & M.Pharm) in various countries such as U.S.A., Canada, U.K., France, South Africa, Germany etc.

## **OBJECTIVES OF THE PROGRAMME**

A unique fusion of biology with engineering and technological concepts to develop skillful process techniques for designing, procuring and evaluating various kinds of drugs, drug delivery systems and consumer products. Pharmacy, the health profession concerned with knowledge about drugs and their effects, draws from the chemical, physical, biological and behavioral sciences. It offers diverse opportunities in India and around the world.

Here are just a few brief sketches of opportunities pursued by the Pharmacy graduates.

- Industrial Pharmacy - Manufacturing of Drugs and Pharmaceutical.
- Analysis and Testing of drugs and pharmaceuticals.
- Hospital & Community Pharmacy (Therapeutic remedies, good health and hygiene)
- Academic (Research and Education in Medical and Pharmacy colleges)
- Pharmacy Graduates are qualified to run their own Drugs store and Pharmaceutical Industry.
- High demand of Pharmacy professionals in MNC's (Multi National Companies) in India and Abroad.
- Research and development (R&D).
- New Drug Discovery (NDD).
- Food and Beverage Industry.
- Process and Formulation Development (Pharmaceutical Product)
- Cosmetics and Toiletries preparation Industry.
- Clinical trial, Bioequivalence Studies, Toxicological Studies, Biotechnological research and Manufacturing.
- Herbal Drug Research and Developments.
- Regulatory Affairs (Drug controller, Drug Inspectors, Food Inspector, Sanitary Officer, Government Analyst etc).
- Working Opportunities in reputed states and Central Government Laboratories like CSIR, CIPL, DRDO, Forensic Lab, Central Ayurvedic Lab and testing labs related to Ministry of Health.
- Excellent Opportunities abroad.
- Higher Studies Abroad
- Self-Employment or Business

## **Performance & Evaluation Scheme**

The students shall write internal sessional tests as for all theory subjects besides the End Semester Examination. The internal sessional will have a weightage of 20 marks and the End Semester Theory Examination shall carry 80 marks making a subject of 100 marks.

Assignments are to be given to reinforce the objective of the course and ensure total understanding of each unit of subject.

### **I. Evaluation methodology**

The evaluation and assessment plan consists of the following components:

- a. Class attendance and participation in class discussions etc.
- b. Weekly quizzes
- c. Home-works and assignments
- d. Projects
- e. Sessional examinations
- f. Final examination

### **II. Award classification**

Assessment procedure will be as follows:

- Class attendance and participation in discussions will be based on:
  - a. Substantial in-class contribution about class topics and discussion questions
  - b. Response to other students' queries
  - c. Contribution in discussion and chat sessions
- Quizzes
  - a. Quizzes will be of multiple choice types, fill-in-the-blanks or match the columns.
  - b. Quizzes will be held periodically
- Home works and assignments
  - a. The assignments/home-works may be of multiple choice types or comprehensive type.
- Projects
  - a. Will be assigned in the mid-part of the course and should be completed and submitted before the end of the course.
  - b. The presentation will be given by each student
- Sessional and Final examinations

There will be comprehensive examinations held on-campus (Internal sessionals) or off-campus (External examination) on dates fixed by the University

# SCHEME OF EVALUATION OF B.PHARM. SECOND YEAR

(EFFECTIVE FROM THE SESSION: 2013-14)

## SEMESTER – III

S. No.	Code	Subject Name	Period (Hours)		Evaluation Scheme						Total	Credit
			L	P	Sessional			End Semester				
					CT	TA	TOT	P	Th	P		
1.	HU-301	Introduction to Human Behavior (Include Human Sociology & Psychology)	3	0	10	10	20	-	80	-	100	3
2.	PH-231	Pharmaceutics – II (Unit Operation - I)	3	3	15	05	20	20	80	30	150	4
3.	PH-232	Pharmacognosy - II	3	4	15	05	20	20	80	80	200	5
4.	PH-233	Pharmaceutical Chemistry – III (Organic Chemistry - II)	3	4	15	05	20	20	80	80	200	5
5.	PH-234	Pharmaceutics – III (Community Pharmacy)	3	4	15	05	20	20	80	80	200	5
6.	PH-235	Anatomy, Physiology and Pathophysiology – III	3	0	15	05	20	-	80	-	100	3
7.	GP-301	General Proficiency	-	-	-	-	-	50	-	-	50	-
			18	15							1000	25

**L: Lecture    P: Practical    CT: Class Test    TA: Teacher Assessment and Attendance**

**Th: Theory    TOT: Total**

*TA =10 (5 for teacher assessment plus 5 for attendance)*

*P= 20(5marks for practical exam., 5marks for viva. 5marks for lab. records and 5 marks for quiz).*

*P= 30(10marks for practical exam., 10marks for viva., 5marks for lab. records and 5 marks for quiz).*

*P= 80(20marks for practical exam. 20marks viva. 20marks for lab. records and 20 marks for quiz).*

# SCHEME OF EVALUATION OF B.PHARM. SECOND YEAR

(EFFECTIVE FROM THE SESSION: 2013-14)

## SEMESTER – IV

S. No.	Code	Subject Name	Period (Hours)		Evaluation Scheme						Total	Credit
			L	P	Sessional			End Semester				
					CT	TA	TOT	P	Th	P		
1.	PH-241	Pharmaceutics – IV (Unit Operation – II)	3	3	15	05	20	20	80	30	150	4
2.	PH-242	Pharmaceutical Microbiology	3	4	15	05	20	20	80	80	200	5
3.	PH-243	Pharmaceutical Biostatistics	3	-	15	05	20	-	80	-	100	3
4.	PH-244	Pharmaceutical Analysis - II	3	4	15	05	20	20	80	80	200	5
5.	PH-245	Anatomy, Physiology and Pathophysiology – IV	3	-	15	05	20	-	80	-	100	3
6.	PH-246	Pharmaceutical Jurisprudence & Ethics	3	-	15	05	20	-	80	-	100	3
7.	AS-401	Technical Writing	3	-	10	10	20	-	80	-	100	3
8.	GP-401	General Proficiency	-	-	-	-	-	50	-	-	50	-
			21	11							1000	26

**L: Lecture    P: Practical    CT: Class Test    TA: Teacher Assessment and Attendance**

**Th: Theory    TOT: Total**

*TA =10 (5 for teacher assessment plus 5 for attendance)*

*P= 20(5marks for practical exam., 5marks for viva. 5marks for lab. records and 5 marks for quiz).*

*P= 30(10marks for practical exam., 10marks for viva., 5marks for lab. records and 5 marks for quiz).*

*P= 80(20marks for practical exam. 20marks viva. 20marks for lab. records and 20 marks for quiz).*

## SEMESTER III

### *HU-301*

#### **INTRODUCTION TO HUMAN BEHAVIOR (INCLUDE HUMAN SOCIOLOGY AND PSYCHOLOGY)**

**Objective of the Course:** The course intends to impart knowledge and learning of different aspects of human behaviour especially in the organisational context that directs human behaviour. This has special significance to the professionals as these aspects of human behaviour needs to be accounted for while taking a decision with respect to enhancement of human productivity.

#### **UNIT-I**

Concept, Nature, Characteristics, Conceptual Foundations and Importance, Roles & Skills of Human Capital. Human's Knowing Behaviour- Approaches to understand Cognitive, Behaviouristic & Social Cognitive behaviour, Pro-social – Behaviour – Nature and Determinants (Standard Behaviour, Altruism, Empathy).

#### **UNIT-II**

Perception and Attribution: Concept, Nature, Process, Importance. Management and Behavioural Applications of Perception. Attitude: Concept, Process and Importance, Attitude Measurement. Attitudes and Workforce Diversity.

Personality: Concept, Nature, Types and Theories of Personality Shaping, Personality Attitude and Job Satisfaction. Learning: Concept and Theories of Learning.

#### **UNIT -III**

Motivation: Meaning, Maslow's, Herzberg, McClelland's Theories of Motivation, Leadership: Style and Theories of Leadership-Trait, Behavioural and Situational Theories, Conflict Management, Conflict: Concept, Sources, Types, Classification of Conflict Intra, Individual, Interpersonal, Intergroup and Organisational, Resolution of Conflict.

#### **UNIT -IV**

Group Dynamics: Types of Group and their development stages, concept, status, norms size and cohesiveness. Power and Politics: Concept, Sources of Power, Distinction between Power, Authority and Influence, Approaches to Power, Political Implications of Power: Dysfunctional Uses of Power.

#### **References:**

1. Newstrom John W. - Organizational Behaviour: Human Behaviour at Work (Tata Mc Graw Hill)
2. Luthans Fred - Organizational Behaviour (Tata Mc Graw Hill, 10th edition)
3. Mc Shane L. Steven, Glinow Mary Ann Von & Sharma Radha R. - Organizational Behaviour (Tata Mc Graw Hill)
4. Robbins Stephen P. - Organizational Behaviour (Pearson Education)
5. Hersey Paul, Blanchard, Kenneth H and Johnson Dewey E. - Management of Organisational Behaviour
6. Greenberg Jerald and Baron Robert A. - Behaviour In Organisations: Understanding and Managing the Human Side of Work (Prentice Hall of India)
7. Laurie J. Mullins : Essentials of Organizational Behaviour, Pearson Learning
8. Ian Brooks : Organizational Behaviour, Pearson Learning
9. Baron, R.A., Psychology, 5<sup>th</sup> Edition, Pearson

## PH-231

### PHARMACEUTICS-II

#### (UNIT-OPERATION- I)

#### OBJECTIVE OF THE COURSE

Every industrial chemical process is based on Unit-Operations (physical treatment) and Unit-Process (chemical treatment) to produce economically desired product from specific raw materials. The subject Unit- Operations is based on fundamental laws and physicochemical principles involved in production, transformation and transportation of materials. Unit-Operations gives idea about science related to specific physical operation; different equipments-its design, material of construction and operation; and calculation of various physical parameters (mass flow, heat flow, mass balance, power and force etc.). In 'Pharmaceutical' curriculum, knowledge of 'unit operations' is very much relevant with respect to formulated drug products (Dosage forms) and basic drugs in Pharmaceutical Industry. The various unit operations to be studied during this curriculum are fluid flow, filtration, centrifugation, crystallization, air-conditioning, industrial hazards and safety precautions, materials used in plant construction, etc.

#### DESIRED OUTCOME OF THE COURSE

After the completion of the course, the students may be able to

- (1) Understand and apply the various parameters and equipments used in fluid flow, filtration, centrifugation, crystallization, air-conditioning in pharmaceutical industry.
- (2) Select the materials used in construction of pharmaceutical plants.
- (3) Have an idea about the efficiency of process and equipments
- (4) Understand the safety with respect to the process, raw chemicals, finished products and long term effect on environment.
- (5) Decide the financial viability of the products as demanded by the purchaser.

#### Unit-I

**1. Unit Operations :** Introduction, basic laws.

**2. Fluid Flow :** Types of flow, Reynold's number, Viscosity, Concept of boundary layer, basic situations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure. [8]

#### Unit-II

**3. Water systems –** Raw water, soft water, purified water, water for injection, quality requirement and treatment of water. washing, cleaning and standardisation of cleaning.

**4. Filtration and Centrifugation :** Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter. Factors affecting filtration, Principles of centrifugation, industrial centrifugal filters, and centrifugal sedimenters. [10]

#### Unit-III

**5. Crystallization :** Characteristics 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 Crystallizer. Supersaturation theory and its limitations, Nucleation mechanisms, crystal growth, Study of various types of Crystallizer, Tanks, agitated batch, Swenson Walker, Single vacuum, circulating magma and Krystal crystallizer, Caking of crystals and its prevention. [08]

#### UNIT – IV

**6. Heating, Ventilation & AC Systems:** Basic concepts and definition, wet bulb and adiabatic saturation temperatures, Psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipment for dehumidification operations. Principles and applications of refrigeration and air conditioning. [08]

#### Unit-V

**7. Material of Construction :** General study of composition, corrosion, resistance, Properties and applications of the materials of construction with special reference to stainless steel and glass.

**8. Industrial Hazards and Safety Precautions :** Mechanical, Chemical, Electrical, fire and dust hazards. Industrial dermititis, Accident record.

### **BOOKS RECOMMENDED**

1. Badger W.L. and Banchero J.T. Introduction to Chemical Engineering, McGraw Hill International Book Co., London.
2. Perry R.H. & Chilton C.H. Chemical Engineers Handbook, McGraw Hill Kogakusha Ltd.
3. McCabe W.L. and Smith J.C. Unit Operation of Chemical Engineering, McGraw Hill International Book Co., London.
4. Sambhamurthy, Pharmaceutical Engineering, New Age Publishers.
5. Gavhane, K.A. Unit Operations-I, Nirali Prakashan.

### **Web links**

[http://nsdl.niscair.res.in/bitstream/  
www.unitoperation.com](http://nsdl.niscair.res.in/bitstream/www.unitoperation.com)  
[www.uolab.isu.edu/](http://www.uolab.isu.edu/)

[units.handbooks.uwa.edu.au](http://units.handbooks.uwa.edu.au)

<https://www.openedu.au/.../murdoch-university-priciples-of-unit-operations>

## **PH-231P**

### **PHARMACEUTICS-II**

#### **(UNIT-OPERATION- I)**

### **OBJECTIVE OF THE COURSE**

The main objective of the course is to understand and consummate the basic fundamental principles by performing experiments related to various unit operations like fluid flow, filtration, centrifugation, crystallisation, air-conditioning, industrial hazards and safety precautions, materials used in plant construction, etc.

### **DESIRED OUTCOME OF THE COURSE**

After the completion of the course, the students may be able to

1. To understand the construction, working and use of manometers, venturimeter and orificemeter in measurement of fluid flow and pressure.
2. To determine Reynolds Number and empathize its significance in fluid flow.
3. To perceive the effect of various factors (i.e., filter media, viscosity of filtrate, pressure, thickness of cake, filter aids, etc.) on rate of filtration.
4. To interpret the principles of centrifugation in liquid-liquid (emulsion) and solid-liquid (suspensions) separations.
5. To study and understand the construction of psychometric charts and its implications in air-conditioning(i.e., determination of humidity, dew point, wet bulb temperature, dry bulb temperature, etc.)



6. To bestow the principles of crystallization by studying the characteristics and solubility curves of various crystals.

## **COURSE CONTENT**

### **1. Measurement of rate of flow of fluids and pressure by:**

- a) Simple and differential manometers
- b) Venturimeter
- c) Orifice meter

### **2. Determination of Reynold Number.**

### **3. Study of factors affecting rate of filtration**

- a) Effect of different filter media
- b) Effect of viscosity of filtrate
- c) Effect of pressure
- d) Effect of thickness of cake
- e) Effect of filter aids.

### **4. Study principle of centrifugation for**

- a) Liquid –Liquid separation and stability of emulsions.
- b) Solid – liquid separation and stability of suspension.

### **5. Determination of dry bulb and wet bulb temperatures and use of Psychrometric charts.**

### **6. Study of characteristics of crystals**

### **7. Study of solubility curve of crystals.**

## **BOOKS RECOMMENDED**

1. Badger W.L. and Banchero J.T. Introduction to Chemical Engineering Mc Graw Hill International Book Co., London.
2. Perry R.H. & Chilton C.H. Chemical Engineers Handbook, Mc Graw Kogakusha Ltd.
3. McCabe W.L. and Smith J.C. Unit Operation of Chemical Engineering Mc Graw Hill International Book Co., London.
4. Sambhamurthy, Pharmaceutical Engineering, New Age Publishers.
5. Gavhane, K.A. “Unit Opeation-I”, Nirali Prakashan.

## **WEB LINKS**

<http://nsdl.niscair.res.in/bitstream/>

[www.unitoperation.com](http://www.unitoperation.com)

[www.uolab.isu.edu/](http://www.uolab.isu.edu/)

[units.handbooks.uwa.edu.au](http://units.handbooks.uwa.edu.au)

<https://www.openedu.au/.../murdoch-university-principles-of-unit-operations>

PHAMACOGNOSY – II

**OBJECTIVE OF THE COURSE**

Pharmacognosy is the study of physical, chemical and biological properties of drug substances of natural origin. This subject includes complete systemic study of medicinal drugs obtained from different secondary metabolites of resins, volatile oils, fibers, pharmaceutical aids and tannins. It also includes the isolation and basic phytochemical screening or general qualitative chemical test of alkaloids and glycosides.

**DESIRED OUTCOME OF THE COURSE**

Students must be able to:

1. To know about the various drugs containing resins.
2. Understand the different plant source containing volatile oil and methods of isolation of volatile oils as well as utilization of aromatic plants.
3. Have a systematic study of a crude drug embrace through consideration of primary and secondary metabolites and the various methods of preliminary phytochemical screening for the detection of various chemical moieties present in the crude drug extract.
4. Study the various fibres and pharmaceutical aids in reference to pharmaceutical industry.
5. Study the systematic pharmacognosy of tannins and tannins containing drugs.

**SYLLABUS**

**Unit-I: Resins:** Study of drugs containing Resins and Resin Combination like Podophyllum, Cannabis, Capsicum, Shellac, Asafoetida, Balsam of tolu, Balsam of peru, Benzoin, Turmeric, Ginger.

**Unit-II: Volatile oils:** General methods of obtaining volatile oils from plants, Study of volatile oils from Mentha, Coriander, Cinnamon, Jatamansi, Cumin, Black pepper, Cassia, Lemon peel, Orange peel, Lemon grass, Citronella, Caraway, Dill, Spearmint, Clove, Fennel, Nutmeg, Eucalyptus, Chenopodium, Cardamom, Valerian, Musk, Palmarosa, Gaultheria, Sandalwood.

**Unit-III: Phytochemical Screening:** An introduction to active constituents of drugs: Their isolation, classification and properties with Qualitative chemical tests of the followings – Alkaloids, Saponins, Cardenolides and bufadienolides, flavonoids and Cyanogenetic glycosides.

**Unit-IV: Fibres:** Study of fibres used in pharmacy such as cotton, silk, wool, nylon, glasswool, polyester and asbestos.

**Pharmaceutical aids:** - Study of Pharmaceutical aids like Talc, Diatomite, Kaolin, Bentonite, Fullers earth, Gelatin and Natural colors.

**Unit-V: Tannins:** Study of tannins & tannin containing drugs like Gambier (Pale Catechu), Black Catechu, Gall and Myrobalans (Harde, Baheda, Arjuna & Ashoka).

Utilization of aromatic plants & desired products with special reference to Sandalwood oil, Mentha oil, Lemon grass oil & Eucalyptus oil.

## BOOKS RECOMMENDED

1. Trease G.E., & Evans W.C., "Pharmacognosy" Balliere Tindall East Bourne U.K.
2. Tyler V.E. et al "Pharmacognosy" Lea & febiger, Philadelphia.
3. Wallis, T.E. "Text Book of Pharmacognosy" J&A Churchill Ltd, London.
4. Kokate C.K. et al "Pharmacognosy" Nirali Prakashan, Pune.
5. Atal C.K. & Kapur BM, "Cultivation & utilization of Medicinal plant, RRL, Jammu.
6. Harborne J B, Phytochemical method, Chapman & Hall International Edition, London.
7. Mohammed Ali, "Pharmacognosy & Phytochemistry".

## Web links

<http://medherb.com/>

<http://www.phytotherapies.org>

<http://www.discoverherbs.com>

<http://www.herbalgram.org>

## PH-232P PHAMACOGNOSY – II

### COURSE OBJECTIVE

To learn and master the course that will examine the Herbal, fabricated preparations.To discuss the processes of standardization of natural products.

### COURSE CONTENT

Exp No.	Experiment	Objective	Expected Outcomes
1.	Study of fibres and pharmaceutical aids.	To Study the fibres. To study the pharmaceutical aids.	Identification and diagnostic characters of given sample with their chemical tests.
2.	Microscopic study of seven selected drugs and their powders mentioned under the category of volatile oils in theory with their chemical tests.	To study the microscopic, powder characteristics and chemical tests of given drugs like Cardamom	Identification and Standardization of given drugs by virtue of characters determined.

		Fennel Caraway Clove Ginger Turmeric Cinnamon	
3.	General chemical test for Alkaloids, Glycosides, Steroids, Flavonoids & Tannins.	To detect the probable chemical present in the given drug sample.	Phytochemical screening of the secondary metabolites.

### OUTCOME OF THE COURSE

The students are expected to compare experimental results with theoretical concepts, speculate reasons for discrepancies, and learn from deductive reasoning.

### WEB LINKS

1. <http://books.google.co.in/>
2. [www.bookganga.com](http://www.bookganga.com)
3. <http://www.pharmagupshup.in>
4. <http://www.gobookee.net>
5. <http://pharmacology.uonbi.ac.ke>
6. <http://www.pharmacognosy.us/>
7. <http://www.botanical.com>

PHARMACEUTICAL CHEMISTRY - III

(ORGANIC CHEMISTRY -II)

**OBJECTIVE OF THE COURSE**

This subject is taught as an advance subject to Organic Chemistry-I. It extends the concept of Organic Chemistry to the field of carbohydrate chemistry, protein chemistry. It also involves the basic concept about nucleic acids and chemistry of oils, fats and waxes. Moreover the structure of this course enables the students aware about the mechanism and synthetic applications of certain name reactions. An introductory has been also involved about heterocyclic compounds and their applications in pharmacy. Highlights shall be on synthetic importance of active methylene compounds, polynuclear hydrocarbons and  $\alpha$ ,  $\beta$ -unsaturated carbonyl compounds.

**DESIRED OUTCOME OF THE COURSE**

On the completion of the course, students will be able to

1. Access the synthetic importance of few medicinally important classes (active methylene compounds, polynuclear hydrocarbons and  $\alpha$ ,  $\beta$ -unsaturated carbonyl compounds).
2. An idea about heterocyclics in medicines
3. Understanding of reaction mechanism
4. Importance of carbohydrate chemistry
5. Basic knowledge of biological chemistry and information how the amino acids and peptide constitute proteins

**SYLLABUS**

**Unit-I:**

$\alpha$ ,  $\beta$ - Unsaturated carbonyl compounds, cycloaddition.

Compounds containing active methylene group and their synthetic importance- Acetoacetic ester and malonic ester.

Polynuclear hydrocarbons- Naphthalene, Anthracene and Phenanthrene

**Unit-II**

Heterocyclic Compounds – Nomenclature, Chemistry, preparation, properties and pharmaceutical importance of pyrrole, furan, thiophene, pyridine, pyrimidine, imidazole, pyrazole, thiazole, benzimidazole, indole, phenothiazines.

**Unit-III**

**Name reactions** – Definition, reaction mechanism and synthetic application of Merwin

–Pondorff, Verley reduction, Oppeneaur oxidation, Beckmann rearrangement, Mannich reaction,

Diel's alder reaction, Michael addition, Reformatsky, Knoevanegal reaction, Benzoin condensation.

**Unit-IV**

Classification, structure, reactions, structure elucidation, identification of carbohydrates

- i) Monosaccharides – Glucose and fructose
- ii) Disaccharides – Sucrose, lactose and maltose.
- iii) Polysaccharides – Starch.

### **Unit-V**

Classification, identification, general methods of preparation and reactions of amino acids and proteins.

Structure of Nucleic Acids.

Chemistry & identification of oils, fats and waxes.

Polymers and polymerization.

### **BOOKS RECOMMENDED**

1. Morrison, T.R. and Boyd, R.N., Organic Chemistry, Prentice Hall of India, Private Limited, New Delhi.
2. Finar, I.L., Organic Chemistry Vol. I & II, ELBS Longman.
3. Jain, M.K. and Sharma S.C, Organic Chemistry, Shoban Lal Nagin Chand & Co., Delhi.
4. Kalsi, “Organic Reactions Stereochemistry & Mechanism”.

### **WEB LINKS**

[http://en.wikipedia.org/wiki/Carbohydrate\\_chemistry](http://en.wikipedia.org/wiki/Carbohydrate_chemistry)

<http://chemistry.about.com/od/biochemistry/a/carbohydrates.htm>

<http://www.genome.duke.edu/cores/proteomics/education/presentations/documents/FundamentalsofProteinChem.pdf>

<https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/heterocy.htm>

<http://www.organic-chemistry.org/namedreactions/>

## PHARMACEUTICAL CHEMISTRY - III

## (ORGANIC CHEMISTRY -II)

**OBJECTIVE OF THE COURSE**

This subject aims to refine students' experimental skills in the synthesis of complex molecules; identification of organic compounds and mixtures with derivatization.

The application of oil and fat analysis and the recording and reporting of scientific observations.

**DESIRED OUTCOME OF THE COURSE**

On the completion of the course, students will be able to learn

1. Advanced methods of identification of organic compounds and mixtures with derivatization.
2. Titerimetric methods of oil and fat analysis.
3. Data recording and interpretation of scientific observations

**COURSE CONTENT**

Exp No.	Experiment	Objective	Expected Outcomes
1.	Identification of organic compounds and their mixture with derivatization.	To separate the mixture and to identify the compounds and to prepare suitable derivatives.	Systematic separation and identification of organic compounds.
2.	Synthesis of organic compounds involving two steps.	To synthesize organic compounds and report their yield and melting point and to perform recrystallization.	Synthesis of organic compounds via organic reactions involving two steps.
3.	Determination of Acid value, Saponification value, Iodine value, Ester value of oils, fats and waxes	To determine Acid value, Saponification value, Iodine value, Ester value of oils, fats and waxes.	Quality control of oil and fats used in pharmacy.

**References**

1. Mann P G & Saunders B C, Practical Organic Chemistry, ELBS/ Longman, London.
2. Furniss B S, Hannaford A J, Smith P W G and Tatehell A R, Vogel's Textbook of Practical Organic Chemistry, The ELBS/ Longman, London.
3. Indian Pharmacopoeia 2007.

**PHARMACEUTICS – III**  
**(COMMUNITY PHARMACY)**

**Objective of the Course**

To impart fundamental knowledge regarding conceptualization and functioning of a community pharmacy. It comprises the definition and scope of community pharmacy in order to understand the responsibilities of pharmacist in various services towards community healthcare. In this subject, the students learn about the functioning of a community pharmacy to improve the quality of life by providing pharmaceutical care.

**Desired Outcome of the Course**

The students should be able to –

- a) Understand the scope and responsibilities of community pharmacist in community and the management of community pharmacy.
- b) Learn about prescription concept, its handling and problems associated with prescription e.g. Drug interaction, incompatibility.
- c) Manage the drug store by means of various inventory methods.
- d) To understand the basic concept of pharmaceutical care and role of community pharmacist in patient counseling to improve patient care and compliance by proper communication.
- e) To expertise in various health screening services used in community care and use of OTC medications.
- f) Learn about the concept of health, drug used for pregnant and breast feeding woman, family planning and prevention of communicable diseases.

**Unit-I**

1. Definition, scope of community pharmacy

Roles and responsibilities of Community pharmacist, code of Ethics.

2. Community Pharmacy Management

- i) Selection of site, Space layout, and design
- ii) Staff, Materials- coding, stocking
- iii) Legal requirements
- iv) Maintenance of various registers
- v) Use of Computers [06]

**Unit-II**

3. Prescription- parts of prescription, legality & identification of medication related problems like drug interactions, incompatibility.

4. Inventory control in community pharmacy- Definition, various methods of Inventory Control.



ABC, VED, EOQ, Lead time, safety stock [08]

### **Unit-III**

5. Pharmaceutical care - Definition and Principles of Pharmaceutical care.

6. Communication skills and Patient counselling

Need for good communication, Key communication skills.

Strategies to overcome barriers

Patient information leaflets- content, design, & layouts, advisory labels

7. Patient compliance

Definition, Factors affecting compliance, role of pharmacist in improving the compliance. [10]

### **Unit-IV**

8. Health screening services

Definition, importance, methods for screening

Blood pressure/ blood sugar/ lung function and Cholesterol testing.

9. OTC Medication- Definition, OTC medication list & Counseling [06]

### **Unit-V**

10. Health Education, WHO, Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients.

Role of Pharmacist in family planning, prevention of communicable diseases, nutrition.

11. Pharmacoepidemiology & Pharmacoeconomics – Brief introduction

12. Rational drug therapy – Brief introduction [10]

### **BOOKS RECOMMENDED**

1. Carter S.J. Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS Publishers, Delhi.

2. Ansel H.C., Introduction to Pharmaceutical Dosage Forms, K.M. Varghese & Co., Bombay.

3. Aulton M.E. Pharmaceutics – The Science of Dosage Form Design, ELBS/ Churchill Livingstone.

4. Remington Pharmaceutical Sciences, Mack Publishing Co., Pennsylvania.

5. I.P., Govt of India Publication.

6. B.P., Her Majesty's Stationary Office, Cambridge.

7. Carter S.J., Cooper and Gunn's Tutorial Pharmacy, CBS Publishers, Delhi.

8. Drugs & Cosmetics Act & Rules.

9. Parmar N.S. Community Pharmacy & Health Education, CBS Publishers

### **Suggested web-links**

[http:// www.literacybridge.org](http://www.literacybridge.org)

[http:// www.wn.org/health](http://www.wn.org/health)

[http:// www.promedmail.org/](http://www.promedmail.org/)

[http:// www.pharmabiz.com](http://www.pharmabiz.com)

[http:// www.drugs.com/](http://www.drugs.com/)

[http:// www.rxlist.com/](http://www.rxlist.com/)

[http:// www.webmd.com/drugs/](http://www.webmd.com/drugs/)

[http:// www.druginfosys.com/](http://www.druginfosys.com/)

[http:// www.mims.com/India](http://www.mims.com/India)

***PH-234P***

**PHARMACEUTICS – III  
(COMMUNITY PHARMACY)**

**Course Objective:** To understand the concept of community pharmacy management, categorization and storage of drugs, patient counseling, prescription handling , use of health screening services and OTC medications, interpretation of pathological diagnostic reports.

**Course Content:**

<b>Exp No.</b>	<b>Experiment</b>	<b>Objective</b>	<b>Expected outcomes</b>
1.	To study the standard labeling and storage requirements for pharmaceutical products based on legal requirements	Categorization and storage of pharmaceutical products	Drug store management
2.	To submit the project report on visit to the nearby community for counseling on rational drug use	Role of counseling in rational drug use	Pharmaceutical care
3.	To study the prescription handling and identification of drug interaction and incompatibilities	Prescription handling with reference to drug interaction and incompatibility	Proper drug dispensing
4.	To study the blood glucose determination with the help of glucometer	Blood glucose measurement	Interpretation of pathological blood report
5.	To measure the blood pressure with help of Sphygmomanometer	Blood pressure estimation	Hypertension diagnosis

6.	To measure the lung function test with help of peak flow meter	Measurement of respiratory parameters	Diagnosis of asthma & other respiratory disorders
7.	To make a design of community pharmacy to incorporate all pharmaceutical care services (As per the schedule N)	Community pharmacy design	Smooth functioning of community pharmacy for complete pharmaceutical care
8.	To study the OTC drugs and their use	Knowledge of OTC drugs	Proper use of OTC drugs
9.	To interpret the given blood test report	Interpretation of diagnostic blood report	Hematological parameters for any possible disease
10.	To interpret the given urine test report	Interpretation of diagnostic urine report	Pathological parameters for any possible disease

### Outcome of the course

The students are expected to compare the experiments with theoretical concepts; expertization in various communities based services, and learn about various disease in relation to various pathological reports.

### References

[http:// www.literacybridge.org](http://www.literacybridge.org)

[http:// www.mims.com/India](http://www.mims.com/India)

[http:// www.webmd.com/drugs/](http://www.webmd.com/drugs/)

[lifelinescreening.com/health-screening-services/default.aspx](http://lifelinescreening.com/health-screening-services/default.aspx)

## ANATOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY – III

### Objectives of the course

Anatomy and Physiology III is designed to provide a foundation in human biology. This course provides anatomy and physiology of digestive system, urinary system. The advanced biology course will provide students with a knowledge and understanding of: pathophysiology of disease related to digestive system, urinary system, cellular adaptation and repair and mechanism of inflammation.

### Desired outcome of the course

The students must be able to:

1. Apply this basic knowledge to changes in bodily functions as a result of disease and determine the reason for functional changes.
2. Understand the structure and function of the digestive system
3. Describe the location of the organs of the digestive system (GI tract and accessory organs) and describe the general functions of each and list the enzymes secreted by the various digestive organs and describe the function of each
4. Understand the structure and function of the excretory system
5. Explain the organs of the excretory system and describe their general functions
6. Describe the structure of the kidney, nephrons and physiology of urine formation
7. Understanding of Cell injury, cellular adaptation and repair and mechanism of inflammation.

### Syllabus

#### Unit I

**Digestive system** –Parts of digestive system, their structure and functions. Various gastrointestinal secretions & their role.

#### Unit II

Pathology of disorders related to digestive system- Peptic Ulcer, Ulcerative colitis, Crohn's disease, Zollinger-Ellison syndrome, Amoebiasis, typhoid, Hepatitis, Cirrhosis of liver, pancreatitis.

#### Unit-III

**Urinary System** – Anatomy & physiology of urinary system, physiology of urine formation, acid- base balance, pathophysiology of renal failure, glomerulonephritis, Urinary tract infection.

## **Unit-IV**

**Cell injury & Adaption**-Courses of cell injury, pathogenesis & morphology of cell injury. Cellular adaptation- Atrophy, hypertrophy, aplasia, metaplasia, & dysplasia, intracellular accumulation & pathophysiology of Neoplasm.

## **Unit-V**

Basic mechanisms involved in the process of inflammation and repair, Alterations in vascular permeability and blood flow, migration of WBC's mediators of inflammation. Brief outline of the process of repair.

## **Books Recommended**

1. Difore SH, "Atlas of Normal Histology" Lea & Febiger Philadelphia.
2. Chaurasia B.D, Human Anatomy, Regional & Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.
3. Guyton AC, Hall JE., Text book of Medical Physiology, WB Saunders Company.
4. Chatterjee C.C. Human Physiology, Medical Allied Agency, Calcutta.
5. Ross & Wilson, Anatomy & Physiology in Health & Illness, Churchill Livingstone.
6. Tortora GJ, & Anagnostoukos NP, Principles of Anatomy & Physiology, Harper & Rave Publishers, New Delhi.
7. Parmar N.S., Health Education & Community Pharmacy CBS Publishers, Delhi.
8. Shalya Subhash, Human Physiology, CBS Publishers & Distributors.
9. Keele, C.A., Niel, E and Joels N, Samson Wright's Applied Physiology, Oxford University Press.
10. Dipiro JL, Pharmacotherapy – A Pathophysiological Approach, Elsevier.
11. Robbins SL, Kumar V, Basic Pathology, WB Saunders.

## **Suggested Web Links**

1. [www.medicinenet.com/diseases\\_and\\_conditions/alpha\\_a.htm](http://www.medicinenet.com/diseases_and_conditions/alpha_a.htm)
2. [http://books.google.co.in/books/about/Pathophysiology\\_of\\_disease\\_electronic\\_re.html](http://books.google.co.in/books/about/Pathophysiology_of_disease_electronic_re.html)

**SEMESTER- IV**  
**PH-241**  
**PHARMACEUTICS – IV**  
**(UNIT OPERATIONS – II)**

**OBJECTIVE OF THE COURSE**

Dosage form development in Pharmaceutical industry requires a complete and quantitative understanding of both the engineering and scientific principles underlying the technological process. Pharmacists require understanding of the basic fundamental laws and physico- chemical principles. The subject provides an idea about the science involved along with the various equipments used, their classification, construction, working, advantages, disadvantages and applications of the various unit-operations like evaporation, distillation, drying and automated process control systems by using CAD, CAM methodology.

**DESIRED OUTCOME OF THE COURSE**

After the completion of the course, the students may be able to

1. Understand the basic laws involved in stoichiometry.
2. Have an idea about the fundamental principles and equipments used in evaporation, distillation and drying.
3. Understand the various process variables (i.e., pressure, temperature, flow level, vacuum, etc.) and the equipments used in their measurement.
4. Elemental concepts of computer aided manufacturing and chemical reactors.

**SYLLABUS**

**Unit-I: Stoichiometry:** Unit processes material and energy balances, molecular units, mole fraction, tie substance, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, dimensionless equations, dimensionless formulae, dimensionless groups, different types of graphic representation. [08]

**Unit-II: Evaporation:** Basic concepts of phase equilibria, factor affecting evaporation, types of evaporators, film evaporator, single effect and multiple evaporator. [08]

**Unit -III: Distillation:** Raoult's law, Phase diagrams , volatility, simple steam and flash distillation, principles of rectification, McCabe thiele method for the calculations of number of theoretical plates, Azeotropic and extractive distillation . [08]

**Unit –IV: Drying:** Moisture content and mechanism of drying, rate of drying and time of drying calculations, classification and type of dryers , dryers used in pharmaceutical industries – Tray dryer, Fluidized bed dryer, spray dryer and special drying methods. [08]

**Unit-V: Automated Process Control Systems:** Process variables, temperature, pressure, flow level and vacuum and their measurements. Elements of automatic process control and introduction to automatic process control systems. Elements of computer aided manufacturing (CAM), Reactors and fundamentals of reactor design for chemical reactions.

**BOOKS RECOMMENDED**

1. Badger W.L. and Banchero J.T. Introduction to Chemical Engineering, Mc Graw Hill International Book Co., London.

2. Perry R.H. & Chilton, C.H. Chemical Engineers Handbook, Mc Graw Kogakusha Ltd.
3. McCabe W.L. and Smith J.C. Unit Operation of Chemical Engineering Mc Graw Hill International Book Co., London.
4. Gavhane, K.A. Unit Operation-II, Nirali Prakashan.
5. Sambhamurthi, Pharmaceutical Engineering, New Age Publishers.

## WEB LINKS

[http://nsdl.niscair.res.in/bitstream/  
www.unitoperation.com](http://nsdl.niscair.res.in/bitstream/www.unitoperation.com)  
[www.uolab.isu.edu/](http://www.uolab.isu.edu/)

[units.handbooks.uwa.edu.au](http://units.handbooks.uwa.edu.au)

<https://www.openedu.au/.../murdoch-university-principles-of-unit-operations>

## PH-241P

### PHARMACEUTICS – IV

### (UNIT OPERATIONS – II)

## OBJECTIVE OF THE COURSE

The main objective of the course is to understand and consummate the basic fundamental principles by performing experiments related to various unit operations like evaporation, drying, distillation, etc. The students will also have an insight into the fundamentals of engineering drawing and its use in construction of diagrams of objects.

## DESIRED OUTCOME OF THE COURSE

After the completion of the course, the students may be able to

1. To determine the overall heat transfer coefficient of a heat exchanger.
2. To perceive the effect of various factors (i.e., surface area, temperature, etc.) on rate of evaporation.
3. To interpret the effect of various factors (i.e., surface area, temperature, etc.) on rate of drying.
4. To plot the drying rate curve of various materials and calculate their free moisture content and bound moisture content.
5. To bestow the principles of distillation by studying the characteristics and working of different types of distillation processes viz, steam, azeotropic and extractive.
6. Have the elementary knowledge of engineering drawing. The students will be able to draw various alphabets, letters and scales according to the principles of engineering drawing. The course will enable the student to construct the isometric views and orthographic projection of various geometrical objects.

## COURSE CONTENT

1. Determination of overall heat transfer coefficient.
2. Study of factors affecting rate of evaporation :-

- a) Effect of surface area
  - b) Effect of temperature
3. Study of factors affecting rate of drying
- a) Surface area
  - b) Temperature
4. Determination of rate of drying, free moisture content and bound moisture content.
5. Experiments based on
- a) Steam distillation
  - b) Extractive distillation
  - c) Azeotropic distillation
6. Elementary knowledge of engineering drawing
- \_ Alphabets/ letter writing
  - \_ Scales
  - \_ Orthographic projections – First and third angle projection methods
  - \_ Simple Isometric views

### **WEB LINKS**

<http://nsdl.niscair.res.in/bitstream/>

[www.unitoperation.com](http://www.unitoperation.com)

[www.uolab.isu.edu/](http://www.uolab.isu.edu/)

[units.handbooks.uwa.edu.au](http://units.handbooks.uwa.edu.au)

<https://www.openedu.au/.../murdoch-university-principles-of-unit-operations>



## PHARMACEUTICAL MICROBIOLOGY

### Objectives of the course

Pharmaceutical microbiology is the part of industrial microbiology that is responsible for ensuring medications do not contain harmful levels of microbes- such as bacteria, yeasts and moulds. This course intends to provide in depth understanding of fundamentals, concepts and laboratory skills of microbiology. It deals with the principles of general microbiology, bacteria and virus structure, taxonomy, growth, and the laboratory isolation and identification of micro-organisms. Course exposes the students to the theories of Sterilization procedures and Sterility testing on which pharmaceutical manufacturing practice is based in industries. The content also provides the knowledge of hygiene concepts involved in factories and hospitals. The course assists the students to learn about various pharmaceutical testing and assay practices implemented during manufacturing.

### Desired outcome of the course

The students must be able to:

1. Better understand the role of Microbiology in Pharmaceutical Industry
2. Have knowledge of concepts of morphology, structure ,taxonomy and nutrition of Bacteria and viruses
3. Have learning about theory and laboratory skills of cultivation, identification and isolation of bacteria.
4. Understand the principles and methods of sterilization used in the pharmaceutical industry
5. Understand the key concepts about disinfectants and antiseptics
6. Understand and practice various evaluation methods of disinfectants
7. Get familiar with Microbiological assays and sterility testing methods and their importance in pharmaceutical industry
8. Understand the concepts of microbial contamination during pharmaceutical manufacturing
9. Identify the key points involved in control of infections in factories and hospitals
10. Get familiar with construction sense of clean and aseptic areas in industries

### Syllabus

#### Unit-I

1. Introduction to the scope of microbiology.
2. Structure of bacterial cell.
3. Classification of microbes and their taxonomy: Bacteria and viruses. [08]

#### Unit-II

4. Identification of Microbes: Stains and types of staining techniques, electron Microscopy.
5. Nutrition, cultivation & isolation of bacteria & viruses. [08]

#### Unit-III

6. Control of microbes by physical and chemical methods.
  - A. Disinfection, factors influencing disinfectants, dynamics of disinfection, Disinfectants And antiseptics and their evaluation.
  - B. Sterilization, different methods, validation of sterilization methods & equipments. [12]

#### Unit-IV

7. Sterility testing as per I.P.
8. Preservative efficacy [5]

## Unit-V

9. Microbial assays of antibiotics, vitamin B12.

10. Factory and hospital hygiene- control of microbial contamination during manufacture, manufacture of sterile products- clean and aseptic area, nosocomial infection, control of hospital infections. [6]

## BOOKS RECOMMENDED

1. Stanier R.Y., Ingraham, J.L., Wheelis M.L. & Painter P.R. General Microbiology, Macmillan Press Limited.
2. Hugo and Russell, Pharmaceutical Microbiology, Black Well Scientific Publication, Oxford.
3. Prescott L.M., Harley J.P. & Klien D.A. Microbiology, McGraw Hill.
4. Pelczar & Reid, Microbiology, Tata Mc Graw Hill, Delhi.
5. Tortora G.J., Funke B.R., Case C.L. **Microbiology- An Introduction, Pearson Education, India**

## Suggested Web links

1. [www.pharmatutor.org](http://www.pharmatutor.org)
2. <http://www.who.int/>
3. [www.slideshare.net](http://www.slideshare.net)

## *PH-242P*

## PHARMACEUTICAL MICROBIOLOGY

### Objective of the Course

The objective of the course is to bestow students with the knowledge and microbiological skills by practicing and understanding the experiments.

### Desired Outcome of the Course

The student will be able to understand and expertise in skills like

1. Functioning of various instruments
2. Preparation of various types of culture media
3. Sub-culturing of common aerobic and anaerobic bacteria
4. Identification and methods of staining
5. Various isolation techniques
6. Sterilization techniques
7. Evaluating methods of antiseptics and disinfectants
8. Testing the sterility of pharmaceutical products as per I.P. requirements
9. Microbial assay of antibiotics and vitamins.

## PRACTICALS

Experiments devised to prepare various types of culture media, sub-culturing of common aerobic and anaerobic bacteria, fungus and yeast, various staining methods, various methods of isolation and identification of microbes, sterilization techniques and their validation, validation of sterilization techniques, evaluation of antiseptics and disinfectants, testing the sterility of pharmaceutical products as per I.P. requirements, microbial assay of antibiotics and vitamins.

## **SUGGESTED PRACTICALS**

1. Study of sterilization methods & equipments
  - Dry heat
  - Moist heat
2. Preparation of various types of culture media.
3. Isolation of bacteria.
4. Sub-culturing of common bacteria, fungi, yeast.
5. Identification and staining of bacteria.
  - Simple staining
  - Gram staining
  - Acid fast staining

## **BOOKS RECOMMENDED**

1. Aneja K.R. Experiments in Microbiology, Plant Pathology, Tissue Culture & Mushroom Cultivation, Vishwa Prakashan.
2. Gaud R.S., Gupta G.D., Practical Microbiology, Nirali Prakashan.

## **Suggested Web links**

1. [www.youtube.com](http://www.youtube.com) (For Laboratory Techniques)

**PH-243**  
**PHARMACEUTICAL BIOSTATISTICS**

**Course Objective:** Basic idea of the course will be to introduce the basic concept of fundamental statistics, which includes sampling, correlation, regression, dispersion, interference and some basic idea to probability. This course is designed to give students experience and confidence in the design and analysis of data within realistic pharmaceutical research contexts. Students will gain basic practical experience in collecting, displaying, summarizing, analyzing and interpreting pharmaceutical data in applied research contexts using standard statistical methods.

**Learning outcomes expected from the course:**

Upon completion of this course, the student will be able to explain each of the following:

- a. Student will be able to distinguish between different types of data.
- b. Understand the features that describe a data distribution.
- c. Student will be able to assess the methods for summarizing a data set
- d. Student will be able to use an appropriate software tool for data summary and exploratory data analysis.
- e. Student will be able to find probabilities of single events, complementary events and the unions and intersections of collections of events.

**Unit-I**

1. Methods of collecting data
2. Diagrammatic representation of data (Pie chart, Histogram, bar diagram, Circular diagram)
3. Classification and Tabulation of data.
4. Sampling-Types of sampling, Merits and limitations of sampling, Sampling errors & non sampling errors.

**Unit-II**

Measures of central tendency for discrete and continuous data

- a. Mean, Types of means.
- b. Median
- c. Mode

Measure of dispersion

- a. Quartile deviation
- b. Mean deviation
- c. Standard error of Mean (SEM)

**Unit-III**

- a. Skewness and Kurtosis
- b. Correlation and regression analysis
- c. Method of least square in straight line

**Unit-IV**

Statistical Inference- Confidence (fiducial) limits.

Test for Hypothesis- t-test, z-test, chi-square test, F- test (variance ratio)

Analysis of variances (ANOVA) - one way and two way.

**Unit-V**

1. Theory of Probability- Simple Probability, Addition Probability, Multiplication Probability
2. Binomial distribution- Fit of Binomial
3. Poisson distribution- Fit of Poisson
4. Normal distribution –Fit of Normal

**BOOKS RECOMMENDED**

1. A Textbook of Mathematics for XI-XII Students, NCERT Publication Vol. I-IV.
2. Gupta S.P. Statistical Methods, Sultan Chand and Co., New Delhi.
3. Greval B.S., Higher Engineering Mathematics, Khanna Publication, New Delhi.
4. Bolton's Pharmaceutical Statistics, Practical and Clinical Application, Marcel Dekker, N.Y.
5. Khan, Khanum "Biostatistics for Pharmacy".

## **PHARMACEUTICAL ANALYSIS- II**

**Objective of the Course:** The course intends to impart knowledge of the basic techniques in determining unknown concentrations of different constituents present in solutions or solids by using non-aqueous, complexometric and many other miscellaneous methods of titrimetric analysis. It also includes Potentiometry, conductometry, polarography, amperometry and separation of individual components from their mixture by chromatography methods.

### **Desired Outcome of the Course**

The students must be able to:

- Determinate the concentration by non-aqueous, complexometric and diazotization titrations.
- Estimate nitrogen by Kjeldahl method.
- Estimate alcohol in galenicals, estimate water by KFR and knowledge of bioassays
- Determinate the concentration by conductometry, potentiometry, polarography and amperometry.
- Separate components from their mixtures and identify them.

### **Unit-I:**

Theoretical considerations and application in drug analysis and quality control by the following analytical techniques (assays included in the Indian Pharmacopoeia, 1996)

(A) Non-aqueous titrations

(B) Complexometric titration. [08]

### **Unit-II:**

(A) Miscellaneous methods of analysis Diazotization titrations, Kjeldahl method of Nitrogen estimation, Karl-Fischer titration, Alcohol estimation in galenicals

(B) Radio assays [08]

### **Unit-III:**

Densimetry- Introduction, Dielectric cell, electrode potential, Nernst equation, salt bridge, standard potential, reference and indicator electrodes, measuring the relative voltage of cell.

A. Potentiometry: General principles, instrumentation and applications.

B. Conductometry: General Principles, instrumentation and applications. [08]

### **Unit-IV:**

Polarography and Amperometry- General principle, Instrumentation and Applications [08]

### **Unit-V:**

Principle, instrumentation and pharmaceutical applications of- Paper, column and Thin layer Chromatography [08]

### **BOOKS RECOMMENDED**

1. Beckett, A H and Stenlake, J.B, Practical Phamaceutical Chemistry, Vol, I and II, The Athlone Press of the University of London.
2. Pharmacopoeia of India, published by The Controller of Publications, Delhi.
3. British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
4. Mendham J, Denny RC, Barnes, J.D. Thomas M.J.K. "Vogel's Text Book of Quantitative chemical" Pearson Education Asia.
5. Connors KA, A Textbook of Pharmaceutical Analysis, Wiley Intescience, New York.
6. G.Vidya Sagar, "Instrumental Methods of Drug Analysis".

## PHARMACEUTICAL ANALYSIS - II

Exp. No.	Experiment	Objective	Expected Outcome
1	Non-aqueous Titrations: Preparation and standardization of perchloric acid and sodium/potassium methoxide solutions, Estimation of some pharmacopoeial products	Determination of concentration of weak acidic or weak basic drugs by non aqueous titration	Knowledge of assay of weak acidic and weak basic drugs
3	Complexometric Titrations: Preparation and standardization of EDTA solution some exercise related to pharmacopoeial assays by complexometric titrations.	Determination of the concentration of metal ion by complexometric titration	Knowledge of complex formation and it's stability at different pH and back titration and replacement titration
3	Miscellaneous Determinations: Exercise involving Diazotization, Kjeldahl, Karl fisher..	Estimation of nitrogen by Kjeldahl, water by KFR and assay of drugs by Diazotization titration	Knowledge of Diazotization, Kjeldahl, Karl fisher
3	Exercise based on acid base titration in aqueous and non-aqueous media, oxidation reduction titrations using potentiometric technique, determination of acid base dissociation constants and plotting of titration curves using pH meter.	Determination of the concentration of a compound by using potentiometer and pH meter	aware to use of pH meter potentiometer
2	Exercises involving conductometric titrations.	Determination of concentration of unknown sample by involving conductometric titrations.	Practical knowledge of conductometric titration
2	Exercises based on paper, column and thin- layer chromatography	Separation and identification of compound	Knowledge of separation and identification

## **ANATOMY PHYSIOLOGY AND PATHOPHYSIOLOGY –IV**

Anatomy and Physiology IV is designed to provide knowledge of human organ system. This course covers anatomy and physiology of respiratory system, cardiovascular system, reproduction system, Endocrine system. The advanced course will provide students with a knowledge and understanding of: pathophysiology of disease related to respiratory system, cardiovascular system, reproduction system, Endocrine system and various joint disorders, eyes disorder etc. The course is designed and intended for those students who plan to major in areas of biological science such as pharmaceutical science and other related areas.

### **Desired outcome of the course**

The students must be able to:

1. Learn how the various organs of the body interact with one another and how they contribute to the overall physiology of the body.
2. Describe the structure, function and physiology of respiration and define each of the respiratory air volumes.
3. Demonstrate the ability to analyze the structures and functions of the circulatory system and identify the major structural features of the heart (chambers, valves, and major vessels).
4. Demonstrate the ability to analyze the structures and functions of the male and female reproductive systems and discuss related biomedical condition and identify the structures and functions associated with the reproductive system.
5. Demonstrate the ability to identify the structures and functions of the endocrine system and also provide the locations, secretions, targets and effects of the major endocrine glands (i.e., pituitary, thyroid, thymus, pancreas, adrenal, and reproductive glands), discuss various diseases of the endocrine system.

### **Syllabus**

#### **Unit-I**

**Respiratory System** – Anatomy & functions of respiratory structures, Mechanism of respiration, regulation of respiration, pathophysiology of Asthma, Pneumonia, Bronchitis, Tuberculosis

#### **Unit-II**

**Cardiovascular System** – Functional Anatomy of heart, conducting system of heart, cardiac cycle, ECG (Electro cardiogram). Pathophysiology of hypertension, Angina, CHF, myocardial infarction, cardiac arrhythmias, Ischaemic heart disease, Arteriosclerosis.

#### **Unit-III**

**Reproductive System-** Male & Female reproductive systems, Menstruation, pathophysiology of sexually transmitted diseases, spermatogenesis, oogenesis, pregnancy.

#### **Unit IV**

**Endocrine System** – Anatomy & Physiology of pituitary, thyroid, parathyroid, adrenal, Pancreas, control of hormone secretion, pathophysiology of hypo & hyper secretion of endocrine glands & their disorders e.g.- Diabetes mellitus.

#### **Unit-V**

**Pathophysiology of Joints disorders** – Arthritis, gout, myasthenia gravis, spasticity, tetany, fatigue  
Hypersensitivity, allergic conditions, Pathophysiology of cataract

### **Books Recommended**

1. Difore SH, “Atlas of Normal Histology” Lea & Febiger Philadelphia.
2. Chaurasia B.D, Human Anatomy, Regional & Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.
3. Guyton AC, Hall JE., Text book of Medical Physiology, WB Saunders Company.
4. Chatterjee C.C. Human Physiology, Medical Allied Agency, Calcutta.
5. Ross & Wilson, Anatomy & Physiology in Health & Illness, Churchill Livingstone.
6. Tortora GJ, & Anagnostikos NP, Principles of Anatomy & Physiology, Harper & Row Publishers, New Delhi.
7. Parmar N.S., Health Education & Community Pharmacy CBS Publishers, Delhi.
8. Shalya Subhash, Human Physiology, CBS Publishers & Distributors.
9. Keele, C.A., Niel, E and Joels N, Samson Wright’s Applied Physiology, Oxford University Press.
10. Dipiro JL, Pharmacotherapy – A Pathophysiological Approach, Elsevier.
11. Robbins SL, Kumar V, Basic Pathology, WB Saunders.

### **Suggested web links**

1. [www.medicinenet.com/diseases\\_and\\_conditions/alpha\\_a.htm](http://www.medicinenet.com/diseases_and_conditions/alpha_a.htm)
2. [http://books.google.co.in/books/about/Pathophysiology\\_of\\_disease\\_electronic\\_re.html](http://books.google.co.in/books/about/Pathophysiology_of_disease_electronic_re.html)



**PH-246**  
**PHARMACEUTICAL JURISPRUDENCE & ETHICS**

**Objective:**

- a. To know about rules and regulations of Pharmaceutical legislations.
- b. To study about code of pharmaceutical ethics.
- c. To study about pharmacy profession in concern to code of ethics.
- d. To study the constitution of PCI.
- e. To study about pharmacy act and pharmacy profession.
- f. To study about Narcotic drugs and psychotropic substances.

**Desired outcome of the course**

- 1) The students must be able to:
- 2) Be acquainted with the law relating to drugs & pharmaceuticals and pharmacy profession
- 3) Offer the knowledge of various acts relevant to pharmacy like Pharmacy Act, Drugs & Cosmetics act, Factories act, Industries development & regulation act, New drugs policy & drug prices control order etc.
- 4) To have awareness about constitution of various governing bodies

**SYLLABUS**

**Unit-1: Introduction**

1. Pharmaceutical Legislations – A brief review.
2. Drugs & Pharmaceutical Industry – A brief review.
3. Pharmaceutical Education – A brief review.
4. The Code of Pharmaceutical Ethics [06]

**Unit-II:** An elaborate study of the following:

- (A) Pharmacy Act 1948  
(B) Drugs and Cosmetics Act 1940 and Rules 1945 [12]

**Unit-III:**

- (C) Medicinal & Toilet preparations (Excise duties Act 1955)  
(D) Narcotic Drugs & Psychotropic Substances Act 1985 & Rules.  
(E) Drugs Price Control Order 1995. [08]

**Unit-IV:** A brief study of the following with special reference to the main provisions.

- (A) Poisons Act 1919  
(B) Drugs and Magic remedies (Objectionable Advertisements) Act 1954.  
(C) Medical termination of Pregnancy Act 1971 & Rules 1975.  
(D) Prevention of Cruelty to Animals Act 1961.  
(E) States Shops & Establishments Act & Rules. [07]

**Unit-V:**

- (F) A.I.C.T.E. Act 1987  
(G) Patents Act 1970  
(H) Weight and Measures Act  
(I) Package and Commodity Act  
(J) U.S Food and Federal D&C Act [07]

Note: The teaching of all the above Acts should cover the latest amendments.

**BOOKS RECOMMENDED**

1. B.M., Mittal, Textbook of Forensic Pharmacy, National Book Centre, Dr. Sundari Mohan Avenue, Calcutta.
2. Relevant Acts & Rules Published by the Govt. of India.
3. N.K. Jain, A Textbook of Forensic Pharmacy, Vallabh Prakashan, N. Delhi.
4. Singh, Harkishan, History of Pharmacy in India- Vol.-I, II & III, Vallabh Prakashan.

## TECHNICAL WRITING

**Objectives of the course:** Technical writing is an integral part of today's life. The advent of new technologies has led to the rapid development. A budding technocrat must be equipped with English language proficiency so that he can make a mark in this globalised world. They also need to acquire optimum writing skills. The course of technical writing will help in the development and improvement of the communication skills and writing skills.

**Desired outcome of the course:**

The student must be able to:

- i. To face the challenges of their professional lives with more confidence.
- ii. Learn technical writing including sentence structure and be able to understand and use technical words.
- iii. Write reports, proposals and technical articles

### **Unit - I**

Communication–Nature and process.

Channels of Communication–Down ward, upward and horizontal Communication. Networks and Barriers to Communication.

Technical Communication–Definition, Oral and Written Technical Communication.

Importance and Need for Technical Communication

Nature of Technical Communication-Aspects and Forms of Technical Communication

Technical Communication Skills-Listening, Speaking, Reading and Writing (Improving these with comprehensions).

### **Unit -II**

Techniques of Writing, Selection of words and phrases in technical writing.

Difference between Technical Writing and General Writing.

Abstract and specific words

Sentence structure, Requisites of sentence construction.

Paragraph Length and structure

Jargons and Cliché.

### **Unit -III**

Scientific Article Writing.

Synopsis Writing, Project writing and Dissertation /Thesis Writing.

Report Writing-meaning, significance, structure and style.

Different type of Reports-routine reports and annual reports.

Project Reports

Sample Reports

Technical Articles-nature, significance and types.

Journal Articles and Conference Papers.

#### **Unit -IV**

Technical Note Making

Mechanics and Note Writing Techniques.

Technical Proposals-meaning, structure, types and significance.

Types of Proposals

Review and Research Articles.

Elements of Technical Articles.

#### **Unit -V**

Meetings-Preparation of Agenda, participation, chairing and writing minutes of meetings.

Conferences, Seminars, Technical Presentations and Workshops.

Video Conferencing, technical description of engineering objects/products and processes.

Slogan Writing, Speech advertising.

CV Writing, difference between Biodata, CV and Resume. Types of resume and tips for resume writing.

#### **Suggested Books**

1. Kavita Tyagi, Padma Mishra, "Basic Technical Communication", PHI Learning Pvt. Ltd, 2012.
2. M Ashraf Rizvi, "Effective Technical Communication," Tata Mc Graw Hill Education Pvt. Ltd, 2012.
3. Barun K. Mitra, "Effective Technical Communication" Oxford University Press, 2006.
4. Rutherford, "Basic Communication Skill," Pearson Publication, New Delhi.

#### **Suggested Web Links:**

<http://www.english4today.com/>

<http://www.learnamericanenglishonline.com/>

<http://learnenglish.britishcouncil.org/en/>