

MAHAMAYA TECHNICAL UNIVERSITY, NOIDA
STUDY AND EVALUATION SCHEME
[Effective from the session: 2012-13]

Course: B. Pharm.

Year-II, Semester-III

S.NO.	Course Code	Subject Name	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
1.	PHARM-231	Pharmaceutics-II (Unit Operation-I)	3	---	15	05	20	80	100
2.	PHARM-232	Pharmaceutical Jurisprudence & Ethics	3	---	15	05	20	80	100
3.	PHARM-233	Pharmacognosy-II	3	---	15	05	20	80	100
4.	PHARM-234	Pharmaceutical Chemistry-III (Organic Chemistry-II)	3	---	15	05	20	80	100
5	PHARM-235	Pharmaceutics-III (Community Pharmacy)	3	---	15	05	20	80	100
6	PHARM-236	Anatomy, Physiology and Pathophysiology-III	3	---	15	05	20	80	100
Practical Day to Day Evaluation									
7	PHARM-231 P	Pharmaceutics-II (Unit Operation-I)	---	4	--	--	20	80	100
8	PHARM-233 P	Pharmacognosy-II	---	4	--	--	20	80	100
9	PHARM-234 P	Pharmaceutical Chemistry-III	--	4	--	--	20	80	100
10	PHARM-235 P	Pharmaceutics-III (Community Pharmacy)	---	4	--	--	20	80	100
			18	16	--	--	200	800	1000

T.A- Teacher Assessment **ESE-**End Semester Examination **CT-**Cumulative Test

NOTE- Duration in Theory & Practical of ESE shall be 3 (three) hours and 4 (four) hours respectively.

MAHAMAYA TECHNICAL UNIVERSITY, NOIDA
STUDY AND EVALUATION SCHEME
[Effective from the session: 2012-13]

Course: B. Pharm.

Year-II, Semester-IV

S.N	Course Code	Subject Name	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
1.	PHARM-241	Pharmaceutics-IV (Unit Operation-II)	3	---	15	05	20	80	100
2.	PHARM-242	Pharmaceutical Microbiology	3	---	15	05	20	80	100
3.	PHARM-243	Pharm. Biostatistics	3	---	15	05	20	80	100
4.	PHARM-244	Pharmaceutical Analysis-II	3	---	15	05	20	80	100
5	PHARM-245	Anatomy, Physiology and Pathophysiology-IV	3	---	15	05	20	80	100
Practical Day to Day Evaluation									
6	PHARM-241 P	Pharmaceutics-IV (Unit Operation-II)	---	4	--	--	20	80	100
7	PHARM-242 P	Pharmaceutical Microbiology	---	4	--	--	20	80	100
8	PHARM-244 P	Pharmaceutical Analysis-II	---	4	--	--	20	80	100
			15	12	--	--	160	640	800

T.A- Teacher Assessment **ESE-**End Semester Examination **CT-**Cumulative Test

NOTE- Duration in Theory & Practical of ESE shall be 3 (three) hours and 4 (four) hours respectively.

SEMESTER-III

PHARM-231

PHARMACEUTICS-II (UNIT OPERATIONS-I)

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. [08]

Unit-II

3. Water systems: Raw water, soft water, purified water, water for injection, quality requirements and treatment of water. washing, cleaning and standardization 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, applications 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 dermatitis, Accident record. [06]

PHARM-231P

**PHARMACEUTICS-II
(UNIT OPERATIONS-I)**

PRACTICALS

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, 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.

PHARM-232

PHARMACEUTICAL JURISPRUDENCE & ETHICS

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.

PHARM-233

PHAMACOGNOSY – II

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.

[05]

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.

[10]

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.

[14]

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

[03]

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

[02]

Unit-V: Tannins: Study of tannins & tannin containing drugs like Gambier (Pale Catechu), Black Catechu, Gall and Myrobalans (Harde, Baheda, Arjuna & Ashoka). [03]

Utilization of aromatic plants & desired products with special reference to Sandalwood oil, Mentha oil, Lemon grass oil & Eucalyptus oil. [03]

PHARM-233P

PHARMACOGNOSY – II

PRACTICALS

1. Identification of crude drugs mentioned in theory.
2. Study of fibres and pharmaceutical aids.
3. Microscopic study of seven selected drugs and their powders mentioned under the category of volatile oils in theory with their chemical tests.
4. General chemical test for Alkaloids, Glycosides, Steroids, Flavonoids & Tannins.

SUGGESTED PRACTICALS

1. Morphology of Mentha, Lemongrass, Nutmeg and chenopodium.
2. Morphology of Turmeric, Ginger, Cannabis, Eucalyptus.
3. Morphology and microscopy of Coriander and Cinnamon.
4. Morphology and microscopy of Dill and Caraway.
5. Morphology and microscopy of Cardamom and Fennel.
6. Morphology and microscopy of Clove and to study its transverse section.
7. Study of Cotton, Silk and Wool along with their chemical Tests.
8. To study the morphology and chemical tests of Talc, Diatomite, and Kaolin.
9. Morphology and microscopy of Bentonite, Gelatin and natural colours (Saffron).
10. To perform the chemical tests of Balsam (Tolu and Peru) and Asafoetida.
11. Preparation of reagents for the chemical tests of Alkaloids and to perform the chemical tests on any Alkaloid containing drug.
12. Test for identification of Glycosides (Saponin and Anthraquinone).
13. Test for identification of Tannins.
14. Tests for identification of steroids.
15. Tests for identification of flavonoids.

PROJECT WORK:

Utilization of Aromatic plants; (Monograph)

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".

PHARM-234

**PHARMACEUTICAL CHEMISTRY - III
(ORGANIC CHEMISTRY -II)**

Unit-I: , β - Unsaturated carbonyl compounds, cycloaddition.

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

Polynuclear hydrocarbons- Naphthalene, Anthracene and Phenanthrene [08]

Unit - II: Heterocyclic Compounds – Nomenclature, Chemistry, preparation, properties and pharmaceutical importance of pyrrole, furan, thiophene, pyridine, pyrimidine, imidazole, pyrazole, thiazole, benzimidazole, indole, phenothiazines. [08]

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. [08]

Unit-IV: Classification, structure, reactions, structure elucidation, identification of:

a) Carbohydrates

i) Monosaccharides – Glucose and fructose.

ii) Disaccharides – Sucrose, lactose and maltose.

iii) Polysaccharides – Starch. [08]

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. [08]

Polymers and polymerization.

PHARM-234P

**PHARMACEUTICAL CHEMISTRY-III
(ORGANIC CHEMISTRY-II)**

PRACTICALS

1. Identification of organic compounds and their mixture with derivatization.
2. Synthesis of Organic Compounds involving two steps.
3. Determination of Acid value, Saponification value, Iodine value, Ester value of oils, fats and waxes.

BOOKS RECOMMENDED

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

**PHARMACEUTICS – III
(COMMUNITY PHARMACY)**

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 counseling
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 & Pharmacoconomics – Brief introduction
 12. Rational drug therapy – Brief introduction
- [10]

PHARM-235P

**PHARMACEUTICS – III
(COMMUNITY PHARMACY)**

PRACTICALS

1. Categorization and storage of Pharmaceutical products bases on legal requirements of labeling and storage.
2. Project report on visit to the nearby Community for Counseling on the rational use of drugs and aspects of health care.
3. Prescription handling and identification of drug interactions, incompatibilities.
4. Health screening services and study of equipments for:-
Blood glucose determination (Glucometer)
Blood pressure (BP apparatus)
Lung function test (Peak flow meter)
5. Design of community pharmacy to incorporate all pharmaceutical care services (as per schedule N).
6. Study of OTC medications- List & available brands
7. Interpretation of various pathological reports of blood and urine.

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.

PHARM -236

**ANATOMY, PHYSIOLOGY AND
PATHOPHYSIOLOGY – III**

Unit I – Digestive system –Parts of digestive system, their structure and functions. Various gastrointestinal secretions & their role. [08]

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. [06]

Unit-III – Urinary System – Anatomy & physiology of urinary system, physiology of urine formation, acid- base balance, pathophysiology of renal failure, glomerulonephritis, Urinary tract infection. [08]

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. [09]

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. [09]

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 & 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.

SEMESTER IV

PHARM-241

PHARMACEUTICS – IV (UNIT OPERATIONS – II)

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. [08]

PHARM-241P

PHARMACEUTICS-IV (UNIT OPERATIONS-II)

PRACTICALS

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

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.

PHARM-242**PHARMACEUTICAL MICROBIOLOGY****Unit-I:**

1. Introduction to the scope of microbiology.
2. Structure of bacterial cell.
3. Classification of microbes and their taxonomy: Bacteria and viruses. [10]

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 [05]

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. [05]

PHARM-242P**PHARMACEUTICAL MICROBIOLOGY****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
 - Hanging drop preparation
6. Evaluation of disinfectants and antiseptics
 - Phenol coefficient test, minimum inhibitory concentration.
7. Test for sterility of pharmaceutical products as per IP.
8. Microbial assay of antibiotics as per IP.

BOOKS RECOMMENDED:

1. Aneja K.R. Experiments in Microbiology, Plant Pathology, Tissue Culture & Mushroom Cultivation, Vishwa Prakashan.
2. Gunasekaran P, Lab Manual of Microbiology, New Age Publishers.
3. Davis, Dulbetco, Eisen Microbiology.
4. Stanier R.Y., Ingraham, J.L., Wheelis M.L. & Painter P.R. General Microbiology, Macmillan Press Limited.
5. Hugo and Russell, Pharmaceutical Microbiology, Black Well Scientific Publication, Oxford.
6. Prescott L.M., Harley J.P. & Klien D.A. Microbiology, McGraw Hill.
7. Sykes, Disinfection and Sterilization.
8. Pelczar & Reid, Microbiology, Tata Mc Graw Hill, Delhi.
9. Virella G. Microbiology and Infectious Diseases, William & Wilkins.
10. Ananthanarayan R & Paniker CKJ, Textbook of Microbiology, Orient Longman.

PHARM-243

PHARMACEUTICAL BIOSTATISTICS

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 and 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".

PHARM-244

PHARMACEUTICAL ANALYSIS- II

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]

PHARM-244P**PHARMACEUTICAL ANALYSIS - II****PRACTICALS**

1. Non-aqueous Titrations: Preparation and standardization of perchloric acid and sodium/potassium methoxide solutions, Estimation of some pharmacopoeial products.
2. Complexometric Titrations: Preparation and standardization of EDTA solution some exercise related to pharmacopoeial assays by Complexometric titrations.
3. Miscellaneous Determinations: Exercise involving Diazotization, Kjeldahl, Karl fisher.
4. 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.
5. Exercises involving conductometric titrations.
6. Exercises based on paper, column and thin- layer chromatography.

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".

Unit-I

Respiratory System – Anatomy & functions of respiratory structures, Mechanism of respiration, regulation of respiration, pathophysiology of Asthma, Pneumonia, Bronchitis, Tuberculosis [08]

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. [10]

Unit-III

Reproductive System- Male & Female reproductive systems, Menstruation, pathophysiology of sexually transmitted diseases, spermatogenesis, oogenesis, pregnancy. [08]

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. [08]

Unit-V

Pathophysiology of Joints disorders – Arthritis, gout, myasthenia gravis, spasticity, tetany, fatigue
Hypersensitivity, allergic conditions,
Pathophysiology of cataract [06]

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, & Anagnodokos 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.