

First B.Pharmacy

Prospectus No. 2013144

Semester-I Examination - Winter-2012,

Semester-II Examination - Summer-2013

संत गाडगे बाबा अमरावती विद्यापीठ
SANT GADGE BABA AMRAVATI UNIVERSITY

आयुर्विज्ञान विद्याशाखा
(FACULTY OF MEDICINE)

PROSPECTUS
OF
THE DEGREE OF
BACHELOR OF PHARMACY (FOUR YEAR –
EIGHT SEMESTER DEGREE COURSE)
SEMESTER-I EXAMINATION, WINTER-2012
SEMESTER-II EXAMINATION, SUMMER-2013



2012

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(Prospectus No.2013144)

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Syllabus Prescribed for
B. Pharm. Semester –I & II
(Introduced from the Academic Session 2010-11)
SEMESTER-I
Subject code Subject

Subject Code	Subject	Maximum Marks (Credits)		Total Marks (Credits)
		Theory	Practical	
1.1	Pharmaceutics-I	80 (04)	80 (04)	160 (08)
1.2	Pharmaceutical biochemistry - I	80 (04)	80 (04)	160 (08)
1.3	Anatomy and Physiology-I	80 (04)	80 (04)	160 (08)
1.4	Pharmacognocny-I	80 (04)	80 (04)	160 (08)
1.5	Pharmaceutical Engineering-I	80 (04)	80 (04)	160 (08)
	Total			800 (40)

Subject code: 1.1

Subject : Pharmaceutics – I

THEORY

45 Hours (3 hrs. /week)

SECTION-A

1. Pharmacy Profession

Pharmacy as a career, evaluation of pharmacy profession, earlier period, middle to modern ages. Introduction to Pharmacopoeias with special reference to Indian Pharmacopoeia, B.P., U.S.P. and International Pharmacopoeia.

2. Introduction to Dosage forms

Classification of solids, semisolids and liquid dosage forms, conventional and novel delivery systems.

3. Pharmacopoeial preparations :

Principles and methods of preparation of aromatic waters, spirits, elixirs, syrups, glycerin, linctuses, solutions, milks and magmas, mucilage and special preparations like pyroxyllins and flexible collodions.

SECTION-B

4. Prescriptions

Various parts of prescriptions and their functions, handling of prescriptions, sources of errors, care required in dispensing procedures including labeling of dispensed products. Preliminary knowledge of important Latin terms used in prescriptions and their translation into English. glycosides, sulfonamides, local anesthetics, dyes, surface active agents,

vitamins. Study of examples of prescriptions containing incompatibilities and their correction and dispensing methods.

5 Pharmaceutical calculations and metrology:

Metric and Imperial systems of weights and measures used in prescriptions Posology, calculations of dosage for infants, children, adults and elderly patients, reducing and enlarging formulae, Percentage solutions, allegation methods, proof spirits, calculations involving alcohol dilutions; pH and buffer solutions, isotonic solutions, displacement value, calculations involving radioisotopes.

Subject code: P-1.1

Subject : Pharmaceutics – I

PRCTICAL

45 Hours (3 hrs. /week)

- Preparation of following classes of products involving the use of calculations in metrology
(at least three products from each category wherever applicable):
Aromatic waters, solutions, spirits, syrups, elixirs, linctuses etc.
- Study of one monograph from the latest edition of Indian Pharmacopoeia.

BOOKS RECOMMENDED:

- Pharmaceutical dosage and drug delivery systems- Ansel-Popovich and Allen (Williams & Wilkins).
- Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS publishers, Delhi.
- Carter S.J., Cooper and Gunn's Tutorial Pharmacy CBS Publishers, Delhi.
- Lachman-Liberman and Kanig - Industrial Pharmacy (Leci Febiger).
- Remington : The Science and practice of Pharmacy - Alfonso and Gennaro (Mack Publishing Co.)
- Bentley's T.B. of Pharmaceutics - Rawlins (ELBS)
- Dispensing of medications, by Hooper (Mack Publishing).
- Aulton M.E., Pharmaceutics – The Science of Dosage form Design, ELBS/Churchill Livingstone.
- Sagarin & Balsam M.S., Cosmetic Science and Technology, Vol-1-3. 2nd ed. John Wiley sons, NY.
- Stoklosa MJ, Pharmaceutical calculation, Lea and Febiger, Philadelphia.
- Thomssen S.G., Modern Cosmetics, Universal Publishing Corporation, Bombay.
- Harry's Cosmeticology.

Subject code: 1.2**Subject : Pharmaceutical Biochemistry-I****THEORY 45 Hours (3 hrs. /week)****Topic No****SECTION-A**

- 1 **Introduction to Biochemistry:** Scope of the subject in Pharmaceutical Sciences, Biochemical reactions, Highlights of Prokaryotic and eukaryotic cell metabolism.
- 2 **Biochemical Morphology:** Prokaryotes, cell structure sub cellular.
- 3 **Biomembranes:** Structure and composition, model proposed, function and properties of membrane, transport hypothesis: Active and Passive, facilitated transport, Na⁺, K⁺, H⁺ pumps. Glucose transport.
- 4 **Enzymes:** Introduction, Classification, (according to the reaction catalysis and sources), Nomenclature, active sites Km, Vmax, Double reciprocal plot, effect of active substrates, pH ionic strength, conc., temperature on rate of enzymes reactions. Enzyme inhibition (Competitive, Non-competitive, irreversible). Isozymes, Therapeutic and clinical diagnosis uses of enzymes.

SECTION-B

- 5 **Carbohydrate Metabolism:** Glycolysis, Glucogenesis, Glycogenolysis, Glycogen formation, Pentose phosphate pathway, Uronic acid pathway, Citric acid cycle and its Significance, Abnormalities of Carbohydrate metabolism.
- 6 **Bioenergetics:** Introduction, Concept of free energy, role of high energy nucleotide phosphates, production of ATP and its biological significances.
- 7 **Nucleic acid Metabolism:** Purine and pyrimidine metabolism, disorders of Purine metabolism, Purine and pyrimidine biosynthesis, Abnormalities of nucleic acid metabolism

Subject code: P- 1.2**Subject : Pharmaceutical Biochemistry –I****PRACTICAL 45 Hours (3 hrs. /week)**

- (1) Estimation of Bilirubin in a given Plasma/Serum sample.
- (2) Quantitative estimation of Carbohydrate by Anthrone method.
- (3) Separation of Sugars from fruit juices by Paper Chromatography.
- (4) Quantitative estimation of Carbohydrate by Follin WU method.
- (5) Quantitative estimation of Glucose in Urine by Benedict method.
- (6) Determination of Ascorbic Acid using Dye 2, 6 Dichlorophenol Indophenol.

- (7) A study of activity of enzyme Salivary Amylase.
- (8) Estimation of Enzyme SGOP Activity in Serum sample.
- (9) Estimation of Enzyme SGPT Activity in Serum sample.
- (10) Estimation of Enzyme Alkaline Phosphatase Activity in Serum sample.
- (11) Estimation of Enzyme Acid Phosphatase Activity in Serum sample.

Recommended Books

1. Lehninger's Principles of Biochemistry by Albert Lehninger, 4/Ed., Palgrave Macmillon.
2. Biochemistry by Lubert Stryer, W.H., Freeman & Company, New York.
3. Harper's Illustrated Biochemistry by R.K. Murray & D.K. Granner, 27/Ed, McGraw Hill.
4. Molecular Biology by J.D. Watson, The Benjamin/Cummings Company Inc.
5. Clinical Biochemistry by Herold Varley, CBS Publishers, New Delhi.
6. Text Book of Biochemistry with Clinical Correlations by Thomas & Devlin, A Wiley Medical Publication.
7. Clinical Chemistry Interpretation and Techniques by Alex Kaplan Lavernel L. & Szebo Kent E. Opheim Published Lea and Febiger.
8. Text Book of Pathology by Harsh Mohan, 5/Ed., Jaypee Brothers Medical Publishers (P) Ltd.
9. Clinical Biochemistry by S. P. Dandekar 2/Ed
10. Pathophysiology of Disease by Mephee & Lingappa, 2/Ed., Appleton & Lane.
11. Pharmaceutical Biochemistry by Sharma P.K & Dandiya P.C, Vallabh Prakashan.
12. Text book of Biochemistry by A. C. Deb
13. Human Biochemistry by Jamam, Orten publisher.
14. Biochemistry by U.Satyanarayan.
15. Varley's Practical Clinical Biochemistry by Harold Varley, 6/Ed., CBS Publishers, New Delhi.
16. Clinical Chemistry Interpretation and Techniques by Alex Kaplan Lavernel L. & Szebo Kent E. Opheim Published Lea and Febiger.
17. Mukherjee K.L. Medical Laboratory Technology. Tata McGraw Hill. New Delhi (Vol. I, II, III)
18. Deb A.C. Viva & Practicals in biochemistry. Central book agency. Calcutta.
19. Plummer D.T. An Introduction to Practical Biochemistry. Tata McGraw Hill, New Delhi.
20. Godkar P.B. Clinical Biochemistry- Principles and Practice. Bhalani Publishing House, Bombay.

Subject code: 1.3**Subject : Anatomy and Physiology-I****THEORY****45 Hours (3 hrs. /week)****Topic No****SECTION-A**

- 1 Basic terminologies used in anatomy and physiology
- 2 Structure of cell, its components- Their structures and functions
- 3 Elementary tissues of human body-epithelial, connective, muscular, and nervous tissues-their characteristics
- 4 Blood-composition and functions of blood, RBC, WBC, Platelets, Haemopoiesis, blood groups, mechanism of Clotting, anemia,.
5. Lymphatic system- Lymph (composition, functions, circulation), lymph node (structure and functions), spleen and its functions.

SECTION-B

- 6 Cardiovascular system- Blood vessels-anatomy of heart, conducting system, cardiac cycle and heart sounds, blood vessels and circulation (pulmonary coronary, systemic and portal), ECG, Blood pressure (Maintenance and regulation), disorders of cardiovascular system.
- 7 Sense organs- Anatomy and physiology of ear and eye. Sense of smell and taste.
- 8 Endocrine system- Anatomy and physiology of hormones of pituitary gland, adrenal gland, thyroid gland, pancreas, gonads (testis and ovary),

Subject code: P-1.3**Subject : Anatomy and Physiology-I****PRACTICAL****45 Hours (3 hrs. /week)**

1. Brief introduction to use of Microscope.
2. Study of instruments used in experimental physiology.
3. Determination of Bleeding time of own blood
4. Determination of clotting time of own blood.
5. Determination of percentage and gram percentage of Haemoglobin of own blood.
6. Determination of RBC count of own blood.
7. Determination of total leukocytes count of own blood(TLC)
8. Determination of differential leukocytes count of own blood (DLC).
9. To study effect of osmotic pressure on human RBC.
10. Determination of blood groups.
11. Determination of Erythrocyte sedimentation rate (ESR).
12. Different techniques used in recording of blood pressure.

13. Studies of Gross Anatomy & Physiology of Various Organ Systems by Models/ Charts / Specimens:

- Circulatory System
- Lymphatic System
- Skeletal System
- Eye
- Ear.

14. Histology: Microscopic study of different types of primary tissues and organs from permanent slides.

Recommended Books

1. Chatterjee, C.C., Human Physiology. Medical Allied Agency, Kolkata.
2. Chaudhari, A.R., Textbook of Practical Physiology. Paras Publishers, New Delhi.
3. Chaudhari, A.R., Viva in Physiology. Paras Publishers, New Delhi.
4. DiFiore-Mariano, S.H., Atlas of Human Histology. Lea and Febiger, Philadelphia.
5. Garg, K., Bahel, I. and Kaul, M., A Textbook of Histology. CBS Publishers and Distributors, New Delhi.
6. Goyal, R.K., Patel, N.M. and Shah, S.A., Practical Anatomy, Physiology and Biochemistry. B. S. Shah Prakashan, Ahmedabad.
7. Ranade, V.G., Joshi, P.N. and Pradhan, S., Textbook of Practical Physiology. Pune Vidyarthi Griha Prakashan, Pune.
8. Singh, I., BD Chaurasia's Human Anatomy. CBS Publisher and Distributors, New Delhi.
9. Singh, I., Textbook of Human Histology. Jaypee brothers Medical Publishers, New Delhi.
10. Chaudhari S K. Concise Medical Physiology. New Central Book Agency (P) Ltd., Calcutta.
11. Ganong, W.F., Review of Medical Physiology. Prentice-Hall International, London.
12. Guyton, A.C., Textbook of Medical Physiology. W. B. Saunders Co., Philadelphia, USA. Jain, A.K., Textbook of Physiology. Avichal Publishing Co., New Delhi.
13. Singh, I., BD Chaurasia's Human Anatomy. CBS Publisher and Distributors, New Delhi.
14. Tortora, G.J. and Grabowski, S.R., 2005. Principals of Anatomy and Physiology. Harper Collins College Publishers, New York.
15. Vander, A.J., Sherman, J.H. and Luciano, D.S., Human Physiology. McGraw-Hill Publishing Co., USA.
16. Wagh, A. and Grant, A., Ross and Wilson's Anatomy and Physiology in Health and Illness. Churchill-Livingstone, London.
17. West, J.B., Best and Taylor's Physiological Basis of Medical Practice. Williams and Wilkins, Baltimore, USA.
18. Warwick, R. and Williams, P., Gray's Anatomy. Longman, London.

Subject code: 1.4**Subject : Pharmacognocny-I****THEORY****45 Hours (3 hrs. /week)****SECTION A**

1. Definition, history and scope of Pharmacognosy including indigenous system of medicine.
2. Source of drugs: Biological, marine, mineral and plant tissue cultures as sources of drugs.
3. Plant taxonomy: Various systems of classification of drugs and natural origin.
4. Plant cell and its structure, Study of plant tissues: parenchyma, collenchyma, sclerenchyma, xylem and phloem. Morphology and Histology of root, stem, bark, wood, leaf, flower, fruit and seed.
5. Botanical sources, Names and skeletal structure of chemical constituents and pharmacological actions of Ayurvedic drugs- Amla, Bheda, Kantkari, Gokhru, Nirgudi, Palash, Nagarmotha, Aswagandha, Ashoka, Bramhi, Neem, Haldi, Pipli, Kumari, Shatavari, Tulsi, Bhuiamla, Shankhpuspi, Hirda, Adulsa, Guggul, kalmegh.

SECTION B

6. Microscopy and Micrometry: Use of camera lucida, stage micrometer, Eyepiece micrometer, methods and significant evaluation of Leaf Constants: stomatal number, stomatal index, vein-islet number and vein termination number, palisade ratio, ca-oxalate crystals, starch grains, trichomes, Lycopodium spore method.
7. Detailed study of Cultivation, collection, processing and storage of crude drugs: Detailed study of methods of cultivation, Merits and demerits of cultivation. Exogenous and endogenous factors affecting cultivation, quality of crude drugs & Collection and processing (Garbling, drying, preservation & storage, sterilization & preparation for market).
8. Brief outline of occurrence, distribution, outline of isolation, identification tests, therapeutic effects and pharmaceutical application of Carbohydrates, lipids, proteins, alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.
9. Systemic pharmacognostic study of the following crude drugs-
Carbohydrates: Agar, Isapgulah, Guar gum, Alginate, Honey, Pectin and Starch.
Lipids: Castor oil, Coca butter, Olive oil, Shark liver oil, wool fat, Spermaceti, Chaulmoogra oil, Neem oil.
Tannins: Gambier, Black catechu, Myrobalan
Proteins: Gelatin, Spirulina, Collagen and its products.
Resins: Podophyllum, Cannabis, Balsam of tolu, Turmeric, ginger asafetida, Capsicum

Subject code: 1.4**Subject : Pharmacognocny-I****PRACTICAL****45 Hours (3 hrs. /week)**

1. To study the compound microscope.
2. To understand the techniques of section cutting, staining, mounting and microchemical reagent.
3. To study the morphological characteristics of Carminatives (Ajowan, Blackpepper, Cardamom and Nutmeg) and Laxative (Isapgghula and Rhubarb)
4. To study the morphological characteristics of drugs acting on central nervous system (Aconite, Aswagandha, Ephedra) and Antitussive (Tulsi and Vasaka)
5. To study the morphological characteristics of Antitumor (Vinca, Colchicum), Antihypertensive (Rauwolfia) and Diuretic (Gokhru), Antiseptic (Curcuma, Neem), Vitamin (Amla).
6. To study morphological characters of flavorings agents and fibres.
7. To study the morphological characteristics of Garlic, Liquorice, Shankhpuspi, Shatawari, Behara, Hirda.
8. To study the morphological and microscopical characteristics of Cinchona bark
9. To study the morphological and microscopical characteristics of Cinnamon bark
10. To study the morphological and microscopical characteristics of Cassia bark
11. To study the morphological and microscopical characteristics of Ephedra stem
12. To study the morphological and microscopical characteristics of Rauwolfia root
13. To study the morphological and microscopical characteristics of Clove buds
14. To study the morphological and microscopical characteristics of Fennel fruit
15. To study the morphological and microscopical characteristics of Coriander fruit
16. Determinations of leaf constants.

Book recommended

1. Kokate C. K. Purohit A. P. and Gokhale S. B. , Pharmacognosy (degree) Nirali Prakashan
2. Kokate C. K. Practical Pharmacognosy, Vallabh Prakashan, Delhi.
3. Atal C. K. and Kapur B. M. Cultivation and utilization of Medicinal plants, RRL, Jammu.
4. Brain K. R. and Turner T. D., The practical Evaluation of phytopharmaceuticals

5. Khandelwal KR, Practical Pharmacognosy, Nirali Prakashan Pune.
6. Chandha K.L. and Gupta R. Advances in Horticulture Vol II- medicinal and aromatic plants,
7. Chopra R. N., Nayar S. L. and Chopra I. C., Glossary of Indian Medicinal plants CSIR, New Delhi.
8. Fahn A, Plant anatomy, 3rd Ed. Pergamon press, Oxford.
9. Iyengar M.A., Study of Crude Drugs, Manipal Power Press, Manipal.
10. Iyengar M.A. , Pharmacognosy Lab Manual. Manipal Power Press, Manipal.
11. Medicinal Plants of India, Zafar R., C.B.S. Publisher, New Delhi.
12. Swain T., Chemical Plant Taxonomy, Academic Press London.
13. Swain T., Comparative Phytochemistry, Academic Press London.
14. The Wealth of India, Raw Marerials (All Volumes), Council of Scientific and Industrial Research,
15. Trease, G.E. and Evans, W.C. Pharmacognosy, 12th Edition, Bailliere Tindall, Eastbourne, U.K.
16. Wallis, T.E. Analytical Microscopy, J.A. Churchill Limited, London.
17. Wallis, T.E. Textbook of Pharmacognosy, J.A. Churchill Limited, London.
18. Whistler R.L., Industrial Gums, Polysaccharides and their derivatives, 2nd Edition, Academic Press,
19. Tyler, V.E., Brady, R., Pharmacognosy
20. Wagner, S.B., Zgainsky, Plant drug Analysis.
21. A.C.Dutta, A Class Book of Botany.
22. V.D.Rangari, Pharmacognosy and Phytochemistry, Volume I & II

Subject code: T-1.5

Subject : Pharmaceutical Engineering-I

THEORY

45 Hours (3 hrs. /week)

SECTION-A

1. **Flow of fluids:**
Introduction, Manometers, Reynolds Number, Viscosity, its units and measurements, Bernoulli's theorem, fluid head, friction loss, enlargement and contraction losses. Flow meters.
2. **Transportation of fluid:**
Measurement of fluid flow: Principle, and construction of venturimeter, orifice meter, Pitot tube, weirs, Rota meter and positive displacement meter. Current meter and disc meter.
Flow controls: Plug cock, globe valves, gate valves, and water hammer, unidirectional valves, automatic regulating valve.
Pumps: Reciprocating pumps, positive displacement pumps, rotary pumps – volute and centrifugal pumps.
Blowers- Compressors, evacuators

3. **Flow of heat:**
Modes of heat transfer; heat transfer coefficient; OHTC Heat flow through a cylinder. Convection- concept of film overall coefficient Surface co-efficient; boiling liquids, condensing vapors. Black body, heaters, heat interchanges, heat insulation.
4. **Corrosion :**
Corrosion types and its prevention.

SECTION-B

5. **Evaporation:**
Different types of evaporators, condensers, traps, Entrapment, separators, evaporator capacity, Heat and material balance, Dahring's rule, factors influencing heat transfer coefficient. Rate of scale formation. Principle and operation of a multiple effect evaporator.
6. **Distillation :**
Vapor-liquid equilibrium, boiling point diagram, Roul't's law, Henery's law, constant boiling mixture, equilibrium diagram, equilibrium distillation, differential distillation, rectification, fractionating column, heat and material balance, factors influencing plate efficiency. Application of distillation to solvent purification, mfg. of essential oils & alcohol distillation
7. **Extraction :**
Extractors, flow sheet of extraction plant, liquid-liquid extraction, extraction towers, solid-liquid extractors, counter current multistage extractors.
8. **Filtration :**
Theory of filtration, limitations of filters, classification of filters, different types of filtering equipment Factors affecting rate of filtration., filter aids, sterile filters. Theory, classification of centrifuges, principle, construction and working of the centrifuges Ex: Perforated basket centrifuge, Horizontal continuous centrifuge, super centrifuge and conical disc centrifuge.

Subject code: P-1.5

Subject : Pharmaceutical Engineering-I

PRACTICAL

45 Hours (3 hrs. /week)

1. Measurement of flow of fluids and their pressure, determination of Reynold's number and calculation of Frictional losses.
2. Evaluation of filter media, determination of rate of filtration and Study of factors affecting filtration.
3. Experiments to demonstrate applications of centrifugation.
4. Thermometers and Psychrometric charts.

Recommended Books :

- 1] Introduction to chemical Engineering by Badger & Banchemo.
- 2] Unit operations of Chemical Engineering - McCabe & Smith.
- 3] Unit operations by Brown.
- 4] Hand book of Chemical Engineering - Perry
- 5] Unit operation in Pharmacy - D.Ganderton
- 6] Theory and practice of Industrial Pharmacy - Leon Lachman
- 7] Tutorial Pharmacy - Cooper & Gunn.

**Syllabus Prescribed for
B. Pharm. Semester –II**

Subject Code Subject

Subject Code	Subject	Maximum Marks (Credits)		Total Marks (Credits)
		Theory	Practical	
2.1	Pharmaceutics-II	80(04)	80(04)	160(08)
2.2	Anatomy and Physiology-II	80(04)	80(04)	160(08)
2.3	Pharmacognocny-II	80(04)	80(04)	160(08)
2.4	Pharmaceutical Engineering-II	80(04)	80(04)	160(08)
2.5	Pharmaceutical Biochemistry-II	80(04)	80(04)	160(08)
2.6	Mathematics	80(04)	—	80(04)
	Total			880(44)

Subject code: T- 2.1**Subject : Pharmaceutics – II****THEORY****45 Hours (3 hrs. /week)****SECTION-A****1. Pharmaceutical Additives**

Diluents, vehicles, bases, solvents, organoleptic additives, preservatives, antioxidants, surfactants, polymers and their applications.

2. Principles and procedures of dispensing prescriptions:

Principles involved and procedures adopted in dispensing of Liquid preparations such as mixtures, solutions, lotions, suspensions, emulsions, liniments, paints, sprays, inhalations,; semisolid preparations such as ointments, creams, pastes, jellies, suppositories;

solid dosage forms such as powders, capsules, effervescent powders, tablet in triturates, lozenges and poultices.

SECTION-B**3. Extraction and Galenicals**

Extraction processes and study of percolation and maceration and their modifications, their applications in the preparation of tinctures and extracts.

4. Incompatibilities:

Definitions, study of types of incompatibilities- physical, chemical and therapeutic, inorganic incompatibilities involving metals and their salts, non-metal, acids and alkalis : Organic incompatibilities involving specific organic salts, purine bases, alkaloids, pyrazolone derivatives, amino acids, quaternary ammonium compounds, carbohydrates.

Subject code: P- 2.1**Subject : Pharmaceutics – II****PRACTICAL****45 Hours (3 hrs. /week)**

- 1) Preparation of following classes of products involving the use of calculations in metrology (at least three products from each category wherever applicable): Liniments, suppositories, tablets, powders and capsules, mixtures, solutions, emulsions, creams, ointments, pastes, jellies, lozenges, lotions, inhalations and paints.etc.
- 2) Identification of various types of incompatibilities in prescriptions. Correction and dispensing of such prescriptions.
- 3) Preparation of selected Pharmacopoeial preparations under the category of infusions, tinctures and extracts.

BOOKS RECOMMENDED:

- 1) Pharmaceutical dosage and drug delivery systems- Ansel-Popovich and Allen (Williams & Wilkins).
- 2) Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS publishers, Delhi.
- 3) Carter S.J., Cooper and Gunn's Tutorial Pharmacy CBS Publishers, Delhi.
- 4) Lachman-Liberman and Kanig - Industrial Pharmacy (Leci Febiger).
- 5) Remington : The Science and practice of Pharmacy - Alfonso and Gennaro (Mack Publishing Co.)
- 6) Bentley's T.B. of Pharmaceutics - Rawlins (ELBS)
- 7) Dispensing of medications, by Hooper (Mack Publishing).
- 8) Aulton M.E., Pharmaceutics – The Science of Dosage form Design, ELBS/Churchill Livingstone.
- 9) Sagarin & Balsam M.S., Cosmetic Science and Technology, Vol-1-3. 2nd ed. John Wiley sons, NY.
- 10) Stoklosa MJ, Pharmaceutical calculation, Lea and Febiger, Philadelphia.

- 11) Thomssen S.G., Modern Cosmetics, Universal Publishing Corporation, Bombay.
- 12) Harry's Cosmeticology.

Subject code: T- 2.2**Subject : Anatomy and Physiology – II****THEORY****45 Hours (3 hrs. /week)****Section-A**

- 1 Respiratory system- Anatomy of respiratory organs and their functions, mechanism and regulation of respiration, physiology of respiration, respiratory volumes, methods of artificial respiration,
- 2 Digestive system- Anatomy and physiology of organs of digestive system, secretions and functions of (salivary glands, stomach, liver, pancreas, small intestine, large intestine) chemical digestion of food, .
- 3 Urinary system- Anatomy and physiology of parts of urinary system, structure of nephron, formation of urine, Renin-angiotensin system, Balance (acid base, electrolyte and water).
- 4 Muscular system- Characteristics and functions of muscle tissue, neuromuscular junction, physiology of muscle contraction.

Section-B

- 5 Reproductive system- Anatomy and physiology of various parts of male and female reproductive systems, physiology of menstruation, spermatogenesis and oogenesis.
- 6 Nervous system- Classification of nervous system, Anatomy and physiology of parts of brain (cerebellum, pons, medulla oblongata, thalamus, hypothalamus, and functional areas of cerebrum), extra pyramidal system, limbic system, Spinal cord (Structure and reflexes), cranial nerves (Names and functions), Autonomous nervous system (sympathetic and parasympathetic), fundamentals of neurotransmitters, process of neuroconduction and neurotransmission.
- 7 Integumentary system: Structure and functions of skin, thermoregulation.

Subject code: P- 2.2**Subject : Anatomy and Physiology – II****PRACTICAL****45 Hours (3 hrs. /week)**

1. Recording of body temperature.
2. Recording of breathing rate.
3. Recording of Electrocardiogram.
4. Study of anatomy and physiology of human skeleton
5. Study of appendicular skeleton.

6. Study of axial skeleton.
7. Study of joints.
8. Study of First Aid Measures
9. Study of Gross Anatomy & Physiology of Various Organ Systems by Models / Charts / Specimens:
 - General Viscera
 - Digestive System
 - Respiratory System
 - Urinary System
 - Reproductive System
 - Central nervous system
 - Muscular system
10. Study of different family planning devices.
11. Investigational procedure.
12. Urine Analysis for normal and abnormal urine pH, sugars, proteins, urea, creatinine etc.
13. Histology: microscopic study of different types of primary tissues and organs from permanent slides.

Subject code: T- 2.3**Subject : Pharmacognocny – II****THEORY****45 Hours (3 hrs. /week)****SECTION A**

1. Plant taxonomy: systemic study of some angiosperms with special reference to medicinally important plants of: Apocynaceae, Solanaceae, Rutaceae, Umbelliferae, leguminosae, Rubiaceae. Liliaceae, Graminae, Labiatae.
2. Genetic manipulation, Polyploidy, mutation and hybridization with reference to medicinal plants.
3. Occurrence, distribution, organoleptic evaluation, chemical constituents including tests wherever applicable and therapeutic efficacy of following categories of drugs.
 - a. Laxatives- Aloe, Rhubarb, Castor oil, Ispaghula, Senna.
 - b. Cardiotonics- Digitalis, Arjuna.
 - c. Carminatives & G.I. regulators- Umbelliferous fruits, Coriander, Fennel, Ajowan, Cardamom, Ginger, Black pepper , Asafoetida, Nutmeg, Cinnamon, Clove.
 - d. Astringents- Catecheu.
 - e. Drugs acting on nervous system- Hyoscyamus, Belladonna, Aconite, Ashwagandha, Ephedra, Opium, Cannabis, Nux - vomina.
 - f. Antihypertensive- Rauwolfia.
 - g. Antitussives- Vasaka, Tolu balsam, Tulsi.
 - h. Antirheumatics- Guggal, Colchicum.

- i. Antitumour- Vinca.
- j. Antileprotics- Chaulmoogra oil.
- k. Antidiabetics- Pterocarpus, Gymnema sylvestro.
- l. Diuretics- Gokhru, Punarnava.
- m. Antidysenterics- Ipecacuanha.
- n. Antiseptics and disinfectants- Benzoin, Myrrh, Neem, Curcuma.
- o. Antimalarials- Cinchona.
- p. Oxytocics- Ergot.
- q. Vitamins- Shark liver oil and Amla.
- r. Enzymes- Papaya, Diastase, Yeast.
- s. Perfumes and flavoring agents- peppermint oil, Lemon oil, Orange oil, lemon grass oil, sandal wood.

SECTION B

4. **Pharmaceutical aids**-Honey, Arachis oil, starch, pectin, olive oil. Lanolin, Beeswax, Acacia, Tragacanth, sodium Alginate, Agar, Guar gum, Gelatin, Starches and products of Mineral origin.
5. **Collection and preparation** of crude drugs for the market as exemplified by Ergot, opium, Rauwolfia, Digitalis, senna, Cinchona, Aswagandha.
6. **Study of source, preparation and identification** of fibers used in sutures and surgical dressings-cotton, silk, wool and regenerated fibers.
7. Adulteration and drug evaluation: Definition, Types, determination of adulterants by Organoleptic, Microscopic, Physical, Chemical and Biological methods of evaluation.
8. Pest Management and Natural pesticides.

Subject code: P- 2.3

Subject : Pharmacognosy – II

PRACTICAL

45 Hours (3 hrs. /week)

1. To study the morphological and microscopical characteristics of Datura leaf
2. To study the morphological and microscopical characteristics of Senna leaf.
3. To study the morphological and microscopical characteristics of Ginger rhizome
4. To study the morphological and microscopical characteristics of Ipecacuanha root
5. To study the morphological and microscopical characteristics of Nux-vomica seed.
6. To identify unknown organized drug with the help of physical and chemical tests – Senna, Starch, Turmeric, Cinchona, Ephedra, Ashoka.

7. To identify unknown unorganized drug with the help of physical and chemical tests – Acacia, agar, Honey, Tragacanth, Gelatin, pale and black Catechu, Kaolin, Bees wax.
8. To determine the stomatal Index of senna leaf of Vinca leaf
9. To determine vein islet and vein termination and palisade ratio
10. To determine total ash value of given sample of crude drug.
11. To determine extractive value of given sample of crude drug.
12. To determine the swelling index in given sample of crude drug.
13. To determine the crude fiber in given sample of crude drug.
14. To determine the moisture content in given sample of crude drug.
15. To determine the extractive values of given sample of crude drugs.

Books Recommended

1. Kokate C. K. Purohit A. P. and Gokhale S. B. , Pharmacognosy (degree) Nirali Prakashan
2. Kokate C. K. Practical Pharmacognosy, Vallabh Prakashan, Delhi.
3. Atal C. K. and Kapur B. M. Cultivation and utilization of Medicinal plants, RRL, Jammu.
4. Brain K. R. and Turner T. D., The practical Evaluation of phytopharmaceuticals
5. Khandelwal KR, Practical Pharmacognosy, Nirali Prakashan Pune.
6. Chandha K.L. and Gupta R. Advances in Horticulture Vol II- medicinal and aromatic plants,
7. Chopra R. N., Nayar S. L. and Chopra I. C., Glossary of Indian Medicinal plants CSIR, New Delhi.
8. Fahn A, Plant anatomy, 3rd Ed. Pergamon press, Oxford.
9. Iyengar M.A., Study of Crude Drugs, Manipal Power Press, Manipal.
10. Iyengar M.A. , Pharmacognosy Lab Manual. Manipal Power Press, Manipal.
11. Medicinal Plants of India, Zafar R., C.B.S. Publisher, New Delhi.
12. Swain T., Chemical Plant Taxonomy, Academic Press London.
13. Swain T., Comparative Phytochemistry, Academic Press London.
14. The Wealth of India, Raw Marerials (All Volumes), Council of Scientific and Industrial Research,
15. Trease, G.E. and Evans, W.C. Pharmacognosy, 12th Edition, Bailliere Tindall, Eastbourne, U.K.
16. Wallis, T.E. Analytical Microscopy, J.A. Churchill Limited, London.
17. Wallis, T.E. Textbook of Pharmacognosy, J.A. Churchill Limited, London.
18. Whistler R.L., Industrial Gums, Polysaccharides and their derivatives, 2nd Edition, Academic Press,
19. Tyler, V.E., Brady, R., Pharmacognosy
20. Wagner, S.B., Zgainsky, Plant drug Analysis.
21. A.C.Dutta, A Class Book of Botany.
22. V.D.Rangari, Pharmacognosy and Phytochemistry, Volume I & II

Subject code: T- 2.4**Subject : Pharmaceutical Engineering – II****THEORY****45 Hours (3 hrs. /week)****SECTION-A**

- Mixing :** Theory of mixing of liquids with liquids, gas with liquids, solids with solids, types of mixing.
- Crystallization :** Crystal forms and habits, solubility curves, supersaturation, nucleation, growth, yield and purity -Mier's theory-crystallizers 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.
- Size reduction :** Definition, objectives of size reduction, factors affecting size reduction, laws governing energy and power requirements of mills including ball mill, hammer mill, fluid energy mill etc
- Size separation:** Screen, standards of screen, screen analysis, types of screening equipment. Size separation by setting, classification and sedimentation.

SECTION-B

- Conveying:** Conveyors, belt & parametric elevation.
- Drying :** Theory of drying - principles, equilibrium moisture content, rate of drying; classification of dryers - drum dryer, spray dryer; drying of solids - convection type, tray dryer, tunnel dryer, rotary dryer, fluidized bed dryer, vacuum dryer, oven dryer, freeze dryer, radiant heat dryers, Freeze Dryer. Uses of dryers in pharmacy.
- Humidity:** Basic concepts and definition, wet bulb and adiabatic saturation temperatures, Psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipments for dehumidification operations. Dehumidification - application and equipment. Refrigeration and air conditioning.
- Safety Hazards:** Classification - mechanical, fire, chemical & occupational, their types & prevention, fire & explosion - Chemistry of fire, classification of fire, method of extinguishing accidents - unsafe actions, unsafe conditions, financial losses, costs prevention. Accidents safety training & education.

Subject code: P- 2.4**Subject : Pharmaceutical Engineering – II****PRACTICAL****45 Hours (3 hrs. /week)**

- Determination of humidity-use of Dry Bulb and Wet Bulb.
- Elementary Knowledge of Engineering Drawing-Concept of orthographic and isometric views of elevation and third angle projection. Notation and abbreviation used in engineering drawing.

- Basic Engineering Drawing Practice- Bolts, nuts, rivetted fronts, screws, worm screws as per specification.
- Drawing of simple pharmaceutical machinery parts.

Recommended Books :

- Introduction to chemical Engineering by Badger & Banchero.
- Unit operations of Chemical Engineering - McCabe & Smith.
- Unit operations by Brown.
- Hand book of Chemical Engineering - Perry
- Unit operation in Pharmacy - D.Ganderton
- Theory and practice of Industrial Pharmacy - Leon Lachman
- Tutorial Pharmacy - Cooper & Gunn.
- N.D.Bhatt: Elementary Engineering Drawing.

Subject code: T- 2.5**Subject : Pharmaceutical Biochemistry –II****THEORY****45 Hours (3 hrs. /week)****SECTION-A**

- Lipid Metabolism:** Oxidation of fatty acids (Beta, Alpha), ketone bodies and their significance, biosynthesis of saturated and unsaturated fatty acids, Phospholipids, Sphingolipids, control of lipid metabolism, Essential fatty acids, biosynthesis of Eicosanoids (prostaglandins, Prostacyclines, thromboxanes and Leukotrienes), Abnormalities of lipid metabolism.
- Metabolism of ammonia and nitrogen containing monomer:** Nitrogen balance, Biosynthesis and catabolism of amino acids, Assimilation of ammonia, Urea cycle, Metabolic disorders of urea cycle, Metabolism of sulphur containing amino acids, Porphyrins biosynthesis, formation of bile pigments, Porphyrias, hyperbilirubenemia.
- Nutrition:** Concept of balanced diet, principle nutrients, nutritional diseases, role of crude fiber, Energy metabolism: BMR.

SECTION-B

- Vitamins:** Introduction, vitamins as co-enzymes and their biological role, Metal as co-enzymes.
- Acid-base balance and mineral metabolism:** Concept of body fluids, regulation of electrolyte, acid-base balance. Mineral metabolism of calcium, iron and iodine.
- Biological oxidation and its biochemical importance. Nitrogen and sulphur cycle
- Biosignaling:** Applications, Methods, Scope.
- Enborn error of Metabolism

Subject code: P- 2.5**Subject : Pharmaceutical Biochemistry –II****PRACTICAL****45 Hours (3 hrs. /week)**

- (1) Preparation of Citrate, Carbonate, Phosphate Buffers.
- (2) Isolation of Casein from Milk.
- (3) Estimation of Urea from Serum sample.
- (4) Estimation of Uric Acid from Serum.
- (5) Estimation of Creatinine from Serum.
- (6) Estimation of Triglyceride in a Given Plasma/Serum sample.
- (7) Estimation of LDL in a Given Plasma/Serum sample.
- (8) Estimation of HDL in a Given Plasma/Serum sample.
- (9) Separation of Amino Acid by Paper Chromatography.
- (10) Estimation of Total Proteins in a Given Plasma/Serum sample.
- (11) Estimation of Total Albumin in a Given Plasma/Serum sample.

Recommended Books

1. Lehninger's Principles of Biochemistry by Albert Lehninger, 4/Ed., Palgrave Macmillan.
2. Biochemistry by Lubert Stryer, W.H., Freeman & Company, New York.
3. Harper's Illustrated Biochemistry by R.K. Murray & D.K. Granner, 27/Ed, McGraw Hill.
4. Molecular Biology by J.D. Watson, The Benjamin/Cummings Company Inc.
5. Clinical Biochemistry by Herold Varley, CBS Publishers, New Delhi.
6. Text Book of Biochemistry with Clinical Correlations by Thomas & Devlin, A Wiley Medical Publication.
7. Clinical Chemistry Interpretation and Techniques by Alex Kaplan Lavernel L. & Szebo Kent E. Opheim Published Lea and Febiger.
8. Text Book of Pathology by Harsh Mohan, 5/Ed., Jaypee Brothers Medical Publishers (P) Ltd.
9. Clinical Biochemistry by S. P. Dandekar 2/Ed
10. Pathophysiology of Disease by Mephee & Lingappa, 2/Ed., Appleton & Lane.
11. Pharmaceutical Biochemistry by Sharma P.K & Dandiya P.C, Vallabh Prakashan.
12. Text book of Biochemistry by A. C. Deb
13. Human Biochemistry by Jamam, Orten publisher.
14. Biochemistry by U.Satyanarayan.
15. Varley's Practical Clinical Biochemistry by Harold Varley, 6/Ed., CBS Publishers, New Delhi.

16. Clinical Chemistry Interpretation and Techniques by Alex Kaplan Lavernel L. & Szebo Kent E. Opheim Published Lea and Febiger.
17. Mukherjee K.L. Medical Laboratory Technology. Tata McGraw Hill. New Delhi (Vol. I, II, III)
18. Deb A.C. Viva & Practicals in biochemistry. Central book agency. Calcutta.
19. Plummer D.T. An Introduction to Practical Biochemistry. Tata Mc-Graw Hill, New Delhi.
20. Godkar P.B. Clinical Biochemistry- Principles and Practice. Bhalani Publishing House, Bombay.

Subject code: T- 2.6**Subject : Mathematics****THEORY****45 Hours (3 hrs. /week)****SECTION-A**

1. **Trigonometry:** Measurement of angles - Degree and Radian, Different types of functions, Inverse functions, graphs of various function, Addition Formula & factor formula of functions.
2. **Limit & Continuity:** Definition, Right Hand & Left Hand Limits, Non-existence of limits Working Rules of limit, Evaluation of limits of simple and trigonometric functions, A brief about continuity.
3. **Differentiation:** Definition of a derivative, working rules, Derivatives of special functions, chain rule, second order derivatives, Applications of derivative: Rate of change, Tangent to a curve, Maxima & Minima and Examples.
4. **Integration:** Definition of integral, Integration of special functions, Methods of Integration: Integration by substitution, Integration by parts, Integration by using partial fractions, Definite integrals, Examples. Evaluation of area, and volume, in simple cases.

SECTION-B

5. **Probability:** Definition, Theorems of probability & Examples.
6. **Differential equation:** Formation and Derivation, order and degree, first order and degree, linear equations with constant co-efficiency, homogeneous linear equation (first method of solution only), Simultaneous differential equations which are linear and of first order.
7. **Statistics:** Definition of statistics, random and non-random sampling methods, calculation of mean, mode, median, standard deviation, standard error estimates. Coefficient of variation and regression analysis, method of least squares.

Books Recommended:

1. Differential Calculus by Shanti Narayan
2. Integral calculus by Shanti Narayan
3. A textbook of Engineering Mathematis -by B.M. Patel
4. Advanced Calculus by Murry R.Spiegel
5. Mathematics for pharmacy students (Volume–I) by Dr. K.N.Gujar & Prof.Ashok Bhavale
6. Calculus by Frank Ayres Jr.-& Elliott Mandelson.
7. Frank Mathematics for B.Pharm by G.D.Dhall, S.N.Chhibber, Hari Om Trivedi
