B. PHARM. SEMESTER-III
301T: PHARMACEUTICS-III (PHARMACEUTICAL ENGINEERING)

1. Unit Operations: Introduction to unit operations, law of material and energy balances, rate of a process, steady and unsteady states, equilibrium state, dimensionless equations, dimensionless formulae, dimensionless groups.


3. Size Reduction: Definition, objectives of size reduction, factors affecting size reduction, mechanisms of size reduction, laws governing energy and power requirements of a mill, ball mill, hammer mill, fluid energy mill and other mills in pharmaceutical industry, wet grinding, selection of size reduction method, selection of degree of size reduction.


8. Crystallization: Characteristics of crystals like-purity, size, shape, geometry, habit, forms size and factors affecting them, solubility curves and calculation of yields, super saturation theory and its limitations, nucleation mechanisms, crystal growth, study of various types of crystallizer, tanks, agitated batch, Swenson Walker, single vacuum, circulating magma and crystal crystallizer, caking of crystals and its prevention.

9. Refrigeration, Air Conditioning and Humidity Control: Principles and applications of refrigeration and air conditioning, basic concepts and definition of humidity, wet bulb and adiabatic saturation temperatures, psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipments for humidification and
10. Evaporation: Basic concept of phase equilibrium, factor affecting evaporation, different types of evaporators, single and multiple effect evaporators, evaporation under reduced pressure.

11. Distillation: Raoult's law, phase diagrams, volatility, simple steam and flash distillations, rectification, Mc. Cabe Thiele method for calculations of number of theoretical plates, azeotropic and extractive distillation.

12. Drying: Moisture content and mechanism of drying, rate of drying, classification and types of dryers, dryers used in pharmaceutical industries, special drying methods.


301P: PHARMACEUTICS – III (PHARMACEUTICAL ENGINEERING)

1. Determine the possible route of reaction by applying law of material balance.
2. Determine the alkalinity of glass as packaging material.
3. Study the effect of number of balls and speed of ball mill on the particle size reduction using ball mill.
4. Study the particle size distribution and frequency distribution of given sample using standard sieve method.
5. Determine rate of filtration of given slurry and determine effect of thickness of filter media, hydrostatic pressure, size of filter media on filtration rate.
6. Determine effect of filter aid on rate of filtration and find optimum concentration of filter aid.
7. Construct (i) solubility curve (ii) Mier’s supersolubility curve for the given sample and calculate the yield of crystals.
8. Calculate humidity at different places using dry bulb and wet bulb temperature method.
9. Construct boiling point diagram for given mixture of alcohol and water.
10. Determine rate of drying, EMC, CMC and FMC for given sample and construct drying curve.
11. Study effect of surface area, material bed thickness, temperature and moisture content on the rate of drying.
12. Determine the corrosion rate of different materials.
13. Determine the corrosion rate of the metal in different environment.

BOOKS RECOMMENDED

5. Carter, S.J., Cooper and Gunn’s Tutorial Pharmacy, CBS Publishers and Distributors, New Delhi.
8. Sambamurthy, K., Pharmaceutical Engineering, NAI (P) Ltd., Delhi.

302 T: PHARMACEUTICS IV
(DISPENSING, COMMUNITY AND HOSPITAL PHARMACY)

1. Prescription: Parts, types and handling of prescription, knowledge of commonly used Latin terms in prescriptions, general dispensing and compounding procedures, labeling
of dispensed products, sources of errors in prescription, care required in dispensing of prescription.

2. Pharmaceutical calculations: Different systems of weights and measures, dilution and concentration of solutions, percentage solutions, calculation by allegation, proof spirits, isotonic solution, calculation for adjustment to isotonicity, posology, knowledge of prophylactic and therapeutic doses of commonly used drugs, detection of overdoses in prescription, calculation of doses for infants, adults and elderly patients.

3. Principle involved and procedures adopted in dispensing of mixtures, solutions, emulsions, lotions, liniments, powders, capsules, tablets, tablet triturates, pastilles, lozenges, pills, ointments, creams, pastes, suppositories, jellies, inhalations, paints, sprays and ophthalmic preparations.

4. Incompatibility: Physical, therapeutic and chemical incompatibilities, incompatibility of common occurrence and their correction.

5. Community pharmacy: Organization and structure of retail and whole sale drug store and design, legal requirements for establishment and maintenance of drug stores, dispensing of proprietary products, maintenance of records, patient counseling on rational use of drugs and aspects of health care.

6. Hospital pharmacy: Organization of a hospital pharmacy, responsibilities of a hospital pharmacist, pharmacy and therapeutic committee, hospital formulary, contents, preparation and revision of hospital formulary, inventory control procedures in hospital pharmacy.

**302 P: PHARMACEUTICS IV**

**(DISPENSING, COMMUNITY AND HOSPITAL PHARMACY)**

1. Prepare and dispense simple powder.
2. Prepare and dispense compound powder.
3. Prepare and dispense powder containing hygroscopic and deliquescent substances.
4. Prepare and dispense powder containing efflorescent materials.
5. Prepare and dispense eutectic mixtures.
6. Prepare and dispense effervescent powder.
7. Prepare and dispense dusting powder.
8. Prepare and dispense tooth powder.
10. Prepare and dispense mixture containing diffusible solids.
11. Prepare and dispense mixture containing indiffusible solids.
12. Prepare and dispense mixture containing precipitate forming liquids.
13. Prepare and dispense prescription possessing physical incompatibility (incomplete solution).
14. Prepare and dispense prescription possessing physical incompatibility (precipitation).
15. Prepare and dispense prescription possessing physical incompatibility (separation of immiscible liquids).
16. Prepare and dispense prescription possessing chemical incompatibility (alkaloidal salts with alkaline substances).
17. Prepare and dispense prescription possessing chemical incompatibility (alkaloidal salts with soluble iodides).
18. Prepare and dispense prescription possessing chemical incompatibility (alkaloidal salts with salicylates).
19. Prepare and dispense prescription possessing chemical incompatibility (soluble salicylates with ferric salts).
20. Prepare and dispense prescription possessing chemical incompatibility (evolution of carbon dioxide).
22. Prepare and dispense emulsion containing fixed oil.
23. Prepare and dispense camphor liniment.
24. Prepare and dispense eye drop/ear drop.
25. Prepare and dispense salicylic acid ointment.

BOOKS RECOMMENDED
2. Gennaro, A.R., Remington: The Science and Practice of Pharmacy, Lippincott,
Williams and Wilkins, Philadelphia.
4. Hoover, Dispensing of Medication, Mack Publishing Co., Easton, Pennsylvania

303T: PHARMACEUTICAL ANALYSIS-I

1. Theoretical aspects of quantitative analysis: Significance of quantitative analysis in quality control, different techniques of analysis, statistical treatment of analytical data, types of errors, mean deviation, standard deviation, accuracy and precision, significant figures, rules for retaining significant figures, methods of expressing concentration, primary and secondary standards.

2. Titrimetric techniques: Theoretical considerations and pharmaceutical applications with special reference to Indian Pharmacopoeia of the following analytical techniques:
   A. Acid-Base titrations: Acid base concepts, role of solvents, relative strengths of acids and bases, ionization, law of mass action, common-ion effect, ionic product of water, pH, hydrolysis of salts, Henderson-Hesselbach equation, buffer solutions, neutralization curves, acid-base indicators, theory of indicators, choice of indicators, mixed indicators, universal indicators, polyprotic systems, preparation and standardization of neutralization titrants.
   B. Oxidation-Reduction titrations: Concepts of oxidation and reduction, redox reactions, strengths and equivalent weights of oxidizing and reducing agents, theory of redox titrations, redox indicators, oxidation-reduction titration curves, titrations involving potassium permanganate, ceric ammonium sulphate, potassium iodate, potassium bromate, iodometry and iodimetry, pharmaceutical applications, preparation and
standardization of redox titrants like potassium permanganate, ceric ammonium sulphate, potassium dichromate, potassium iodate, potassium bromate, iodine, sodium thiosulphate.

C Precipitation titrations: Precipitation reactions, solubility products, detection of end point in precipitation titrations, indicators used in precipitation titrations, preparation and standardization of titrants like silver nitrate, ammonium and potassium thiocyanate, titrations according to Mohr’s and Volhard’s methods, ammonium and potassium thiocyanate, applications in pharmaceutical analysis.

D Gravimetric analysis: Fundamentals of gravimetry, precipitation reagents, precipitation techniques, specific examples of gravimetric estimation like aluminium as hydroxy quinolate, barium as barium sulphate, lead as chromate and magnesium as magnesium pyrophosphate.

E Non-aqueous titrations: Scopes and limitations, solvents used in non-aqueous titrations, acid-base equilibria in non-aqueous media, differentiating and leveling effect of solvents, preparation and standardization of perchloric acid and tetrabutyl ammonium hydroxide, titration of weak acid and weak bases with suitable examples.

F. Complexometric titrations: Theory of complexometric analysis, factors influencing stability of complexes, metal ion indicators, types of disodium edetate titrations with suitable examples, preparation and standardization of disodium edetate, methods to increase the selectivity of EDTA titrations.

303P: PHARMACEUTICAL ANALYSIS-I

1. Perform the assay of Sodium Hydroxide IP.
2. Perform the assay of Boric Acid IP.
3. Perform the assay of Hydrogen Peroxide solution IP.
4. Perform the assay of Ferrous Sulphate IP.
5. Perform the assay of Ascorbic Acid IP.
6. Perform the assay of Ascorbic Acid tablets IP.
7. Perform the assay of Sodium Metabisulphite IP.
8. Perform the assay of Sodium Chloride IP.
9. Determine Barium as Barium Sulphate gravimetrically.
10. Perform the assay of Adrenaline IP.
11. Perform the assay of Diiodohydroxyquinoline IP.
12. Perform the assay of Magnesium Sulphate IP.
13. Perform the assay of Dibasic Calcium Phosphate IP.
14. Perform the assay of Calcium Gluconate IP.

**BOOKS RECOMMENDED**

4. Pharmacopoeia of India, Govt. of India, Ministry of Health and Family Welfare, New Delhi.

**304T: PHARMACOGNOSY-I**

1. Definition, history, scope and development of pharmacognosy, sources of crude drugs and methods of their classification.
2. Plant hormones and their applications, influence of mutation and hybridization with reference to medicinal plants.
3. Pest control and natural pest control agents.
4. Quality control of crude drugs: Different types of adulteration and their evaluation using various methods like organoleptic, microscopic, physical, chemical and biological.
5. An introduction of various types of primary and secondary metabolites as active constituents of crude drugs, general methods of their isolation, classification, properties
and systematic pharmacognostic study of:

a) Carbohydrates and drugs belonging to this class like: Agar, Guar Gum, Acacia, Isabgol, Pectin, Sterculia, Tragacanth.

b) Lipids and drugs belonging to this like: Castor oil, Beeswax, Cocoa butter, Hydonocarpus oil, Kokum butter, Codliver oil, Woolfat.

c) Resins and Tannins, and drugs of these classes like: Podophyllum, Balsams, Turmeric, Ginger, Ipomea and Myrobalan.

d) Pharmaceutical aids like: Talc, Kaolin, Bentonite, Gelatin, Cotton and Viscose Rayon.

**304P: PHARMACOGNOSY - I**

1. Study of morphological characters of agar and pectin.
2. Study of morphological characters of gum acacia and gum tragacanth.
3. Study of morphological characters of guar gum and gum sterculia.
4. Study of organoleptic characters of cocoa butter and kokum butter.
5. Study of organoleptic characters of castor oil and hydnocarpus oil.
7. Perform morphology and microscopy of isabgol seed.
8. Perform morphology and microscopy of ginger.
11. Determine palisade ratio of given sample.
12. Determine stomatal number of given sample.
13. Determine stomatal index of given sample.
15. Study of organoleptic characters of bentonite and gelatin.
17. Perform identification test of drug containing carbohydrates.
18. Perform identification test of drug containing lipids.
19. To prepare herbarium sheets.
BOOKS RECOMMENDED

3. Kokate C.K., Purohit A.P., Gokhale S.B., Pharmacognosy, Nirali Prakashan, Pune

305T: ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II

4. Endocrine System: Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenals, pancreas, testis and ovary; their hormones and functions.
5. Digestive System: Gross anatomy of gastrointestinal tract, functions of its different parts, various gastrointestinal secretions and their role in the absorption and digestion of food.
6. Reproductive System: Anatomy of male & female reproductive system and their hormones, physiology of menstruation, coitus, infertilization, sex differentiation, spermatogenesis and oogenesis, pregnancy its maintenance and parturition.
8. Sense Organs: Basic anatomy and physiology of the eye (vision), ear (hearing), taste buds, nose (smell) and skin (superficial receptors).

305P: ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II

1. Study and draw human central nervous system with the help of charts/models.
2. Study and draw human autonomous nervous system with the help of charts/models.
3. Study and draw human respiratory system with the help of charts/models.
4. Study and draw human endocrine system with the help of charts/models.
5. Study and draw human digestive system with the help of charts/models.
6. Study and draw human reproductive system with the help of charts/models.
7. Study and draw human urinary system with the help of charts/models.
8. Study and draw human eye with the help of charts/models.
9. Study and draw human ear with the help of charts/models.
10. Study and draw human nose with the help of charts/models.
11. Study and draw human taste buds components with the help of charts/models.
12. Study and draw human skin components with the help of charts/models.
13. Determine the normal constituents of urine in the given sample of urine.
14. Determine the abnormal constituents of urine in the given sample of urine.
15. Study and draw the histological characteristics of urinogential organs with the help of permanent slides.
16. Study and draw the histological characteristics of endocrine glands with the help of permanent slides.
17. Study and draw the histological characteristics of nerve cells & spinal cord with the help of permanent slides.
18. Study and draw the histological characteristics of digestive organs with the help of permanent slides.
19. Study and draw the histological characteristics of skin with the help of permanent slides.
20. Study and draw the histological characteristics of respiratory organs with the help of permanent slides.

BOOKS RECOMMENDED
2. Tortora, G.J. and Grabowski, S.R. Principles of Anatomy and Physiology, John Wiley & Sons, US.

306 P: COMMUNICATION SKILLS & PERSONALITY DEVELOPMENT-III
1. Professional correspondence: Memos, components of a memo, organization, development, language and tone of a memo, memo formats, types of memos, status memos, negative memos, personal memos and memos of transmittal.
2. Resume and curriculum vitae: Types of resume, design of resumes, writing job application letters, organization approaches to letters of application and resumes, follow-up correspondence.

BOOKS RECOMMENDED