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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I N D E X
First B.Pharmacy (Semester-I & II)
(Prospectus No.2013144)

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	Pharmacognocy-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)**

1) 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.

2) Study of one monograph from the latest edition of Indian Pharmacopoeia.

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: 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 Mc-Graw 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 : Pharmacognocy-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, Shankhapuspi, 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 cathechu, Myrobalan
   Proteins: Gelatin, Spiruluna, Collagen and its products.
   Resins: Podophyllum, Cannabis, Balsam of tolu, Turmeric, ginger asafetida, Capsicum

Subject code: 1.4
Subject : Pharmacognocy-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 (Isapghula 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, Shankapuspi, 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, Roult'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 & Banchero.
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	Pharmacognocy-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, pyrrozolone 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 : Pharmacognocy – II
THEORY **45 Hours (3 hrs. /week)**

SECTIONA

1. Plant taxonomy: systemic study of some angiosperms with special reference to medicinally important plants of: Apocynaccae, Solanaccae, Rutaccae, Umbelliferae, leguminosae, Rubiaccae. Lilliaccae, Graminae, Labiatae.
2. Genetic manipulation, Polypoloidy, 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- Aloes, 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 - vominca.
   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, Rauwalfia, 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

1. **Mixing :** Theory of mixing of liquids with liquids, gas with liquids, solids with solids, types of mixing.
2. **Crystallization :** Crystal forms and habits, solubility curves, supersaturation, nucleation, growth, yield and purity -Mier's theory-crystallizers and its limitations, nucleation mechanisms, crystal rowth, study of various types of crystallizer, tanks, agitated batch, Swenson Walker, single vacuum, circulating magma and crystal crystallizer, caking of crystals and its prevention.
3. **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
4. **Size separation:** Screen, standards of screen, screen analysis, types of screening equipment. Size separation by setting, classification and sedimentation.

SECTION-B

5. **Conveying:** Conveyors, belt & parametric elevation.
6. **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.
7. **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.
8. **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)**

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

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

Recommended Books :

1] Introduction to chemical Engineering by Badger & Banchero.
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.
8] N.D.Bhatt: Elementary Engineering Drawing.

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

SECTION-A

1. **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.
2. **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.
3. **Nutrition:** Concept of balanced diet, principle nutrients, nutritional diseases, role of crude fiber, Energy metabolism: BMR.

SECTION-B

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

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Second B.Pharmacy Prospectus No. 2014145
Semester-III Examination - Winter-2013,
Semester-IV Examination - Summer-2014

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I N D E X
Second B.Pharmacy (Semester-III & IV)
(Prospectus No.2014145)

Syllabus prescribed for B.Pharm. Semester-III
(Implemented from the Academic Session 2011-12)

SEMESTER-III

Subject Code	Subject	Maximum Marks		Total Marks
		Theory	Practical	
.3.1.	Physical I Pharmaceutics-	80	80	160
3.2.	Pharmaceutical Microbiology	80	80	160
3.3.	Pharmaceutical Organic chemistry-I	80	80	160
3.4.	Hospital and Community Pharmacy	80	80	160
3.5.	Pharmaceutical Inorganic chemistry	80	80	160
3.6.	Pathophysiology	80	ð	80
	Total			880

Subject code: T- 3.1
Subject : Physical Pharmaceutics –I
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **States of Matter, Properties of Matter:** Binding forces between molecules**:** States of matter, gaseous, liquid and solid state, amorphous and crystalline states of solids; polymorphism; latent heat and vapor pressure, phase equilibria and phase rule.
2. **Thermodynamics :** Laws of thermodynamics and their applications in Pharmacy.
3. **Solubility and distribution phenomena:** Solubility definitions, expressions, solvent solute interactions, polar solvents-non polar solvents-semipolar solvents, solubility of gases in liquids, effect of pressure- temperature-salting out-chemical reactions of solubility calculations, solubility of liquids in liquids, ideal and real solutions, complete and partial miscibility, influence of foreign substances-

three component systems, dielectric constant and solubility, solubility of solids in liquids, solubility of salts in water-solubility of slightly soluble and weak electrolytes, calculating solubility of weak electrolytes as influenced by pH. Influence of co-solvents on the solubility of drugs, combined effect of pH and solvents, distribution of solutes between immiscible solvents, effect of ionic dissociation and molecular association on partition extraction, preservation action of weak acids in emulsion, distribution co-efficient.

SECTION-B

4. **Coarse Dispersions.** Interfacial properties of suspended particles, settling in suspensions, theory of sedimentation, effect of Brownian movement, sedimentation of flocculated particles, sedimentation parameters, wetting of particles, controlled flocculation, emulsions-types-theories-physical stability, preservation of emulsions, rheological properties of emulsions, phase equilibria and emulsion formulation. Semisolid dispersions.
5. **Kinetics and drug stability:** Rates and orders of reaction influence of temperature and other factors, on reaction rates. Decomposition and stabilization of medicinal agents. Accelerated stability analysis.
6. **Colloids:** Introduction, types of colloidal system, optical properties, kinetic properties, Electric properties of colloids, stabilization of colloids and application in Pharmacy.

Subject code: P- 3.1
Subject : Physical Pharmaceutics –I
PRACTICAL **45 Hours (3 hrs. /week)**

1. Studies on polymorphs, their identification and properties.
2. Studies of different types of colloids and their properties
3. Preparation of various types of suspensions and determination of their Sedimentation parameters.
4. Stability studies of emulsions.
5. Determination of half-life, rate constant and order of reaction.
6. Accelerated stability testing, shelf-life determination and expiration dating of pharmaceuticals.
7. Experiments involving tonicity adjustments.

Recommended Books:

1) Remingtonôs Pharmaceutical Sciences.
2) Elements of Physical Chemistry - Glasstone & Lewis
3) Theory & Practice of Industrial Pharmacy - Lachman, Libermann & Kanig.
4) Physical Pharmacy by Martin - Swarbrick & A.Cammarata
5) Bentleyôs Text Book of Pharmaceutics by Rewilins.
6) Tutorial Pharmacy - Cooper & Gunn
7) Physical Pharmaceutics by Milo Gibaldi.
8) Practical Physical Pharmacy by Dr.U.B.Hadkar, T.N.Vasudevan, K.S.Laddha,
9) Practical Pharmaceutical Technology by - Engene
10) Practicals in Physical Pharmacy by CVS Subramaniam.
11) Practicals in Physical Pharmacy by Dr. D. V. Derle.

Subject code: T-3.2

Subject : Pharmaceutical Microbiology

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Introduction to microbiology**; Classification of microbes and their taxonomy, bacteria, viruses (DNA, RNA and retroviruses), fungi, actinomycetes, rickettasia and spirochaetes.
2. Nutrition, cultivation, isolation and identification of bacteria, viruses, protozoa and fungi.
3. **Microbial spoilage and preservation of pharmaceutical products:** Types of spoilage, factors affecting microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage, preservation of pharmaceutical products, preservatives, evaluation of microbial stability of formulations.

SECTION-B

4. **Infection:** Modes of microbial infection, transmission and control/ prevention of bacterial, fungal, protozoal and viral diseases (and AIDS)
5. **Sterilization:** Different methods, evaluation of sterilization methods, sterility testing of pharmaceutical products as per I.P. and B.P. requirements. Sources of contamination and methods of prevention,

designing of aseptic area, laminar flow equipment, their services and maintenance.

6. **Immunology and Immunological Preparations:** Principles, antigens and haptens, immune system, cellular humoral immunity, Immunological tolerance, bacterial resistance, immunogenetics, antigen-antibody reactions and their applications. Hypersensitivity, active and passive immunization; Vaccines-their preparation, Standardization and storage.

Subject code: P- 3.2

Subject : Pharmaceutical Microbiology

PRACTICAL **45 Hours (3 hrs. /week)**

1. Preparation of various types of culture media
2. Sub culturing of different microorganism by different methods like Slants, Stabs, Culture plates and isolation of pure culture by streak plate techniques, simple and multiple streaking techniques.
3. Isolation of pure culture of micro-organism from soil sample.
4. Preservation of bacterial strain.
5. Various staining methods.

Recommended Books:

1) Microbiology, Pelzar & Reid
2) Industrial Microbiology, Prescott & Duner
3) Pharmaceutical Microbiology, Malcolm and Harris
4) R.Anathanarayan and C. K.J. Panikar, Textbook of microbiology.
5) S.S. Kori and M. A. Halkai, Pharmaceutical microbiology
6) Tutorial Pharmacy - Cooper & Gunn
7) Applied Microbiology for Pharmacy Biosciences by Vinita Kale and Kishore Bhusari, Himalaya Publishing House, Mumbai.
8) Bergeyôs Manual of Determinative bacteriology.
9) Brock T D, Madigen M T Biology of Microorganism. Prentice Hall, New Jersey USA. Davis, Dulbetco, Eisen Microbiology.
10) Hugo and Russel, Pharmaceutical Microbiology; Blackwell Scienctific Publication, Oxford.
11) Salle A J, Fundamental Principles of bacteriology
12) Practical Microbiology by R. S. Gaud and G. D. Gupta. 2nd Edition, Nirali Prakashan, Pune

Subject code: T- 3.3

Subject : Pharmaceutical Organic chemistry-I

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

Topic

1. **Introduction to Organic Chemistry:** Importance & Properties of Carbon. Quantam Mechanics, Atomic Orbitals, Molecular Orbitals, Pauliõs Exclusion principle, Types of Bonds, Hybridization, Hybrid Orbitals, Intermolecular forces & related properties, Intramolecular Forces, Acids & Bases, Significance of Solubility, Conjugation, Bond Length & Bond Energies. Fundamentals of Molecular Formula, Molecular Weight, Empirical Formula, Factor affecting electron availability. Reaction Mechanism, energy of activation, transition state.
2. **IUPAC** Nomenclature of organic compounds.
3. Brief Description of methods of formation of Alkyl Halides and Nucleophilic Substitution at saturated carbon. SN 1 & SN 2 reaction: Mechanism & stereochemistry (examples of compounds containing one asymmetric carbon atom only)

   Factors affecting Substitution: Substrate structure, Nature of Nucleophile, Nature of Leaving Group and Solvent.
4. **Alkanes :** Common and IUPAC name, properties and reactions of alkanes, mechanism and kinetics of chlorination and halogenation, molecular and empirical formula.

SECTION- B

5. **Alkenes:** Preparations & Reactions. E 1 & E 2 Substitution v/s Elimination. Addition Reaction of Alkenes: mechanism , Regioselectivity (Markonikov & anti-Markonikov) in addition of Hydrogen, Halogen, Hydrogen Halide, Halohydrin Formation, Oxymercuration ï Demercuration Hydroboration- Oxidation, Hydroxylation, Allylic substitution (using NBS) and Ozonolysis .
6. **Conjugated Dienes:** Structure, Electrophilic addition to dienes : 1,2 & 1,4- addition, Diels Alder Reaction : (Mechanism only)
7. **Alkynes:** General methods of preparation and reaction.
8. **Alcohols & Ethers:** General methods of preparation including Grignard reaction. All general reactions including Lucas test. Ethers: General methods of preparation & reaction.

9. **Benzene & Aromaticity:** Huckel rule, Resonance Benzene and derivatives. Mechanism of Electrophilic aromatic Substitution: Halogenation, Nitration, Sulphonation and Friedel Craftõs reaction, Orientation and reactivity in Electrophilic aromatic substitution. Mechanism of nucleophilic aromatic substitution. Addition-Elimination and Elimination-addition (reaction involving benzyne intermediate)

Subject code: P- 3.3

Subject : Pharmaceutical Organic chemistry-I

PRACTICAL **45 Hours (3 hrs. /week)**

1. Preparation, transfer & Storage of Chromic acid mixture.
2. Determination of Physical constants of few organic compounds (both solid & liquid) & calibration of thermometer.
3. Qualitative Analysis single organic compounds.
4. Synthesis of some organic compound.
5. Resolution of Racemic Mixtures.

Reference Books :-

1. Stereochemistry of Carbon Compounds by E.L.Eliel, 32 reprint 2005, Tata McGraw Hill Publishing Co.Ltd.New Delhi.
2. Stereochemistry of organic Compound Principles and applications by Nasipuri, Revised Eddition, New age international Publishers.
3. Organic Chemistry: Morrison & Boyd.
4. A Guidebook of reaction mechanism in organic chemistry: Peter Skyes.
5. Fundamentals of Organic Chemistry : I.L.Finar (vol.I &II)
6. Principles of Organic Chemistry: T.A.Geissman.
7. Basic principles of Organic Chemistry: John D.Roberts & Majorie C.Skyes.
8. Organic Chemistry: Stanley H. Pine.
9. Advanced Organic Chemistry: Reaction, Mechanism & Structure. By Jerry March
10. A Textbook of Organic Chemistry: Arun Bahl, B.S.Bahl.

Subject code: T- 3.4

Subject : Hospital and Community Pharmacy

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Community pharmacy management:** Introduction to community Pharmacy, Organization and structure of retail and wholesale pharmacy, factors to be considered for location of retail pharmacy, finance, personnel, legal and infrastructure requirements for establishing retail pharmacy, maintenance of records of retail and wholesale pharmacy.
2. **Community pharmacies in primary health care services**: Family planning, first aid, communicable diseases, non communicable diseases. In population control, first aid and prevention of communicable diseases like AIDS, sexual transmitted diseases.
3. **Application of computers in pharmacy**: Drug information centre, disease information services, Records and Reports: Prescription filling, drug profile, patient medication profile, cases on drug interaction and adverse drug reactions, idiosyncratic cases, etc.
4. **Patient counseling:** General considerations, importance and steps and procedure involved. Concept of Polypharmacy and its implications. Over-the-counter (OTC) drugs sales, the concept of essential drugs and rational drug use.
5. **Introduction to hospitals and hospital pharmacy:** Historical development.
6. **Hospital Pharmacy:** Objectives and functions, organization, planning and administration of moderrn hospital pharmacy services, location, layout, personnel, qualifications, requirements, and evaluation of hospital pharmacist, Work load and remuneration of hospital pharmacist.

SECTION-B

7. **Hospital formulary:** Organization, formulary content, preparation and Distribution. Pharmacy Procedure manual preparation and publication.
8. **Hospital committees' constitution and function:** Pharmacy and therapeutic committee, Infection control committee, Antibiotic policy, committee, Research and ethics committee.

9. **Hospital Manufacturing:** Economical considerations and estimation of demand, lay out, raw materials, production planning, requirements, manpower requirements and quality assurance, manufacturing of ï Sterile products and non-sterile products. Total parenteral nutrition.
10. **Drug distribution Systems:** Outpatient and Inpatient services, unit dose drug distribution systems, floor ward stock systems, satellite pharmacy services, central sterile services, bed side pharmacy. Role of hospital pharmacist in isotope and non isotope pharmacy.
11. **Controlled drugs dispensing (narcotic Drugs):** Procedures for dispensing and maintenance of records.
12. **Sterilization:** Techniques**,** application of sterilization of surgical dressings, OT and other equipment used in hospital (Cotton, bandage, adhesive tapes, IV sets, B.G.set, ryles tubes, catheters and syringes).

Subject code: P- 3.4

Subject : Hospital and Community Pharmacy

PRACTICAL **45 Hours (3 hrs. /week)**

1. Preparation of patient medication information for glyceryl trinitrate, captopril, digitalis and warfarin.
2. Identification and uses of surgical dressings, instruments, glasswares and Other hospital equipments.
3. Manufacture and testing of non-sterile products used in hospital Normal saline, Dextrose (5% and 20%), Dextrose and Normal Saline (DNS), Ringer Lactate Solution.
4. Identification test for important raw materials used in the manufacture of sterile and non sterile products.
5. Sterilization of various types of surgical instruments and glasswares.
6. Identification of incompatibilities and irrationality in prescription.
7. Demonstration of self-monitoring medical instruments like glucometer, BP apparatus, inhalers, sprays and diagnostic indicators.
8. Project report on availability and use of essential drugs in General hospital.
9. Visit to two-community pharmacy for schedule N compliance.
10. Report on OTC and controlled drugs sales over a period of one week in a local community pharmacy.
11. Project report on visit to nearby community on the rational use of drugs.

12. Exercises on patient counseling in respect of some of selected diseases like tuberculosis, malaria, diabetes, cerebro vascular disease, asthma, diarrhoea, hepatitis.
13. Preparation of patient medication information for glyceryl trinitrate, captopril, digitalis and warfarin.

Reference

1. Text Book of Drug Store and Business Management by R.M. Mehata
2. Hospital Pharmacy - by W.Hassan
3. Text Book of Hospital Pharmacy - by Merchant & Qadry
4. Text book of hospital and clinical pharmacy by Chunawala and Paradakar
5. Text book of hospital and clinical pharmacy by Nand & Khar.

Subject code: T- 3.5

Subject : Pharmaceutical Inorganic chemistry

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Pharmacopoeia and Monograph:-** Different pharmacopoeia and contents of official monograph.
2. **Purity of pharmaceuticals** and factors affecting purity of pharmaceuticals. Sources of impurities/contamination and methods to control them,, Limit test for chlorides, sulphates, arsenic, iron, lead, heavy metals as per IP.
3. **Pharmaceutical Aids and Necessities:-** Acids,bases, buffers, antioxidants, preservatives, adsorbants, diluents, excipients, suspending agents, colorants etc.
4. **Hardness of water,** methods to remove hardness of water, different official waters and official quality control tests for water.
5. **Major intra and extra cellular electrolytes:-**Physiological ions, Electrolytes used in replacement therapy, Physiological acid base balance, Electrolytes used in acid base theraoy, Electrolyte combination therapy, In organic diuretics.

   Sodium chloride inj, Ringer solution lactated, Ringer injections, Sodium acetate, and potassium bi carbonate, sodium citrate, sodium lactate, ammonium chloride.

6. **Important In organic gases** used in pharmacy:-Oxygen, Nitrogen, Nitrous Oxide, Carbon dioxide, Helium, Ammonia and their compounds as per I.P.
7. **Dental products :-**

· **Anticaries agents:-**fluoride containing compounds, sodium fluoride, stannous fluoride, Phosphate containing compounds.

· **Dentifrices:-**Dentifrices containing fluorides, Dentifrices containing polishing agents, Pumice, Dentifrices containing Desensitizing agents, Zinc chloride, and zinc-Eugenol cement.

SECTION-B

8. **Respiratory stimulants:-**Ammonium carbonate, Aromatic ammonia spirit.

   Expectorants and emetics:-Ammonium chloride, Potassium iodide, Antimony potassium tartarate. Mode of action of all compounds.
9. **Poisons and antidote:-**Classification, Sodium thiosulphate, Sodiumnitrite.
10. **Topical agents:-**
    - **Protectives:-**Talc, Zinc oxide, Calamine, Zinc state, Titanium dioxide, aluminum compound,Silicone polymer.
    - **Antimicrobial And Astringent:-**Hydrogen peroxide solution, Sodium perborate, Zinc peroxide, Potassium permanganate, Sodium hypochloride solution, Iodine solution and Silver nitrate, Mercuric oxide, mercuric chloride and sulphate, boric acid, Selinium sulphide, Zinc sulphate.
11. **Complexing and chelatig agents used in therapy.**
12. **Gastrointestinal agents:-**

    Acidifying agents:-dil Hcl

    Antacids:- Sodium bicarbonate, aluminium hydroxide, aluminium phosphate, Basic aluminium carbonate Calcium phosphate, Magnesium carbonate, Milk of magnesia.

    Protectives and adsorbants:-Bismuth compounds, Bismuth sub carbonate, Bismuth subgallate, Bismuth sodium tartarate, Kaoline, Activated charcoal, Pectin.

    Saline cathartics:-Sodium phosphate, Sodium potassium tartarate, Magnesium carbonate, Magnesium oxide.

13. **Essential and Trace ions:-**Absorption, distribution, physiological role. Official compounds of Fe, Cu, Zn, Mn, I, chromium, molybdenum, selenium.

    Fe-ferrous sulphate. Iron sorbite injection, ferric ammonium citrate, ferric chloride, Cu-Copper sulphate,14-Iodine, Potassium iodide, Sodium iodide, Zn-Zinc sulphate.

14. **In-organic radio pharmaceutical:-**Fundamental concepts of radioactivity, radiation dosimetry, biological effects of radiation, medicinal application of radioisotopes (therapeutic & diagnostic), radio pharmaceutical preparations, quality control of radio pharmaceutical, radio opaque contrast media.

Note:- For official compounds, general properties assays, storage & uses should be discussed.

Subject code: P-3.5

Subject : Pharmaceutical Inorganic Chemistry

PRACTICAL 45 Hours (3 hrs. /week)

1. Preparation of some inorganic pharmaceutical compounds (minium 5).
2. Semi micro-identification tests of mixtures of cations and anions (not mor than 4) as used in pharmaceuticals.
3. Limit tests for Chloride, Sulphate, Iron, Lead.
4. Prepare and test purified water of Pharmacopoeial standard (I.P.).
5. **Test for purity of following.**
   A) Swelling power in bentonite.
   B) Acid neutralizing capacity in aluminium hydroxide gel.
   C) Ammonium salt in potassium alum.
   D) Adsorption property in heavy kaolin.
   E) Presence of iodates in potassium iodide.

Reference Books :-

1) Inorganic Medicinal and Pharmaceutical Chemistry-J.H.Block, E.B.Roche & I.O.Sonie, Co.Wilson (Varghese Pub.)
2) Bentleys and Driverôs textbook of Pharmaceutical Chemistry revised by L.M.Atherden, 8th edition. Oxford University press, London.
3) Indian Pharmacopoeia, Latest edition.
4) Modern Inorganic Pharmaceutical Chemistry by C.A.Dicher.
5) Concise Inorganic Chemistry-J.D.Lee.

6) Remington the Science and practice of pharmacy by Remington, 20th edition, Lipincott, William and Wilkins.
7) Advanced Inorganic Chemistry, 18th Edition, Cotton & Wilkinson (Willy Eastern Ltd.,Delhi).
8) Vogelôs Text Book of Quantative Inorganic Analysis.
9) Vogels Text Book of Quantative Analysis, 5th edition.
10) Wilson & Gisvoldôs Principles of Organic and Medicinal Chemistry. Harkishan Sing & A.K.Kapoor-Principal of Inorganic Chemistry.
11) Pharmaceutical Inorganic Chemistry by Dhake & Tipnis, 2nd edition.
12) Inorganic Pharmaceutical Chemistry (Practical), 2nd edition, Dhake & Belsare.
13) Harkishan Sing & A.K.Kapoor - Principles of Inorganic Chemistry.

Subject code: T- 3.6

Subject : Pathophysiology

THEORY 45 Hours (3 hrs. /week)

SECTION-A

1. **Cardiovascular System:** Pathophysiology of Hypertension, Ischemic Heart Disease (Angina and Infarction), Congestive Cardiac Failure, Cardiac arrhythmias and Shock.
2. **Disorders of Respiratory tracts:** Pathophysiology of Bronchial Asthma and Pneumonia, tuberculosis, chronic Obstructive Airway Disease
3. **Disorders of Gastrointestinal tracts:** Disorders of oesophagus-Achalasia, gastro-oesophagial reflux and reflux oesophagitis, causes, consequences and management.

   Disorder of stomach, small intestine and large intestine - Peptic ulcer disease-acute ulcer, chronic peptic ulcer, tuberculosis of intestine, Acute intestinal obstruction. Constipation, diarrhea, vomiting Nausea, Flatus etc. Ulcerative colitis, Crohnôs disease and typhoid fever.

SECTION-B

4. **Nervous disorders:** Pathophysiology of Epilepsy, Parkinsonôs and Alzheimerôs Disease, Psychosis, Schizophrenia and Depression
5. **Disorders of Urinary tracts:** Pathophysiology of Urinary Tract Infections, Acute and Chronic Renal Failure.
6. **Endocrine disorders:** Pathophysiology of disorders of pituitary gland- growth hormone- Dwarfism, Gigantism. Adrenal gland-Addisonôs disease. Thyroid gland-Hypo and Hyperthyroidism. Sex

hormones- Hirsuitism, Gynecomastia, virility, impotence etc. Pancreas-Diabetes.

7. **Pain and inflammation:** Pathophysiology of Headache e.g. migraine, cluster headache, muscle contraction, (tension headaches), headaches affecting elderly. Pathophysiology of joint pain like osteoarthritis. Rheumatoid arthritis and gout.

Recommended Books

1. Robbins Pathologic. Basis of Disease Harcourt Asia Pte.ltd. New Delhi
2. Harsh Mohan: Textbook of Pathology, *Jaypee Brothers, Medical Publishers, New Delhi.*
3. Harisons Internal Medicine, *Tata Mc-Graw Hill Publications, Singapore.*
4. Davidsons: Textbook of Medicine. *Tata Mc-Graw Hill Publications, Singapore.*
5. Stahl S. M.. Essential Psychopharmacology Cambridge University Press New Delhi.
6. Dipiro J.L. Pharmacotherapy Handbook. Tata McGraw Hill New Delhi.

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SEMESTER-IV

Subject Code	Subject	Maximum Marks		Total Marks
		Theory	Practical	
4.1	Physical Pharmaceutics-II	80	80	160
4.2	Pharmaceutical Organic chemistry-II	80	80	160
4.3	Pharmaceutical Analysis-I	80	80	160
4.4	Pharmaceutical Biotechnology	80	80	160
4.5	Pharmacology-I	80	80	160
4.6	Basic Computer Applications	80	ð -	80
	Total			880

Syllabus Prescribed for
B. Pharm. Semester – IV

Subject code: T- 4.1
Subject : Physical Pharmaceutics – II
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Surface and interfacial phenomenon :** Surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, complex films, adsorption at solid liquid-interfaces, surface activity, surface active agents, HLB classification, solubilization-micelle formation, determination of critical micelle concentration, detergency, and wetting agents. Contact angle, flocculating agents, deflocculating agents, foaming agents, anti-foaming agents. Medicinal and pharmaceutical applications.
2. **Micrometerics :** Introduction and pharmaceutical importance, particle size and distribution, particle shape, particle volume, particle number, surface area, methods for determining particle size, particle volume measurement, specific surface, methods for determining

surface area, Derived properties of powders-porosity packing-arrangement-densities, bulkiness-flow properties of powders, angle of repose, factors affecting flow of powders.

SECTION-B

3. **Diffusion and dissolution:** Steady state of diffusion, procedures and apparatus used, diffusion and drug release, diffusion principles in biological systems, vapor sorption and Transmission. Thermodynamics of diffusion.
4. **Rheology :** Fundamentals of rheology, type of flow, quantitative measurement of flow, mechanical models to illustrate flow on viscoelasticity, thixotrophy, measurement of thixotrophy, thixotrophy in formulation, rheology of disperse system, pharmaceutical application of rheology. Methods of viscosity measurements.
5. **Complexation and protein binding:** Classifications, methods of preparation and analysis, crystalling structure of complexes, thermodynamic treatment of stability constants, protein binding.

Subject code: P- 4.1

Subject : Physical Pharmaceutics – II

PRACTICAL **45 Hours (3 hrs. /week)**

1. Determination of particle size, particle size distribution and surface area using various methods of particle size analysis.
2. Determination of derived properties of powders like density, porosity, compressibility, angle of repose etc.
3. Determination of surface/interfacial tension, HLB value and critical micelle concentration of surfactants.
4. Study of rheological properties of various types of systems using different viscometers.
5. Studies on different types of complexes and determination of their stability constants.

Recommended Books:

1) Remingtonôs Pharmaceutical Sciences.
2) Elements of Physical Chemistry - Glasstone & Lewis
3) Theory & Practice of Industrial Pharmacy - Lachman, Libermann & Kanig.
4) Physical Pharmacy by Martin - Swarbrick & A.Cammarata
5) Bentleyôs Text Book of Pharmaceutics by Rewilins.
6) Tutorial Pharmacy - Cooper & Gunn
7) Physical Pharmaceutics by Milo Gibaldi.
8) Practical Physical Pharmacy by Dr.U.B.Hadkar, T.N.Vasudevan, K.S.Laddha,
9) Practical Pharmaceutical Technology by ï Engene
10) Practicals in Physical Pharmacy by CVS Subramaniam.
11) Practicals in Physical Pharmacy by Dr. D. V. Derle.

Subject code: T-4.2

Subject : Pharmaceutical Organic chemistry – II

THEORY **45 Hours (3 hrs. /week)**

Section-A

1. **Stereochemistry:** Isomerism, Stereoisomerism, Geometric Isomerism, Saw-Horse Projection of Molecules, Optical activity, Specific Rotation, Enatiomers, Diastereomers, Racemic modification & its resolution, Conformational isomerism, Meso-Compounds, elements of Symmetry, Chirality, Chiral Centeres, Nomenclature in Stereoisomerism (Configuration: R & S, Z & E, D & L), Sequence Rule. Synthesis & reaction of Chiral Molecules, Stereo selective & Stereo specific Reaction.
2. **Free Radicals:** Structure & stereochemistry, stability, Generation of free radicals (Thermal decomposition, photochemical, oxidation, reduction and electrolysis), Radical anions & cations (definitions & some organic reactions involving them as intermediates), free radical reactions (Kolbe electrolysis, Hunsdiecker reaction, Sandmeyer reaction, Gomberg reaction).
3. **β- Keto esters:** Mechanism of Claisen and Dieckamnn reactions, Use of aceto-acetic ester and malonic ester in Synthesis.

   Unsaturated Compounds: Michael Addition and addition of Grignard Reagent.

4. **Polycyclic Compounds:** Structure, synthesis and reactions of naphthalene, anthracene and phenanthrene involving substituents, carcinogenic hydrocarbons.

SECTION- B

Aldehydes and Ketones: General methods of preparation, mechanism of nucleophilic addition and condensation reactions: Acetal, amine, oximes, hydrazones, smicarbazones, enamine preparation & use.

Addition of Grignard reagent and Hydrides, MPV reduction, Oppenaur oxidation, Aldol condensation, Cannizroõs reaction, Reformatsky reaction, Perkin reaction, Knoevenagel reaction, Haloform Reaction & Mannich reaction.

Carboxylic acids (aromatic & aliphatic): Methods of preparation and reaction. Functional derivatives of carboxylic acids: Acid halides, Anhydrides, Esters and Amides- General Methods of preparation and Mechanism of esterification, transesterification and ester hydrolysis.

Phenols: Prepation and reaction.

Sulphonic Acids : Prepation and reactions

Subject code: P- 4.2

Subject : Pharmaceutical Organic chemistry – II

PRACTICAL 45 Hours (3 hrs. /week)

1. Qualitative Analysis of Binary Mixtures
   a. Solid-Solid mixtures (minimum 10)
   b. High vacuum (fractional) distillation of liquid-liquid mixtures (minimum 2)
2. Synthesis of some compounds having importance as intermediates in medicinal organic chemistry involving single step reactions.
3. Study and use of stereo models to improve the understanding of the concepts studied in theory.

Recommended Books

1. Advanced Organic Chemistry by E.S. Gould, 4/Ed. Wiley Eastern Edition.
2. Principles of Organic Synthesis by Norman, 3/Ed., Nelson Thorns Publication.
3. Organic Chemistry by Morrison & Boyd, 7/Ed, Pearson Education.

4. Heterocyclic Chemistry by Joule and Mill, 4/Ed., Blackwell Publishing Oxford.
5. Organic Chemistry by Fieser & Fieser, Vol. I-X, 1/Ed. Asia Publishing House.
6. Modern Hetrocylic Chemistry By Leao Payrettee.
7. Organic Synthesis- The disconnection approach by Stuart Warren, John Wiley & Sons.
8. Vogelõs Textbook of Practical Organic Chemistry by A. I. Vogel, 5/Ed., Pearson Education.
9. Handbook of Organic Analysis (Qualitative and Quantitative) by H. T. Clarke, 1/Ed. Arnold-Heinemann.
10. Textbook of Practical Heterocyclic Chemistry by Fitten and Smalley.
11. Synthesis of Drugs-Synthone approach Vol. 1, by Radhakrishnan Ayer, J. R. Rao,
12. M. S. Degani, S. A. Ghone, K. Mohanraj, 2/Ed, 2008, Sevak Publication Pvt. Ltd.
13. Quantitative organic Analysis by Siggsa & Honna, 4/Ed., A Wiley Interscience Publication. John Wiley & Sons.
14. Organic Synthesis, Vol. I to X, John Wiley & Sons Ins. New York.

Subject code: T-4.3

Subject : Pharmaceutical Analysis – I

THEORY 45 Hours (3 hrs. /week)

SECTION-A

1. **Introduction** : Significance of quantitative analysis in quality control, different techniques of analysis, preliminaries and definition. Concept of error, classification of errors and means to minimize errors, precision and accuracy, Defination of terms mean, mode, median, SD, percent CV, statistical tests of significance, t-test, F-test, Q-test and application of all above tests to chemical data. Fundamentals of volumetric analysis, methods of expressing concentrations, primary and secondary standards, calculation of equivalent weight & stochiometry.

   Official methods of control:-Standardization of pharmaceutical chemicals, Raw material analysis RMA and finished product analysis FPA, a brief introduction to manufacturing variations, storage conditions & shelf life of different dosage forms.

2. **Aqueous Acid – Base Titrations:** Acid base concept, law of mass action, Neutralization curves, end point detection. Theory of

indicators, choice of indicators, mixed indicators. Application to I.P. products: assay of Aspirin power, Benzoic acid powder.

3. **Complexometric Titrations:-** Concept of complexation and chelation, formation of complex, its stability & factors affecting stability, Warnerôs co-ordination number. Titration curves, types of complexometric titration, method of end point detection, metallochrome indicators (no structure).

   Application to I.P. products: Assay of zinc sulphate powder, Calcium gluconate powder, Calcium gluconate Injection.

SECTION-B

4. **Oxidation Reduction Titrations :** Theory of redox titrations, strength and equivalent weight of oxidizing and reducing agents. Oxidation ï reduction curves, Redox indicators. Titration involving potassium permanganate, Potassium dichromate, potassiumbromate, potassium iodate cerium (IV) sulphate, Iodine (iodimetry and iodometry), titanious chloride.

   Application to I.P. products: Ferrous sulphate, Ascorbic acid, Methylene blue, Isoniazide, Hydrogen peroxide.

5. **Nonaqueous titrations :** Types of solvents, end point detection Karl-fischer method. Application to I.P. products: Mebendazole powder, Atenolol powder, Norfloxacin powder.

6. **Precipitation Titration:-** Precipitation reactions, factor affecting solubility of precipitate. Principal of precipitation titration. Titration involving mercuric nitrate, ammonium or potassium thiocynate.

   Argentometric titration: Theory (Moharôs, Volhardôs, Guy lussac & Fajanôs Method Adsorption indicator). Application to I.P. products: Assay of sodium chloride & potassium chloride, injection.

7. **Sodium nitrite titration :** Theory, Application to I.P. product: Assay of sulphanilamide.

Subject code: P- 4.3

Subject : Pharmaceutical Analysis – I

PRACTICAL **45 Hours (3 hrs. /week)**

1. Standardization of analytical weights and calibration of volumetric apparatus.

2. Preparation and standardization of secondary standard reagents and assay of drugs official in I.P. of following categories.

3. **Acid – Base titration :** Preparation and standardization of acids and some bases. Assay involving Direct and Back titration some official assay procedures eg., Boric acid, Benzoic acid, Aspirin.

4. **Complexometric titration :** Preparation and standardization of EDTA solution. Assay of magnesium sulphate, lead nitrate, calcium gluconate.

5. **Precipitation titration :** Preparation and standardization of titrants like silver nitrate and ammonium thiocynate. Titration according to Mohrôs, Volhardôsand Fajanôs method.

6. **Oxidation-Reduction titration :** Preparation and standardization of redox titrants such as Potassium permanganate, potassium dichromate, Iodine, Sodium thiosulphate, cerric ammonium sulphate. Assay of Ferrous sulphate powder, oxalic acid, strong and weak iodine solution, Lugolôs solution, titanous chloride.

7. **Non-aqueous titration :** Preparation and standardization of perchloric acid, sodium/potassium/lithium methoxide. Assay of Norfloxacin powder/tablet, Mebendazole powder/tablet, and atenolol powder/ tablet.

8. Assay of sulpha drugs by Dizotization

Recommended Books

1. Vogelôs Text Book of Quantitative Chemical Analysis, 6/Ed., Pearson Education.
2. Quantitative analysis by V.Alexyev, Student Edition, CBS Publisher & Distributor.
3. Fundamentals of Analytical Chemistry by skoog, West, Holler, Harvest, 8/ED., Thomson Brookslcole.
4. Pharmaceutical Analysis by Higuchi, Reprint 2004, CBS Publisher & Distributors.
5. The Quantitative analysis of drugs by Garrat D C, 3/Ed., CBS Publisher & Distributors.
6. Quantitative analysis by Day RA & Underwood AL, 5/Ed., Prentice Hall of India Pvt. Ltd. New Delhi.
7. Analytical Chemistry by Christian GD, 6/ED., John Wiley & sons.
8. A Textbook of Pharmaceutical Analysis by Connors KA, 4/Ed., John Wiley & Sons.

9. Practical Pharmaceutical Chemistry Part-I by Beckett AH & Stanlake JB, 4/Ed., CBS Publisher & Distributors.
10. Handbook of Instrumental Techniques for Analytical Chemistry by Frank Settle, First Indian Reprint 2004, Pearson Education.
11. Pharmaceutical Analysis Vol.II, K.R.Mahadik, S.G.Wadodkar, H.N.More, Nirali Prakashan.

Subject code: T-4.4

Subject : Pharmaceutical Biotechnology

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Cell culture methods:** Comprehensive study of cell and organ culture methods.
2. **Replication of DNA:** Semi conservative replication, Meselson & stahlôs Experiments, replication initiation, elongation and termination, enzymes and proteins involved in prokaryotic and eukaryotic replication.
3. **Protein synthesis:** Genetic code and its significance, Transcription and Translation; Initiation, elongation and termination, structure and role of RNA Polymerase in eukaryotes and prokaryotes. role of RNA and proteins involved in the process.
4. **Genetic Recombination:** Introduction to genes and gene therapy. Transformation, conjugation, tansduction, protoplast fusion and genecloning and their applications. Development drugs produced by biotechnology such as Humatrope, HB erythroprotine.

SECTION-B

5. **Antibiotics & other fermented products:** Historical development of antibiotics Antimicrobial spectrum and methods used for their standardization. Screening of soil for organisms producing antibiotics, fermenter its design, control of different parameters. Isolation of mutantôs factors influencing rate of mutation. Design of fermentation process. Isolation of fermentation products with special reference to penicillin, streptomycin, tetracycline and vitamin B 12.

6. **Microbial Transformation:** Introduction, types of reactions mediated by micro organisms, design of biotransformation processes, selection on organisms, biotransformation process and its improvements with special reference to steroids.
7. **Bacterial Enzyme:** Enzyme immobilization, Techniques of immobilization of enzymes, factors affecting enzyme kinetics. Immobilization of bacteria and plant cells.

Subject code: P-4.4

Subject : Pharmaceutical Biotechnology

PRACTICAL **45 Hours (3 hrs. /week)**

1. Microbial limit test as per I.P. specifications.
2. Sterility testing of pharmaceutical products.
3. Microbial assay of antibiotics/vitamins/amino acids.
4. Bacteriological examinations of water, milk & food products.
5. Demonstration of an experiment to illustrate the production of an antibiotic by fermentation.
6. Immobilization of enzymes and study of itôs activity.
7. Experiments to illustrate microbial bio-transformation (Demonstration).

Recommended Books:

1) Kielslich K, Ed Biotechnology Vol 6a, Verleg Chemie, Switzerland.
2) Lewin Benjamin, Gene V Microbiology.
3) Peppler, Microbial Technology, Vol II & I.
4) Prescott L M, Jarely G P, Klein D A, Microbiology, WmC Borown Publishers, Oxford.
5) Prescott and Dunn, Industrial Microbiology, McGraw Hill Book Company Inc.Inc. NY.
6) Salle A. J., Fundamental Principles of bacteriology.
7) Shotton E and Ridgaway K., Physical Pharmaceutics Oxford University Press, London.
8) Stanier R. Y., Ingraham, General Microbiology, Wheellis and Painter.
9) Ward O.P. Fermentation Technology, Principles, Processes & Products Open University Press, Milton Keynes, UK.
10) Microbiology, Pelzar & Reid
11) R.Anathanarayan and C. K. J. Panikar, Textbook of microbiology.
12) Practical Microbiology by R. S. Gaud and G. D. Gupta. 2nd Edition, Nirali Prakashan, Pune

Subject code: T-4.5
Subject : Pharmacology-I
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1 **Introduction of Pharmacology:** Definitions, scope and general principles of pharmacology, various branches of pharmacology, Nature and sources of drugs, routes of drug administration.

2 **Bioassays**: Types, principles and applications, merits and demerits of bioassays. Official bioassay of drugs as per IP.

3 **Adverse drug effects:** Introduction to adverse drug effects. Mechanism and types of allergic reactions. Predictable and unpredictable adverse drug reactions e.g. side effects, secondary effects, toxic effects, intolerance, idiosyncrasy, drug allergy, photosensitivity, drug dependence, drug withdrawal reactions, teratogenicity.

4 **Pharmacokinetics:** Biological membranes- structure, types, properties and functions of biological membranes, Physicochemical factors and processes in transfer of drugs across the biological membranes, Drug absorption, Bio-availability, factors affecting drug absorption and bio-availability.

Distribution, Metabolism (Biotransformation) and Excretion (Elimination) of drugs and factors affecting all these processes.

SECTION-B

5 **Pharmacodynamics:** Introduction to pharmacodynamics. Principles and mechanism of drug action. Factors modifying drug action. Concept of drug summation, drug synergism, drug antagonism and its types.

Drug Receptors- Basic discussion about receptors, classification and families of receptors, receptors theory, drug effects and regulation of receptors. Quantitation of drug receptor interactions and their effects, dose response relationships and therapeutic index.

6 **Pharmacology of drugs acting on autonomic nervous system**: Organisation and function of autonomic nervous system, autonomic transmission and cotransmission.

Cholinergic system and Drugs, Anticholinergic drugs. Adrenergic system and drugs, Antiadrenergic drugs.

Subject code: P- 4.5
Subject : Pharmacology-I
PRACTICAL **45 Hours (3 hrs. /week)**

1. Care and handling of common laboratory animals.
2. Introduction to animal physiology with their biochemical reference value in various animal species.
3. Study of different parameters of animals e.g. body weight, life span, B.P, temperature etc.
4. Study of laboratory animals and various preparations of them used in animal experimentation.
5. Study of laboratory appliances used in experimental pharmacology.
6. Study of various physiological salt solutions used in experimental pharmacology.
7. Study of various anesthetics employed to anesthetize the laboratory animal.
8. Study of various routes of administration in animals
9. To study the blood sample collection from experimental animals.
10. To study the influence of various route of administrations on sleeping time by using suitable drugs.
11. To study the absorption of suitable drugs from intestine preparation from rat, mice, or goat.
12. To study the effects of autonomic drugs on the rabbit eye with special reference to physostigmine sulphate and atropine.
13. To study the Hypnotic property of drug/drugs using mice/rats as experimental animals.

Note

- Suitable animal preparation- Any experiment suitable to demonstrate the concept- It could be either in-vivo or in-vitro, The animal selected may be mice, rat, rabbit, guinea pig as admissible as per prevailing Government/CPCSEA guidelines. In case of in-vitro preparations- any tissue preparation from above animals or various tissues from goat may be obtained from slaughter house/ abattoir /butcher shop.
- Agonist- Any agonist that can exhibit activity using the given preparation as reported in standard books/journals may be selected e.g.-Adrenaline and other catecholamines, Acetyl Choline, Histamine, Serotonin, oxytocin etc.

- Antagonist- Any antagonist that can exhibit blocking activity of above mentioned agonists in the given preparation as reported in standard books/journals may be selected.

Recommended Books

1. Goodman Gilman, The Pharmacological basis of therapeutics. Mc-graw Hill New Delhi.
2. Foster R.W. Basic Pharmacology, Arnold, New Delhi.
3. Stahl S. M.. Essential Psychopharmacology Cambridge University Press New Delhi.
4. Dipiro J.L. Pharmacotherapy Handbook. Tata McGraw Hill New Delhi.
5. Official books - Indian Pharmacopoeia, British Pharmacopoeia, United States Pharmacopoeia.
6. Tripathi K.D. Essentials of medical Pharmacology Jaypee New Delhi.
7. Barar F.S.K. Essentials of Pharmacotherapeutics, S. Chand & Company Ltd. New Delhi.
8. Rang H.P., Dale M.M. et. al. Pharmacology. Churchill L Ivingstone, New Delhi.
9. Katzung B.G .Basic & Clinical Pharmacology Mc-graw Hill, New Delhi.
10. Lewisôs Pharmacology. Churchill Livingstone London.
11. Harvey R.A., Champe P.C. Lippincottôs Illustrated Reviews-Pharmacology. Lippincott Williams & Wilkins, Pennsylvania.
12. Ghosh M.N. Fundamentals of Experimental pharmacology. Hilton & Company Kolkata.
13. Vogel G.H. Drug discovery and evaluation. Springer Germany.
14. Goyal R.K. Practicals in pharmacology. B.S. Shah Prakashan Ahmedabad.
15. Kulkarni S.K. Handbook of Experimental Pharmacology. Vallabh Prakashan. New Delhi.
16. Pillai, K. K. Experimental Pharmacology. CBS Publishers New Delhi.
17. Grover, J.K. Experiments in Pharmacy and Pharmacology Vol-II. CBS publishers New Delhi.

18. Perry W. L. M. Pharmacological Experiments on Isolated preparations. E.&S.Livingstone, London.
19. Kasture S.B.Text book of Experimental Pharmacology, Career Publication Nashik.
20. Official books - Indian Pharmacopoeia, British Pharmacopoeia, and United States Pharmacopoeia.
21. Related research papers from various journals.

Subject code: T-4.6

Subject : Basic Computer Applications

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. Introduction to computers and Operating Systems

Introduction: Definition of Electronic Digital Computers and their characteristics like speed, Storage, Accuracy, Diligence, Automation and versatility. Classification and types of computers, Structure of Computer (Block diagram of computer), Function of different units of computer, memory, RAM, ROM, Input and Output devices, Secondary Storage Devices, Concept of Operating Systems, Definition, Elements of MS-DOS, Unix and Windows.

2. Electronic Communication and computer networks

Software: Types of Communication, Data Transmission, Networks, Types of Networks, Internet, electronic mail, e-commerce.

SECTION-B

3. Computer Languages and basic application software

Software: Computer Languages - Machine language, Assembly Language, High Level Languages and their comparison. Introduction to Compilers and Interpreters (Definition and Comparison). Types of Software, Word Processor - MS-Word, Features, application. Spreadsheet - MS-Excel, Features, application. Data Base

Management System MS-Access, Features, application Presentation Graphics - Microsoft Power Point, Features, application.

4. Computer applications

Applications: In general, Scientific and research, Role of computer in Pharmaceutical and Clinical studies, In Drug Information Storage, Pharmacokinetics, Drug Design and Pharmaceutical Analysis.

References:

1. Computer and Commonsense (4th Edition) ï Roger Hunt, John Shelly
2. Computer Today (3rd Edition) ï Donald Landers.
3. Computer Medicine ï S.Rose
4. Computer Applications in Pharmacy ï William and fassett
5. MS-CIT ï Computing Essentials ï Timothy J.Oôleary, Linda I Oôleary.
6. Introduction to Biostatastics & Computer Science ï Y.I.Shah, Dr.A.R.Paradkar, M.G.Dhayagure

Third B.Pharmacy Prospectus No. 2013146
Semester-V Examination - Winter-2012,
Semester-VI 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-V EXAMINATION, WINTER-2012
SEMESTER-VI EXAMINATION, SUMMER-2013

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I N D E X

Third B.Pharmacy (Semester-V & VI)

(Prospectus No.2013146)

SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects, papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc. refer the University OrdinanceBooklet the various conditions/provisions pertaining to examinations as prescribed in the following Ordinances-

Ordinance No. 1	:	Enrolment of Students.
Ordinance No.2	:	Admission of Students
Ordinance No. 4	:	National Cadet Corps
Ordinance No. 6	:	Examination in General (relevant extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute NO.18, Ordinance 2001.
Ordinance No.9	:	Conduct of Examinations (Relevant extracts)
Ordinance No.10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission Candidates to Degrees
Ordinance No.109	:	Recording of a change of name of a University Student in the records of the University
Ordinance No.6 of 2008	:	For improvement of Division/Grade.

Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

DIRECTION

No.: 21/2010 Date : 21/06/ 2010

Subject : Examination Leading to the Degree of भेषजी स्नातक (Bachelor of Pharmacy) (Four Year - Eight Semester Degree Course), Direction 2010.

Whereas, the Sub-committee appointed by Board of Studies in Pharmaceutical Sciences have prepared and recommended the Schemes of Teaching and Examinations along with provisions to be incorporated in the Ordinance for B.Pharm. Semester-I to VIII as per Semester Pattern and Credit Based Performance and Assessment System.

AND

Whereas, the Hon'ble Vice-Chancellor has accepted the aforesaid recommendations under sub-section (7) of Section 14 of the Maharashtra Universities, Act, 1994 on behalf of the Board of Studies in Pharmaceutical Sciences and faculty of Medicine on 27.5.2010.

AND

Whereas, the aforesaid recommendations were placed before the Academic Council in its meeting held on 28.5.2010 vide item No.45 and the Council resolved to accept the refer the Schemes/ provisions to be incorporated in the Ordinance to the Ordinance Committee for placing it directly before the Management Council.

AND

Whereas, the making of Ordinance/Regulation for B.Pharm. Semester-I to VIII is a time consuming process.

AND

Whereas, the Academic Session is starting from 14th June 2010 and it is necessary to provide the Schemes of examinations, eligibility criteria along with other details.

Now, therefore, I, Dr. Kamal Singh, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1) This Direction may be called "Examination Leading to the Degree of भेषजी स्नातक (Bachelor of Pharmacy) (Four Year - Eight Semester Degree Course), Direction, 2010".

2) This direction shall come into force from the date of its issuance.

3) There shall be Eight Examinations leading to the Degree of भेषजी स्नातक (Bachelor of pharmacy), namely:

(i) the First B.Pharm Examination consisting of Semester-I & II at the end of the each semester;

(ii) the Second B.Pharm Examination consisting of Semester-III & IV at the end of the each semester;

(iii) the Third B. Pharm. Examination consisting of Semester-V & VI at the end of the each semester;

(iv) the Final B. Pharm Examination consisting of Semester-VII & VIII at the end of the each semester.

4) The duration of each semester shall be of six months.

5) The examinations specified in Paragraph 3 shall be held twice a year at such places and on such dates as may be appointed by the Board of Examination.

6) An applicant for admission to an examination specified in Paragraph 3 shall prosecute a regular course of study in courses prescribed for the examination concerned for not less than one semester in a particular semester in a College affiliated to the University.

7) Subject to his compliance with the provisions of this Direction and of other Ordinances in force from time to time, an applicant for admission to-

(A) The प्रथम भेषजी स्नातक (First B. Pharm- Semester I and II) Examination shall have passed not less than one academic year previously-

(i) The Diploma in Pharmacy Examination from an Institution recognized by the Pharmacy Council of India ; with minimum 40% marks.

or

(ii) The 12th Standard Examination of the Maharashtra State Board of Secondary and Higher Secondary Education with English , Physics , Chemistry and Biology or Mathematics as subjects of study at the 12th Standard; securing minimum 50% marks(45% marks for backward class candidates from Maharashtra) in the said subjects taken together and passed in the same sitting

or

(iii) An Examination recognised as equivalent thereto in such subjects and with such standards of attianments as may be prescribed.

(iv) The norms laid down by the Directorate of Technical Education, Mumbai, Government of Maharashtra from time to time.

(B) The **द्वितीय भेषजी स्नातक** (Second B.Pharm- Semester III and IV) Examination –

Shall have passed not less than one academic year previously the **प्रथम भेषजी स्नातक** (First B. Pharm) Examination of the University or the post H.S.S.C. Diploma in Pharmacy (i.e. according to Education Regulation, 1991 of Pharmacy Council of India) from the Board of Technical Education or equivalent from an institute approved by Pharmacy Council of India in first attempt scoring not less than 600 marks out of 1000 marks at D.Pharm. Part-II Examination, provided that they appear and pass in the theory papers of Mathematics of First year B.Pharm. (Semester-II) examination otherwise, their result of the third year B.Pharm. (Semester-V) examination shall not be declared.

(C) The **तृतीय भेषजी स्नातक** (Second B.Pharm- Semester V and VI) Examination shall have passed the **द्वितीय भेषजी स्नातक** (Second B. Pharm i.e. Semester-III & IV) Examination of the University not less than one Academic year previously.

(D) The **अंत्य भेषजी स्नातक** (Final B.Pharm- Semester VII and VIII) Examination shall have passed the **तृतीय भेषजी स्नातक** (Third B. Pharm i.e. SemesterV & VI) Examination of the University not less than one Academic year previously.

8) Subject to his/her compliance with the provisions of this Direction & other Ordinances pertaining to Examination in force from time to time, the applicant for admission , at the end of the course of study of a particular semester/session, to an Examination specified in column (1) of the table below, shall be eligible to appear if

i) he/she satisfies with the conditions in the table and the provisions thereunder.

ii) he/she complies with the provisions of the ordinance pertaining to the Examination in general from time to time.

iii) he/she has prosecuted a regular course of study in a college affiliated to the University.

iv) he/she has in the opinion of the Principal shown satisfactory progress in his/her studies.

TABLE

Name of the Exam.	The student should have passed the exam. of	The student should have satisfactorily completed the following session/ semester	The student should have passed the following examination
B.Pharm. Semester-I	As mentioned in Para 7 (A)	—	—
B.Pharm. Semester-II	—	B.Pharm. Semester-I	—
B.Pharm. Semester-III	—	B.Pharm. Semester-II	2/3rd Heads of I & II Semester combined together
B.Pharm. Semester-IV	—	B.Pharm. Semester-III	-do-
B.Pharm. Semester-V	B.Pharm.I & II Semester	B.Pharm. Semester-IV Semester-V	2/3rd Heads of III & IV Semester combined together
B.Pharm. Semester-VI	-do-	B.Pharm. Semester-V	-do-
B.Pharm. Semester-VII	B.Pharm. III & VI Semester	B.Pharm. Semester-VI	2/3rd Heads of V & VI Semester combined together
B.Pharm. Semester-VIII	-do-	B.Pharm. Semester-VII	-do-

Explanation :

i) While calculating 2/3 rd heads of passing,fraction if any shall be ignored

ii) For considering the heads of passing, every theory and every practical shall be considered as separate head of passing.

iii) An examinee who has passed 2/3rd heads of passing shall be allowed to keep term in the next higher class.

9) Without prejudice to the other provisions of Ordinance No. 6 relating to the Examination in General , the provisions of Paragraphs 5,7,8,10,27,31 and 32 of the said Ordinance shall apply to every Collegiate candidate.

10) The fee for each examination and practical examination shall be as prescribed by the University, from time to time.

11) An applicant for admission to an examination shall satisfy the Head of the Department /Principal in the Terminal and other Tests conducted during the academic year regarding his suitability to take the examination.

12) The maximum marks allotted to the Sessional Examination in each paper, the written part and the practical part for each of the Four Examinations shall be per **Appendices-I to V** appended with this Direction.

13) The scope of the subjects shall be as indicated in the Syllabus.

14) The Head/ Principal shall maintain in his office a complete record of marks obtained by the candidate in the sessionals. He shall send to the Registrar in a sealed cover the final marks in sessional examination obtained by every applicant.

15) In order to pass an examination an examinee-

(i) Shall obtain not less than 45% of the total marks allotted to each written paper and its respective sessional Examination taken together as shown in the concerned Appendix;

(ii) Shall obtain not less than 50% of the total marks allotted to each practical and its respective sessional taken together as shown in concerned appendix.

16) There shall be no classification of successful examinees at the **प्रथम, द्वितीय व तृतीय भेषजी स्नातक** (First : Sem-I & II , Second: Sem-III & IV and Third B.Pharm : Sem-V & VI) Examinations.

17) Division of Successful examinees at the **अन्त्य भेषजी स्नातक** (Final B.Pharm- Semester VII and VIII) examination shall be determined on the basis of the aggregate marks obtained at the **तृतीय आणि अन्त्य भेषजी स्नातक** (Third and Final B.Pharm- Semester V, VI, VII, and VIII) examinations taken together.

18) Those obtaining 60% or more marks in the aggregate shall be placed in the First Division, and all other successful examinees in the second Division.

19) An examinees who is successful at an examination and obtains not less to 75% of the total marks prescribed in a subject, shall be declared to have pass examination with Distinction in that subject.

20) If a student fails in an examination his marks of Internal/ Sessional Assessment of Theory of the examination shall be carried over for the next examination. However, he can give a declaration to the effect that his Internal/Sessional Assessment marks of the Theory should not be counted and his marks in the Theory shall be only on the basis of external examination.

21) Improvement of Internal Assessment :-

- If a candidate desires for improvement of internal assessment of theory/practical, he may reappear for an examination and fresh marks for internal assessment will be considered. There is only one chance to appear for improvement of internal assessment examination for internal theory/practical subject.
- Examination of the subject head "Project and the Seminars" will be conducted by the institute. The criteria for marks distribution is specified in the scheme of examination. The institute must submit the marks awarded in the Project report and in seminar to the controller of examination along with the periodic test marks (i.e. internal assessment marks). Once the candidate has passed in the subject head "Project report and seminar," the candidate will not be allowed to reappear for examination in this subject head.

22) Provisions of Ordinance No. 18 of 2001 relating to an Ordinance to provide grace marks for passing in a Head of passing and Improvement of Division (Higher Class) and getting distinction in the subject and condonation of deficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance 2001 shall apply to the examinations under this Direction.

23) As soon as possible after the examination, but not later the 30th June next following in case of examinations held in summer and 28th february next following in case of examinations held in winter, the Board of Examination shall publish a list of successful examinees. The list of successful examinees at the **अन्त्य भेषजी स्नातक** (Final B.Pharm.- Semester VII and VIII) Examination shall be arranged in the First and Second Division, as envisaged in Paragraph 17 of this Direction the names of Examinees passing the B.Pharm. Examination as a whole in the minimum prescribed period and obtaining the prescribed number of places in the First or Second Division shall be arranged in order of Merit as provided in the examinations in General Ordinance No. 6.

24) Notwithstanding anything to the contrary in this Direction , the Degree of Bachelor of Pharmacy shall not be conferred upon a person unless:-

He Undergoes a practical training of not less than four weeks after taking the Third year (Semester-V & VI) or Final year (Semester-VII & VIII) B. Pharm. Examination in Pharmaceutical industry/Primary Health Centre/Private Hospitals with 20 bed capacity and Medical shop (Whole sale or Retail) approved by the Head/Principal and unless the Head/ Principal certifies that the person has satisfactorily completed the said practical training as the case may be.

25) Successful examinees at the **प्रथम भेषजी स्नातक , द्वितीय भेषजी स्नातक व तृतीय भेषजी स्नातक** (First B.Pharm,- (Sem. I and II) Second B.

Pharm, (Sem. III and VI) and Third B. Pharm (Sem. V and VI)) Examinations shall be entitled to receive a Certificate signed by the Registrar; and those successful at the अन्त्य भेषजी स्नातक (Final B.Pharm. Sem. VII and VIII Examination) shall, on payment of the prescribed fees, receive a degree, in the prescribed form, signed by the Vice-Chancellor.

Sd/-
(Dr.Kamal Singh)
Vice-Chancellor

Amravati
Dated : 19/06/2010

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*Corrected vide Direction No.8 of 2011.

Appendix-I
Scheme of teaching for B. Pharm (Semester wise)
First to Eight semester

Sub. Code	Subject	Scheme of teaching	
		Theory	Practical
Semester-I			
1.1	Pharmaceutics-I	03	03
1.2	Pharmaceutical Biochemistry-I	03	03
1.3	Anatomy and Physiology-I	03	03
1.4	Pharmacognocy-I	03	03
1.5	Pharmaceutical Engineering-I	03	03
Semester-II			
2.1	Pharmaceutics-II	03	03
2.2	Anatomy and Physiology-II	03	03
2.3	Pharmacognocy-II	03	03
2.4	Pharmaceutical Engineering-II	03	03
2.5	Pharmaceutical Biochemistry-II	03	03
2.6	Mathematics	03	—
Semester-III			
3.1	Physical Pharmaceutics-I	03	03
3.2	Pharmaceutical Microbiology	03	03
3.3	Pharmaceutical Organic chemistry-I	03	03
3.4	Hospital and Community Pharmacy	03	03
3.5	Pharmaceutical Inorganic Chemistry	03	03
3.6	Pathophysiology	03	—
Semester-IV			
4.1	Physical Pharmaceutics-II	03	03
4.2	Pharmaceutical Organic chemistry-II	03	03
4.3	Pharmaceutical Analysis-I	03	03
4.4	Pharmaceutical Biotechnology	03	03
4.5	Pharmacology-I	03	03
4.6	Basic Computer Applications	03	—
Semester-V			
5.1	Pharmaceutics-III	03	03
5.2	Medicinal Chemistry-I	03	03
5.3	Pharmaceutical Organic Chemistry-III	03	03
5.4	Pharmacognocy-III	03	03
5.5	Pharmacology-II	03	03
5.6	Biopharmaceutics-I	03	—

Semester-VI			
6.1	Pharmaceutics-IV	03	03
6.2	Medicinal Chemistry-II	03	03
6.3	Pharmaceutical Analysis-II	03	03
6.4	Pharmacognocy-IV	03	03
6.5	Biopharmaceutics-II	03	03
6.6	Clinical Pharmacy	03	—
6.7	Project*	—	03
Semester-VII			
7.1	Pharmaceutics-V	03	03
7.2	Medicinal Chemistry-III	03	03
7.3	Pharmacology-III	03	03
7.4	Pharmacognocy-V	03	03
7.5	Pharmaceutical Analysis-III	03	03
7.6	Pharmaceutical Jurisprudence	03	—
7.7	Seminar (one per each student)*	03	—
Semester-VIII			
8.1	Pharmaceutics-VI	03	03
8.2	Medicinal Chemistry-IV	03	03
8.3	Pharmaceutical Analysis-IV	03	03
8.4	Pharmacognocy-VI	03	03
8.5	Clinical Pharmacotherapeutics	03	03
8.6	Communication Skills	03	—

Appendix-II

Scheme of Examination for B. Pharm (Semester wise)

First to Eight semester

Sub. Code	Subject	Scheme of Examination						Minimum Marks for passing		Total Marks in theory/ practical (Credits)
		Theory		Practical		Theory Int. Marks	Pract. Int. Marks	Theory	Pra ctie al	
		Hrs	Marks	Hrs	Marks					
Semester-I										
1.1	Pharmaceutics-I	3	60	5	50	20	30	36	40	80 (04) + 80 (04)
1.2	Pharmaceutical Biochemistry-I	3	60	5	50	20	30	36	40	80 (04) + 80 (04)
1.3	Anatomy and Physiology-I	3	60	5	50	20	30	36	40	80 (04) + 80 (04)
1.4	Pharmacognocy-I	3	60	5	50	20	30	36	40	80 (04) + 80 (04)
1.5	Pharmaceutical Engineering-I	3	60	5	50	20	30	36	40	80 (04) + 80 (04)
		Total Marks (credits) for the Semester								800 (Total Credits: 40)
Semester-II										
2.1	Pharmaceutics-II	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
2.2	Anatomy and Physiology-II	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
2.3	Pharmacognocy-II	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
2.4	Pharmaceutical Engineering-II	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
2.5	Pharmaceutical Biochemistry-II	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
2.6	Mathematics	3	60	—	—	20	—	36	—	80 (04)
		Total Marks (credits) for the Semester								880 (Total Credits: 44)
Semester-III										
3.1	Physical Pharmaceu-tics-I	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
3.2	Pharmaceutical Microbiology	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
3.3	Pharmaceutical Organic chemistry-I	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
3.4	Hospital and Community Pharmacy	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
3.5	Pharmaceutical Inorganic chemistry	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
3.6	Pathophy siology	3	60	—	—	20	—	36	—	80 (04)
		Total Marks (credits) for the Semester								880 (Total Credits: 44)
Semester-IV										
4.1	Physical Pharmaceutics-II	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
4.2	Pharmaceutical Organic chemistry-II	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
4.3	Pharmaceutical Analysis-I	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
4.4	Pharmaceutical Biotechnology	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
4.5	Pharmacology-I	3	60	5	50	20	30	36	40	80 (04)+ 80 (04)
4.6	Basic Computer Applications	3	60	—	—	20	—	36	—	80 (04)
		Total Marks (credits) for the Semester								880 (Total Credits: 44)

Semester-V										
5.1	**Pharmaceutics-III**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
5.2	**Medicinal Chemistry-I**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
5.3	**Pharmaceutical Organic Chemistry-III**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
5.4	Pharmacognocy-III	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
5.5	**Pharmacology-II**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
5.6	**Biopharmaceutics-I**	**3**	**60**	—	—	**20**	—	**36**	—	**80 (04)**
		Total Marks (credits) for the Semester								**880 (Total Credits: 44)**
Semester-VI										
6.1	**Pharmaceutics-IV**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
6.2	**Medicinal Chemistry-II**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
6.3	**Pharmaceutical Analysis-II**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
6.4	**Pharmacognocy-IV**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
6.5	Biopharmaceutics-II	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
6.6	**Clinical Pharmacy**	**3**	**60**	—	—	**20**	—	**36**	—	**80 (04)**
6.7	**Project***	—	—	**3**	**80**	—	—	—	—	**80 (04)**
		Total Marks (credits) for the Semester								**960 (Total Credits: 48)**
Semester-VII										
7.1	**Pharmaceutics-V**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
7.2	**Medicinal Chemistry-III**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
7.3	**Pharmacology-III**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
7.4	**Pharmacognocy-V**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
7.5	**Pharmaceutical Analysis-III**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
7.6	**Pharmaceutical Jurisprudence**	**3**	**60**	—	—	**20**	—	**36**	—	**80 (04)**
7.7	**Seminar (one per each student)***	**3**	**80**	—	—	—	—	**36**	—	**80 (04)**
		Total Marks (credits) for the Semester								**960 (Total Credits: 48)**
Semester-VIII										
8.1	**Pharmaceutics-VI**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
8.2	**Medicinal Chemistry-IV**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
8.3	**Pharmaceutical Analysis-IV**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
8.4	**Pharmacognocy-VI**	**3**	**60**	**5**	**50**	**20**	**30**	**36**	**40**	**80 (04)+ 80 (04)**
8.5	**Clinical Pharma cotherapeutics**	**3**	**60**	—	—	**20**	—	**36**	—	**80 (04)**
8.6	**Communication Skills**	**3**	**60**	—	—	**20**	—	**36**	—	**80 (04)**
		Total Marks (credits) for the Semester								**800 (Total Credits: 40)**

Project Report :-

* The topic for the project shall be based on the practical work /theoretical/ review oriented /any topic from current Pharmaceutical development and shall be assigned to him/her by the respective guide from faculty members immediate from the date of the commencement of the sixth semester.

* Report to be submitted in the institute and examination (seminars on the project report) shall be conducted at the college level.

Examination/ Evaluation of the project shall be based on Introduction and information retrieval systems, Organization of material and references in the project report, Representation, Skill in oral presentation, Questioning and defending, and finally on the report.

Seminar :-

* The topic for the seminar shall be assigned to him/her by the faculty members of Seventh semester & topic should be decided from the syllabus of same semester, with immediate from the date of the commencement of the seventh semester.

  Evaluation of seminar shall be based on the communication, representation and skill in oral presentation.

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Appendix-III

Semester-I

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	Pharmacognocy-I	80 (04)	80 (04)	160 (08)
1.5	Pharmaceutical Engineering-I	80 (04)	80 (04)	160 (08)
	Total			800 (40)

Semester-II

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	Pharmacognocy-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)

Semester-III

Subject Code	Subject	Maximum Marks (Credits)		Total Marks (Credits)
		Theory	Practical	
3.1	Physical Pharmaceutics-I	80 (04)	80 (04)	160 (08)
3.2	Pharmaceutical Microbiology	80 (04)	80 (04)	160 (08)
3.3	Pharmaceutical Organic chemistry-I	80 (04)	80 (04)	160 (08)
3.4	Hospital and Community Pharmacy	80 (04)	80 (04)	160 (08)
3.5	Pharmaceutical Inorganic chemistry	80 (04)	80 (04)	160 (08)
3.6	Pathophysiology	80 (04)	—	80 (04)
	Total			880 (44)

Semester-IV

Subject Code	Subject	Maximum Marks (Credits)		Total Marks (Credits)
		Theory	Practical	
4.1	Physical Pharmaceutics-II	80 (04)	80 (04)	160 (08)
4.2	Pharmaceutical Organic chemistry-II	80 (04)	80 (04)	160 (08)
4.3	Pharmaceutical Analysis-I	80 (04)	80 (04)	160 (08)
4.4	Pharmaceutical Biotechnology	80 (04)	80 (04)	160 (08)
4.5	Pharmacology-I	80 (04)	80 (04)	160 (08)
4.6	Basic Computer Applications	80 (04)	—	80 (04)
	Total			880 (44)

Semester-V

Subject Code	Subject	Maximum Marks (Credits)		Total Marks (Credits)
		Theory	Practical	
5.1	Pharmaceutics-III	80 (04)	80 (04)	160 (08)
5.2	Medicinal Chemistry-I	80 (04)	80 (04)	160 (08)
5.3	Pharmaceutical Organic Chemistry-III	80 (04)	80 (04)	160 (08)
5.4	Pharmacognocy-III	80 (04)	80 (04)	160 (08)
5.5	Pharmacology-II	80 (04)	80 (04)	160 (08)
5.6	Biopharmaceutics-I	80 (04)	—	80 (04)
	Total			880 (44)

Semester-VI

Subject Code	Subject	Maximum Marks (Credits)		Total Marks (Credits)
		Theory	Practical	
6.1	Pharmaceutics-IV	80 (04)	80 (04)	160 (08)
6.2	Medicinal Chemistry-II	80 (04)	80 (04)	160 (08)
6.3	Pharmaceutical Analysis-II	80 (04)	80 (04)	160 (08)
6.4	Pharmacognocy-IV	80 (04)	80 (04)	160 (08)
6.5	Biopharmaceutics-II	80 (04)	80 (04)	160 (08)
6.6	Clinical Pharmacy	80 (04)	—	80 (04)
6.7	Project	80 (04)	—	80 (04)
	Total			960 (48)

Semester-VII

Subject Code	Subject	Maximum Marks (Credits)		Total Marks (Credits)
		Theory	Practical	
7.1	Pharmaceutics-V	80 (04)	80 (04)	160 (08)
7.2	Medicinal Chemistry-III	80 (04)	80 (04)	160 (08)
7.3	Pharmacology-III	80 (04)	80 (04)	160 (08)
7.4	Pharmacognocy-V	80 (04)	80 (04)	160 (08)
7.5	Pharmaceutical Analysis-III	80 (04)	80 (04)	160 (08)
7.6	Pharmaceutical Jurisprudence	80 (04)	—	80 (04)
7.7	Seminar (one per each student)	80 (04)	—	80 (04)
	Total			960 (48)

Semester-VIII

Subject Code	Subject	Maximum Marks (Credits)		Total Marks (Credits)
		Theory	Practical	
8.1	Pharmaceutics-VI	80 (04)	80 (04)	160 (08)
8.2	Medicinal Chemistry-IV	80 (04)	80 (04)	160 (08)
8.3	Pharmaceutical Analysis-IV	80 (04)	80 (04)	160 (08)
8.4	Pharmacognocy-VI	80 (04)	80 (04)	160 (08)
8.5	Clinical Pharmaco-therapeutics	80 (04)	—	80 (04)
8.6	Communication Skill	80 (04)	—	80 (04)
	Total			800 (40)

Appendix-IV

DISTRIBUTION OF TOTAL MARKS/ CREDITS SEMESTER WISE :

Year	Semester	Total Marks/Credits
First year	Semester-I	800(40)
	Semester-II	880 (44)
Second year	Semester-III	880 (44)
	Semester-IV	880 (44)
Third year	Semester-V	880 (44)
	Semester-VI	960 (48)
Fourth year	Semester-VII	960 (48)
	Semester-VIII	800 (40)
	Total Marks/Credits	**7040(credits= 352)**

Appendix-V

Sant Gadge Baba Amravati University, Amravati

B. Pharm Syllabus

Credit-grade based performance and assessment system (CGPA))

Features of the Credit System

With effect from June 2010

FEATURES OF THE CREDIT SYSTEM

- Degree course would be of total 352 credits.
- Two credit course of theory will be of two clock hours per week running for 08 weeks.
- Four credit course of theory will be of three clock hours per week running for 12 weeks.
- Two credit courses of practical will consist of three hours of laboratory exercise for 12 weeks.
- Three credit course of practical will consist of three hours of laboratory exercise for 12 weeks.

FIRST YEAR MAY DEVIDE INTO TOTAL TWO SEMESTERS (SEMESTER-I AND SEMESTER-II) AND SHALL HAVE TOTAL 11 THEORY COURSES, 10 PRACTICAL COURSE.

- 11 Theory courses x 4 credits = 44 credits
- 10 Laboratory courses x 4 credits = 40 credits

Total = 84 credits

SECOND YEAR MAY DEVIDE INTO TOTAL TWO SEMESTERS (SEMESTER-III AND SEMESTER-IV) AND SHALL HAVE TOTAL 12 THEORY COURSES, 10 PRACTICAL COURSE.

- 12 Theory courses x 4 credits = 48 credits
- 10 Laboratory courses x 4 credits = 40 credits

Total = 88 credits

THIRD YEAR MAY DEVIDE INTO TOTAL TWO SEMESTERS (SEMESTER-V AND SEMESTER-VI) AND SHALL HAVE TOTAL 12 THEORY COURSES, 11 PRACTICAL COURSE AND 1 PROJECT

- 12 Theory courses x 4 credits = 48 credits
- 10 Laboratory courses x 4 credits = 40 credits
- 1 Project x 4 credits = 04 credit

Total = 92 credits

FORTH YEAR MAY DEVIDE INTO TOTAL TWO SEMESTERS (SEMESTER-VII AND SEMESTER-VIII) AND SHALL HAVE TOTAL 12 THEORY COURSES, 8 PRACTICAL COURSE AND 1 SEMINAR

- 12 Theory courses x 4 credits = 48 credits
- 9 Laboratory courses x 4 credits = 36 credits
- 1 SEMINAR x 4 credits = 04 credit

Total = 88 credits

EVERY STUDENT SHALL COMPLETE MINIMUM 262 CREDITS IN EIGHT SEMESTERS.

1. First year have two semesters and will consist of 84 credits.
2. Second year have two semesters and will consist of 88 credits.
3. Third year have two semesters and will consist of 92 credits.
4. Forth year have two semesters and will consist of 88 credits.

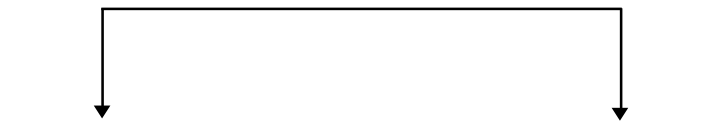
- First year (semester-I and II) = 84 credits
- Second year (semester-III and IV) = 88 credits
- Third year (semester-V and VI) = 92 credits
- Forth year (semester-VII and VIII) = 88 credits

Eight semesters total credits = 352 credits

SCHEME OF SYLLABUS AND CREDIT SYSTEM

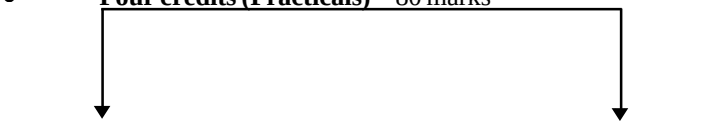
Two credits = 40 marks, three credits= 60 marks and four credits = 80 marks.

- **Four credits (theory)** = 80 marks



- Two credits (theory) **= 40 marks**

- **Four credits (Practicals)** = 80 marks



- **Two credits (Practicals)** = 40 marks

Academic calendar showing dates of commencement and end of teaching, internal assessment tests and term end examination shall be duly notified before commencement of each semester every year by the school.

- Credit system offers more options to students and has more flexibility.
- Students can get requisite credits from the concerned school where he is mutually permitted on terms mutually agreed to complete the same and be eligible to appear for term end examination.
- Seminar and the project shall be compulsory to each student at the end semester of third and final year.

- Paper setting and assessment for a particular course would be the responsibility of the course In-charge.
- A student who passes the internal tests but fails in Term End Examination of a course shall be given FC grade.
- Student with FC grade in a course would be granted credit for that course but not the grade for that course and shall have to clear the concerned course within 1.5 year from appearing for first time in the concerned paper.
- The evaluation is based on average weightage system. Every subject has credit point based system. Every student is awarded grade point out of maximum 10 points in each subject (based on 10 point scale).
- Grades-Marks for each course would be converted to grades as shown in following Table 1 for theory and table 2 for practical.

Table 1: Final Grade point for SGPA and CGPA for Theory

Final grade	Range of Marks obtained out of 100 or equivalent fraction	Grade point
A+	90-100	10
A	80-89	9
B+	70-79	8
B	60-69	7
C+	50-59	6
C	50-54	5
D	40-49	4
F	Below 40	0

Table 2: Final Grade point for SGPA and CGPA for Practical

Final grade	Range of Marks obtained out of 100 or equivalent fraction	Grade point
A+	90-100	10
A	80-89	9
B+	70-79	8
B	60-69	7
C+	55-59	6
C	50-54	5
D	Below 50	0

- Equivalence of the conventional division/class with the CGPA in final semester is in accordance with the following table 3.

Table-3: Equivalence of Class/Division to CGPA

Sr. No.	CGPA	Class/Division
1.	7.5 or more than 7.5	First Class with Distinction
2.	6.00 or more but not less than or equal to 7.49	First Class
3.	5.50 or more but not less than or equal to 5.99	Higher Second Class
4.	5.00 or more but not less than or equal to 5.49	Second Class

- Based on the grade point obtained in each subject, Semester Grade Point Average (SGPA) and then Cumulative Grade Point Average (CGPA) are computed as follows.

Computation of SGPA and CGPA

Every student is awarded point out of maximum out of 10 point in each subject (Based on 10 point scale). Based on the Grade point obtained in subject the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) are computed. The computation of SGPA and CGPA is as under.

Semester Grade Point Average (SGPA) is the weightage average of point obtained by a student in a semester and computed as follows.

$$SGPA = \frac{U1xM1 + U2xM2 + \ldots UnMn}{U1+U2+\ldots\ldots Un}$$

Where U1, U2,…… are subject credit of the respective course and M1, M2,…….. are the Grade point obtained in the respective subject (out of 10).

The Semester Grade Point Average (SGPA) for all the four semester is also mentioned at the end of every semester.

The Cumulative Point Average (CGPA) is used to describe the overall performance of a student in the course and is computed as under. CGPA shall be calculated on semester V, VI, VII & VIII.

$$CGPA = \frac{\sum_{n-1}^{n} SGPA(n)\ Cn}{\sum^{n} Cn}$$

Where SGPA (n) is the nth semester SGPA of the student and C_n is the nth semester total credit. The SGPA and CGPA are rounded off to the second place of decimal.

- Degree will be awarded on the basis of the performance of credits from the Semester-V to VIII.

ACADEMIC CALENDAR AND TERMS

The terms and academic activities of the Sant Gadge Baba Amravati University, Amravati under CGPA shall be as per the dates given below, only the years shall be changed i.e. the dates shall remain same as given below irrespective of the year.

Beginning of First Term (Semester I, III, V and VII) : As Per University Academic Calendar

Beginning of Second Term (Semester II, IV, VI and VIII) : As Per University Academic Calendar

Vacation : As Per University Academic Calendar

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SANT GADGE BABA AMRAVATI UNIVERSITY
DIRECTION

No.: 68 / 2010 Date : 11/11/ 2010

Subject : Consideration of equivalence of D.Pharm. passed students admitted in B.Pharm. 1st year semester pattern, Direction 2010.

Whereas, Direction No. 21/2010 in respect of Examination Leading to the Degree of भेषजी स्नातक (Bachelor of Pharmacy) (Four Year - Eight Semester Degree Course) is in existence from the Academic Session 2010-11.

AND

Whereas, in the aforesaid direction the equivalence for D.Pharm. passed students admitted in the first year B.Pharm. semester pattern is not provided.

AND

Whereas, the Board of Studies in Pharmaceutical Science in its emergent meeting held on 21.10.2010 vide item No.60 have resolved to recommend provisions for aforesaid students.

AND

Whereas, the Hon'ble Vice-Chancellor has accepted the above recommendation of B.O.S. in Pharmaceutical Sciences on behalf of faculty of Medicine and Academic Council on 25.10.2010.

AND

Whereas, the aforesaid recommendations are to be regularized by framing the concerned Ordinance & making of the Ordinance may likely to take some time and the above provision is to be implemented from the current session.

Now, therefore, I, Pravin Pardesi, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1) This Direction may be called "Consideration of equivalence of D.Pharm. passed students admitted in B.Pharm. 1st year semester pattern, Direction, 2010".

2) This direction shall come into force from the date of its issuance.

3) Exempted to the candidates from appearing in all the subjects excluding the subject Mathematics of First Year B.Pharm. Ist &

IInd semester those who are admitted on the basis of D.Pharm. Such candidates have to pass in the theory paper of Mathematics of first year B.Pharm. second semester otherwise his/her result of third year B.Pharm. Semester-V examination will not be declared.

Sd/-
Amravati (Pravin Pardesi)
Dated : 09/11/2010 Vice-Chancellor

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SANT GADGE BABA AMRAVATI UNIVERSITY
DIRECTION

No.: 4 / 2012 Date : 22/02/ 2012

Subject : Corrigendum to Direction No.21/2010 & 8 of 2011 in respect of Examination Leading to the Degree of भेषजी स्नातक (Bachelor of Pharmacy) (Four Year - Eight Semester Degree Course).

Whereas, Direction No.21/2010 in respect of Examination Leading to the Degree of भेषजी स्नातक (Bachelor of Pharmacy) (Four Year - Eight Semester Degree Course) is in existence in the University.

AND

Whereas, the aforesaid Direction is corrected by issuing corrigendum to Direction No.21 of 2010 vide Direction No.8/2011.

AND

Whereas, the Academic Council in its meeting held on 13.1.2012 vide item No.14 7) A) R-2, R-3 & R-4 has accepted the recommendations of the faculty of Medicine (including Pharmaceutical Sciences, Dentistry & Homoeopathy) regarding corrections in the aforesaid Directions from the Academic Session 2011-12.

AND

Whereas, the Hon'ble Vice-Chancellor has approved the corrections recommended by the Dean, faculty of Medicine (including Pharmaceutical Sciences, Dentistry & Homoeopathy) on behalf B.O.S. in Pharmaceutical Sciences, faculty of Medicine and Academic Council on 9.2.2012 to be implemented from the Academic Session 2011-12.

AND

Whereas, the said matter is required to be regulated by framing an Ordinance/Regulation.

AND

Whereas, conversion of above said Directions into respective Ordinance/Regulation is before the Ordinance Committee for making Draft Ordinance/Regulation and onward submission to higher authorities.

AND

Whereas, making of Ordinance/Regulation may likely to take some time.

AND

Whereas, the Academic Session 2011-12 is already started and hence it is necessary to issue corrigendum to above directions in this regard.

Now, therefore, I, Dr. Mohan K.Khedkar, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1) This Direction may be called "Corrigendum to Direction No.21/2010 & 8 of 2011 in respect of Examination Leading to the Degree of भेषजी स्नातक (Bachelor of Pharmacy) (Four Year - Eight Semester Degree Course)".
2) This direction shall come into force from the date of its issuance.
3) the following corrections be made in Direction No.8 of 2011 for rectifying the Direction which are to be implemented from the Academic Session 2011-12 as follows-

   i) the present tables i.e. Table-1 & Table-2 be substituted by the following tables as Table-1 & Table-2 :

Table 1: Grade point for Theory

Grade	Range of Marks obtained out of 100 or equivalent fraction	Grade point
AA	90-100	10
AB	80-89	9
BB	70-79	8
BC	60-69	7
CC	55-59	6
CD	45-54	5
FF	Below 45	0
ZZ	Absent in Examination	

Table 2: Grade point for Practical

Grade	Range of Marks obtained out of 100 or equivalent fraction	Grade point
AA	90-100	10
AB	80-89	9
BB	70-79	8
BC	60-69	7
CC	55-59	6
CD	50-54	5
FF	Below 50	0
ZZ	Absent in Examination	

ii) In Table 3 "Equivalence of Class/Division to CGPA", in Sr.No.2, 3, & 4, the word 'not' appearing in the column CGPA be deleted.

iii) The following additional Table for 'Grade Points for SGPA & CGPA' of B.Pharm. be inserted.

Table-4 : Grade Points for SGPA and CGPA of B.Pharm.

Grade Point	Final Grade
9 - 10	AA
8 - 8.99	AB
7 - 7.99	BB
6 - 6.99	BC
5.5 - 5.99	CC
4.5 - 5.49	CD
0 - 4.49	FF
Absent in Examination	ZZ

iv) The formula for CGPA be corrected as-

$$CGPA = \frac{\sum_{n=5}^{n=8} SGPA(n)C(n)}{\sum_{n=5}^{n=8} C(n)}$$

v) Grade for failure students should be 'FF' instead of 'FC'.

vi) The words and figure "within 1.5 year from appearing for first time in the concerned paper" appearing in aforesaid Direction at Sr.No. 3), in line 9 & 10, be deleted.

vii) In Direction No.8 of 2011, the following provision be inserted in Sr.No.3), after the contents of first bullet (i.e. ●).
"The students who passed D.Pharm. examinations and admitted to B.Pharm. Ist year Ist / IInd semester should be exempted for award of "FF" Grade in B.Pharm. first year, IInd Semester Examination."

4) i) In Direction No.21 of 2010, the following provision be inserted.
"There should be 5 incentive marks for each semester of B.Pharm. examinations."

ii) The word "Candidate" appearing in the first line of Para 21 of the Direction No.21 of 2010 be substituted by the word "Ex-student".

iii) In Direction No.21 of 2010, the words, "The post H.S.S.C. Diploma in Pharmacy (i.e. according to Education Regulation, 1991 of Pharmacy Council of India) from the Board of Technical Education or Equivalent from an institute approved by Pharmacy Council of India in first attempt scoring not less than 600 marks out of 1000 marks at D.Pharm.Part-II examination." appearing in Para 7 (B) be substituted by the words "The norms laid down by the Directorate of Technical Education, Mumbai, Government of Maharashtra from time to time."

Sd/-
Amravati (Dr.M.K.Khedkar)
Dated : 21/02/2012 Vice-Chancellor

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
% ORDINANCE NO. 42 OF 2005

Examination in Environmental Studies leading to Bachelor Degree, Ordinance, 2005

Whereas it is expedient to frame an Ordinance relating to Examination in Environmental Studies leading to Bachelor Degree level, hereinafter appearing, the Management Council is hereby pleased to make the following Ordinance.

1. This Ordinance may be called "Examination in Environmental Studies leading to Bachelor Degree, Ordinance, 2005."

2. This Ordinance shall come into force from the Academic session 2005-06.

3. In this Ordinance and in other ordinances relating to the examination, unless there is anything repugnant in the subject or context :-

(i) "Academic session" means a session commencing on such date and ending with such date of the year following as may be appointed by the Management Council.
(ii) "Admission to an examination" means the issuance of an admission card to a candidate in token of his having complied with all the conditions laid down in the relevant ordinance, by a competant officer of the University.
(iii) "Applicant" means a person who has submitted an application to the University in the form prescribed for admission to an examination.
(iv) "Candidate" means a person who has been admitted to an examination by the University.
(v) "Regular Candidate" means an applicant who has applied for admission to a Univeristy examination through an affiliated college, Department or Institute in which he/she has prosecuting a regular course of study.
(vi) "Examinee" means a person who present himself/herself for an examination to which he/she has been admitted.
(vii) "Examination" means an examination prescribed by the University under the relevant Ordinance.
(viii) "External Candidate" means a candidate who is allowed to take a University examination in accordance with the provision of Original Ordinance No. 151.
(ix) " Non-Collegiate Candidate" means a candidate who is not a collegiate candidate.
(x) An "Ex-student" is a person who having once been admitted to an examination of this University, is again required to take the same examination by reason of his failure or absence thereat and shall

include a student who may have joined a college, Department or Institute again in the same class.

(xi) "Bachelor Degree Examination" means a examination leading to Bachelor Degree of the University.

(xii) "Previous Year" means a year following by final year of Bachelor Degree.

4. Save as otherwise specifically provided, the conditions prescribed for admission to the examination under this Ordinance shall apply to all persons who wish to take the examination to the Degrees of the University mentioned in para 5 below.

5. The conditions prescribed for admission to examination under this Ordinance shall apply to following degrees of the University :-

1) Bachelor of Arts
2) Bachelor of Performing Arts
3) Bachelor of Fine Arts
4) Bachelor of Mass Communication
5) Bachelor of Social Work
6) Bachelor of Commerce
7) Bachelor of Business Administration
8) Bachelor of Science
9) Bachelor of Computer Science
10) Bachelor of Computer Applications
11) Bachelor of Pharmacy
12) Bachelor of Science (Home Science)
13) Bachelor of Technology (Cosmetics)
14) Bachelor of Engineering
15) Bachelor of Engineering (Part Time) (Civil)
16) Bachelor of Textile
17) Bachelor of Technology (Chemical Technology)
18) Bachelor of Technology (Chemical Engg.)
19) Bachelor of Architecture, and
20) Bachelor of Laws (Five Year Course)

6 i) Environmental Studies shall be a compulsory subject for a previous year examination of the following Bachelor Degrees of the University,

1) Bachelor of Arts
2) Bachelor of Performing Arts
3) Bachelor of Fine Arts
4) Bachelor of Mass Communication

5) Bachelor of Social Work
6) Bachelor of Commerce
7) Bachelor of Business Administration
8) Bachelor of Science
9) Bachelor of Computer Science
10) Bachelor of Computer Applications
11) Bachelor of Pharmacy
12) Bachelor of Science (Home Science)
13) Bachelor of Technology (Cosmetics)
14) Bachelor of Engineering (Part Time) (Civil)

ii) Environmental Studies shall be a compulsory subject for IIIrd & IVth Semester of the following Bachelor Degrees of the University,

1) Bachelor of Engineering
2) Bachelor of Textile
3) Bachelor of Technology (Chemical Technology)
4) Bachelor of Technology (Chemical Engineering)
5) Bachelor of Architecture, and

iii) Environmental Studies shall be a compulsory subject for Vth & VIth Semester of the Degree of Bachelor of Laws (Five Year Course)

iv) Students admitted to Second Year/Third Year/IVth Semester Vth Semester of various degree examination courses in different faculties n the academic session 2005-06 or thereafter shall have to appear for examination in the subject Environmental studies.

7. The main Examination leading to Environmental Studies shall be held in Summer and Supplementary examination in Winter every year, at such places and on such date as may be appointed by the Board of Examinations.

Explanation :- Examination shall be conducted on the basis of one common question paper for all Bachelor Degree examination courses irrespective of annual or semester pattern.

8. Scope of the subject for annual pattern examination and or semester pattern examination shall be as provided under the syllabus.

9. Common question paper for all courses covered under this Ordinance alongwith answer books shall be supplied by the University to the Colleges, Departments and Institutes for conducting the examination of the subject.

10. Valuation of the answer books relating to this subject shall be done at College/Department/Institution level only. Remuneration for valuation of answer books shall not be paid by the University.
Provided that prescribed evaluation fee for evaluation of each answer Book/s of an external examinee/s appeared from the examination centre shall be paid to each examination centre.
11. It shall be obligatory on the part of the College/Department/Institute to submit candidate wise following information to the University on or before the date as may be prescribed by the University :-

Sr. No.	Grade/Category	Marks secured
1.	"A"	- 60 and above
2.	"B"	- 45 to 59
3.	"C"	- 35 to 44
4.	"D"	- 25 to 34
5.	"Fail"	- 24 and below
6.	"Absent"	

12. For the purposes of teaching, learing and examination, the Committee consisting of three teachers shall be appointed by the Principal/ Head of the Department/Head of the Institution under his/her Chairmanship/ Chairpersonship. While appointing three teachers on the said committee, the Principal shall take care that the teachers to be appointed on the committee, if necessary, shall be from different faculty.

13. i) Duration of theory examination of this subject shall be three hour.
ii) For all Bachelor Degree examinations, common question paper of 100 marks shall be provided by the University.
iii) Distribution of these 100 marks shall be as follows :-

a) Part-A, Short Answer Pattern	-25 Marks
b) Part-B, Essay type with inbuilt choice	-50 Marks
c) Part-C, Essay on Field Work	-25 Marks

14. Medium of instruction shall be English or Marathi or Hindi. Question paper shall be supplied in English and Marathi and Hindi. A candidate shall have option to write answers in English or Marathi or Hindi.

15. Examination for the subject Environmental Studies shall be compulsory for external candidates appearing as a fresh candidate at Winter and/or Summer examination.

16. For teaching of the subject, there shall be atleast two hour per week.
For teaching the subject to the regular candidates, a full time approved teacher of the University and or a person having Postgraduate Degree in any faculty with second class shall be considered elligible.

17. For teaching of the subject, additional fee to be charged to regular candidate shall be as prescribed by the University.

18. Every College/University Teaching Department shall Charge addtional fee of Rs. 100/- to every student of the subject Environmental Studies. Out of this Rs.100/-, the College/University Teaching Department shall have to pay Rs.25/- to the University as an examination fee of each candidate for the subject Environmental Studies.
19. The Grade secured by an examinee in the examination of this subject shall not be considered for providing the facility of A.T.K.T. in next higher class.

20. The provisions of Ordinance No. 18/2001 shall not be applicable for securing a grade or higher grade in the examination of this subject.

21. Result of the Final Year of the respective Degree shall not be declared of an examinee unless he/she secures any one of the grade in the examination of subject.
Provided an examinee admitted to Five Year LL.B. course desiring not to continue his/her education beyond Sixth Semester of the said course shall have to secure any one of the grade in the examination of the subject otherwise his/her result of Sixth Semester for awarding B.A. degree shall not be declared.

22. Certificates shall be issued, to the successful examinees in the subject Environmental Studies, after the examination.

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Syllabus Prescribed for B. Pharm. Semester –V
(Introduced from the Academic Session 2012-13)

SEMESTER-V

Subject Code	Subject	Maximum Marks (Credits)		Total Marks (Credits)
		Theory	Practical	
5.1.	Pharmaceutics-III	80 (04)	80 (04)	160 (08)
5.2.	Medicinal Chemistry-I	80 (04)	80 (04)	160 (08)
5.3.	Pharmaceutical Organic Chemistry-III	80 (04)	80 (04)	160 (08)
5.4.	Pharmacognosy-III	80 (04)	80 (04)	160 (08)
5.5.	Pharmacology-II	80 (04)	80 (04)	160 (08)
5.6.	Biopharmaceutics-I	80 (04)	—	80 (04)
	Total			880 (44)

\Subject code: T-5.1

Subject : Pharmaceutics – III

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. Preformulation studies:

a) Study of physical properties of drugs like physical form, particle size, shape, density, wetting, dielectric constant, solubility, dissolution, organoleptic property and their effect on formulation, stability and bioavailability.

b) Study of chemical properties of drugs like hydrolysis, oxidation, reduction racemisation, polymerisation etc. and their influence on formulation and stability of products.

c) Stabilization and stability testing protocol for various pharmaceutical products.

2. **Drug Regulatory affairs & NDA.**

3. **Liquid dosage forms :** Introduction Types of additives used in formulations, vehicles,stabilizers,preservatives, suspendingagents, emulsigying agents, solubilizers, colors, flavors, manufacturing, packaging and evaluation of clear liquids, suspension and emulsion.

SECTION-B

4. **Semisolid dosage forms :** Types, mechanism of drug penetration, factors influencing penetration, semisolid bases and their selection; general formulations of semisolids and gels manufacturing procedure, evaluation and packaging.

5. **Pharmaceutical aerosols :** Various propellants and valves, general formulations. manufacturing, packaging and evaluation methods, pharmaceutical applications.

6. **Ophthalmic preparations:** Requirements, formulations, methods of preparation, containers, evaluation.

Subject code: P-5.1

Subject : Pharmaceutics – III

PRACTICAL **45 Hours (3 hrs. /week)**

1. Preformulation studies including drug-excipient compatibility studies, effect of stabilizers, preservatives etc. in dosage form design.
2. Preparation, evaluation and packaging of liquid orals like solutions, Syrups, suspensions and emulsions, ointments, creams, suppositories, eye drops, eye ointments etc.

Recommended Books:

1) Ansel H.C., Introduction to Pharmaceutical Dosage Forms, K M Varghese & Co., Bombay.
2) Aulton M E Pharmaceutics - The Science of Dosage Form Design, ELBS/Churchill Livingstone.
3) Avis K E, Lachman L and Lieberman H A, Marcel Dekker Inc. Pharmaceutical Dosage Forms; Parenteral Medications, Vols. 1 & 2, NY.
4) Lachman L, Liberman H.A. & Kanig J.L., "The Theory & Practice of Industrial Pharmacy", Lea & Febiger, Philadelphia.
5) Banker G S and Rhode C T Modern Pharmaceutics, Marcel Dekker Inc., NY.
6) Bean H S, Beckett A H, and Carless A H Advances in Pharmaceutical Sciences, Vol 1-4 Academic Press, London.
7) Carter S J, Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS Publishers, Delhi.
8) Carter S J, Cooper and Gunn's Tutorial Pharmacy CBS Publishers, Delhi.
9) Remington's, the science and Practice of Pharmacy, Mack Publishing Co. Easton, Pernsybrania.

Subject code: T-5.2

Subject : Medicinal Chemistry-I

THEORY **45 Hours (3 hrs. /week)**

Section A

1. Basic principles of medicinal chemistry:

Physico-chemical aspects (optical, geometric and bioisosterism) of drug molecules and biological action. Drug-receptor interaction including transduction mechanism

2. Drug metabolism:

Phase I and phase II reactions, biological factors affecting drug metabolism, inducers and inhibitors of drug metabolism, significance of drug metabolism in medicinal chemistry, principles of prodrug design

Section B

3. History, development, classification, recent development, mode of action (biochemical and molecular basis wherever applicable), SAR, IUPAC and synthesis of drugs of following classes

Sympathomimetic agents including biosynthesis and metabolism of adrenergic neurotransmitters, adrenoreceptor blockers, cholinergic agents, cholinesterase inhibitors, anticholinergic agents including antispasmodics, ganglionic stimulants and blockers, neuromuscular blockers

Subject code: P-5.2

Subject : Medicinal Chemistry –I

PRACTICAL **45 Hours (3 hrs. /week)**

1) Laboratory scale preparation by conventional / microwave synthesis of selected drugs from course content and characterization by melting point / boiling point / thin layer chromatography / ultra-violet spectroscopy / IR spectroscopy
2) Establishing the pharmaceutical standards of drug synthesized

Books Recommended

1. J. N. Delagado and W. A. R. Remers, Eds, Wilson and Giswold's Textbook of Organic, Medicinal and Pharmaceutical Chemistry, J. Lipponcott Co. Philadephia.
2. W. C. Foye, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.

3. H. E. Wolff, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York Oxford University Press, Oxford.
4. Daniel Lednicer, Strategies for Organic Drug Synthesis & Design, John Wiley & sons, USA.
5. B. N. Ladu, H. G. Mandel & E. L. Way, Fundamental of Drug Metabolisum & Disposition, William & Wilkins co., Baltimore.
6. I. L. Finar, Organic Chemistry, Vol. I & II, ELBS/ Longman, London.
7. Vogel's Text book of Practical Organic Chemistry, ELBS/ Longman, London
8. Mann & Saunder, Practical Organic Chemistry, Orient Longman, London.
9. Shriner, Hermann, Morrill, Curtin & Fuson, The Syntematic Identification of Organic Compounds, John Wiley & Sons. USA.
10. R. M. Silverstein, G. Claytron Bassel's, T. C. Movvill, Spectormetric identification of Organic compounds, John Wiley & Sons, USA

Subject code: T-5.3

Subject : Pharmaceutical Organic chemistry – III

THEORY **45 Hours (3 hrs. /week)**

Section-A

1. Chemistry of Heterocyclic Compounds

Structures & numbering & corresponding drugs of the following Heterocyclic compounds: Furan, Thiophene, Pyrrole, Pyrazole, thiazole, imidazole, oxazole, isoxazole, hydantoin, pyridine, pyridazine, pyrimidine, indole, benzyl furan, benzylthiazole, benzimidazole, benzoxazole, quinoline, isoquinoline, quinazoline, cinnoline, purine, xanthine, pteridine, Coumarin; Synthesis and Reaction of following compounds: furan, thiophene, pyrrole, indole imidazole, thiazole, pyridine, quinoline and isoquinoline.

2. **Organic Synthesis by Retro Synthesis**

Introduction to common terms. Disconnections involving one and two functional groups, Rules of disconnection, The retro-synthesis of following drugs be covered: Ibuprofen, Propranolol, Losartan, Ciprofloxacin and Sulfamethoxazole.

3. **Introduction to Combinatorial Chemistry**

History, Multiple Parallel Synthesis, Chemistry and equipments, Mixture synthesis Strategies including solid supported synthesis, Deconvolution methods.

Section-B

4. Chemistry of Carbohydrates

Introduction, Classification and reactions of C5 and C6 sugars and cyclic structures/glycosides. Mutarotation, Establishment of structures of monosaccharides, disaccharides and starch by chemical methods.

5. **Chemistry of Proteins & Amino Acid**

Methods of peptide synthesis- solution and solid phase peptide synthesis (up to pentapeptide), Structure of natural amino acids, isoelectric point. Methods of preparation of amino acids. Peptide bonds, structures of some biologically and medicinally important simple peptides. Proteins, Classification and function. Denaturation, structure of proteins, conjugated proteins, secondary structure of proteins.

6. **Molecular Rearrangements- Mechanism, Stereochemistry & Example (at least two examples)**

a) Rearrangement of electron deficient systems

General Theory. Whitmore-1, 2-shift, Wagner-Meerwein rearrangement, Piancol rearrangement, Wolf rearrangement, Beckmann rearrangement, Hofmann rearrangement, Lossen rearrangement, Curtius rearrangement, Schmidt rearrangement, Baeyer-Villiger Oxidation.

b) Electron-rich rearrangements

Stevens rearrangement, Wittig rearrangement, Neber reaction, Benzillic acid rearrangement, Dakin oxidation, Sommelet rearrangement, Favourskii rearrangement.

c) Migration of Aromatic rings

Fries rearrangement, Claisen rearrangement, Willgerodt reaction, N-Halormide rearrangement.

d) Migration involving double and triple bonds

Cope rearrangement.

7. **Mechanism of following name reaction with example (at least two examples)**

Aldol Condensation, Allan-Robinson reaction, Arndt-Eistert Synthesis, Algar-Flynn-Oyamada Reaction, Birch Reduction, Cannizzarro Reaction, Chichibabin Reaction, Claisen Condensation, Diels-Alder Reaction, Mannich Reaction, MPV Reduction, Michael Reaction, Oppenauer Oxidation, Reformatsky Reaction, Woiff-Kishner Reduction, Wurtz Reaction.

Subject code: P-5.3

Subject : Pharmaceutical Organic Chemistry –III

PRACTICAL **45 Hours (3 hrs. /week)**

1. Synthesis of some heterocyclic compounds
2. Quantitative determination of reactive groups, nitro, hydroxyl, primary and secondary amines, esters, amides and carbonyl.
3. Synthesis of some organic compounds based on name reactions.
4. Synthesis of some organic compounds using green chemistry approach.

Recommended Books

1. Advanced Organic Chemistry by E.S. Gould, 4/Ed. Wiley Eastern Edition.
2. Principles of Organic Synthesis by Norman, 3/Ed., Nelson Thorns Publication.
3. Organic Chemistry by Morrison & Boyd, 7/Ed, Pearson Education.
4. Heterocyclic Chemistry by Joule and Mill, 4/Ed., Blackwell Publishing Oxford.
5. Organic Chemistry by Fieser & Fieser, Vol. I-X, 1/Ed. Asia Publishing House.
6. Modern Hetrocylic Chemistry By Leao Payrettee.
7. Organic Synthesis- The disconnection approach by Stuart Warren, John Wiley & Sons.
8. Vogel's Textbook of Practical Organic Chemistry by A. I. Vogel, 5/Ed., Pearson Education.
9. Handbook of Organic Analysis (Qualitative and Quantitative) by H. T. Clarke, 1/Ed. Arnold-Heinemann.
10. Textbook of Practical Heterocyclic Chemistry by Fitten and Smalley.
11. Synthesis of Drugs-Synthone approach Vol. 1, by Radhakrishnan Ayer, J. R. Rao,
12. M. S. Degani, S. A. Ghone, K. Mohanraj, 2/Ed, 2008, Sevak Publication Pvt. Ltd.
13. Quantitative organic Analysis by Siggsa & Honna, 4/Ed., A Wiley Interscience Publication. John Wiley & Sons.
14. Organic Synthesis, Vol. I to X, John Wiley & Sons Ins. New York.

Subject code: T-5.4
Subject : Pharmacognocy-III
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. Microscopy: Study of plant cell inclusions, reactions of cell walls, cell contents, clearing agent, macerating reagents. Plant tissues. Micromerty, Leaf constants, trichomes, powdered microscopy. Quantitative microscopy as applied drugs evaluation and procedures of microtome sectioning procedure, preparations of biological materials for examination by electronic microscope.
2. Common Poisonous Plants of India
3. Marine Pharmacognsy: Novel medicinal Agents from marine sources.
4. Detailed study of plant Biochemistry, Study of techniques employed in the elucidation of Biosynthetic pathways and the study of important Biosynthetic pathways of plants like photosynthesis, Carbohydrate utilization, Aromatic Biosynthesis, shikimic acid pathway, Isoprenoid pathway, Biosynthesis of tropane, quinoline, hopane, quinidine, opium and indole alkaloids. Biosynthesis of steroidal and antraquinone glycosides.

SECTION-B

5. Glycosides: Definition, general characters and classification, occurrence, general method of isolation and estimation. Study of the biological sources, cultivation, collection, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests for identification of following drugs containing glycosides:
   a) Saponins: Liquorice, ginseng, dioscorea, sarsaparilla and senega.
   b) Cardioactive sterols: Digitalis, squill, strophanthus and thevetia.
   c) Anthraquinone cathartics: Aloe, senna, rhubarb and cascara.
   d) Others: Psoralea, Ammi majus, Ammi visnaga, gentian, saffron, chirata, quassia, citrus bioflavonoids (Lemon and Orange peels), Solanaceous species aswagandha.
6. Introduction, classification and study of different chromatographic methods and their applications in evaluation of herbal drugs.

Subject code: P-5.4
Subject : Pharmacognocy-III
PRACTICAL **45 Hours (3 hrs. /week)**

1. Morphological, Histological, Microchemical and chemical study of-Cinnamon.
2. Morphological, Histological, Microchemical and chemical study of-Clove.

3. Morphological, Histological, Microchemical and chemical study of-Ephedra.
4. Morphological, Histological, Microchemical and chemical study of-Fennel
5. Morphological, Histological, Microchemical and chemical study of-Ginger
6. Morphological, Histological, Microchemical and chemical study of-Ipecac
7. Morphological, Histological, Microchemical and chemical study of-Nux-vomica
8. Morphological, Histological, Microchemical and chemical study of-Quassia
9. Morphological, Histological, Microchemical and chemical study of-Senna.
10. Morphological, Histological, Microchemical and chemical study of-Coriander
11. Morphological, Histological, Microchemical and chemical study of-Vinca leaf
12. Identification of powdered crude drugs and their combinations with the help of organoleptic, microscopic, micro-chemical and chemical methods. (Minimum 5 Expt.).
13. Few exercises on isolation of active principles from crude drugs.
14. Establishment of thin layer chromatographic profiles of some volatile oils and extracts containing alkaloids and glycosides.
15. Spotting of crude drugs mentioned in theory
16. Successive extraction and qualitative test for different extract.
17. Thin layer chromatographic study of different natural products.

Recommended Books

1. Pharmacognosy by G.E. Trease, W.C. Evans, ELBS.
2. Pharmacognosy by Varro E.Tyler, Lynn. R.Brady, James E.Robbers.
3. Text Book of Pharmacognosy by T.E. Wallis, CBS Pub. Delhi.
4. Plant Physiology of Frank B.Salisburry, Cleon. W.Ross, CBS Pub. Delhi
5. Diosgenin and other steroid drug precursors by Asolkar,CSIR.
6. Antibiotics,Isolation&Seperationby Weinsted.M.I.Wagman,G.H.
7. Hormone Chemistry by W.R.Butt.
8. Quantitative analysis & Steroids by Gorog.S.
9. Steroids by Feiry & Feisher.
10. Alkaloids Chemical & Biological by S.W.Pelletier.
11. Biotechnology of Industrial antibiotics by E.vardemme.
12. Chromatography of Alkaloids by Vapoorte, Swendson.
13. Elements of chromatography by P.K.Lala.
14. Introduction to chromatography theory & Practicals by V.K. Srivastava, K.Kishore.

15. Principles of Biotechnology by Leininger.
16. Jenkins Quantitative Pharmacuetical Chemistry by A.N.Knevell.
17. Handbook of vitamins by L.J.Machlein.
18. Clerk's Isolation & Identification of drugs by A.C.Mottal.
19. Selected Topics in Exp-Pharmacology by Seth.V.K.
20. Burger's Medicinal Chemistry by wolff.M.I.
21. Wilson & Gisvolds Text Book of organic Medicinal and Pharmacuetical Chemistry by Deorge.R.F.
22. Phytochemical methods of chemical analysis by Harbone.
23. Organic chemistry vol.II by I.L.Finar.
24. The Essential oil by Gunther.E.
25. The use of Pharmacological techniques for the evaluation of natural products by B.N.DhavanR.C.Srimal. CDRI, Lucknow.
26. Physical methods in organic chemistry by J.C.P.Schwartz.
27. Techniques in organic chemistry by Weiss Creger.
28. Practical Pharmacognosy by Dr.C.K. Kokate.
29. Practical Pharmacognosy by Dr.P.K.Lala.
30. Herbal medicines – Janne Barnes, Linda. A.Anderson.
31. Chinese materia medica – Yaru – PingZhu.
32. Natural products from plants – Peter.B.Kanfman.
33. Selection, Preparation and pharmacological evaluation of plant material, M.Williamson, DT.Okpako.

Subject code: T-5.5

Subject : Pharmacology-II

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Pharmacology of Autacoids and their antagonists:** Histamine and antihistamines, 5-hyrroxytryptamine and its antagonists, drug therapy for migraine, Prostaglandins, leukotrienes (eicosanoids), platelet activating factors, Plasma Kinins, Angiotensin.
2. **Chemotherapy:** Introduction- Molecular basis of Chemotherapy and drug resistance. General classification of drugs, mechanism of action, Pharmacokinetics, adverse reactions, drug interaction, pharmacological uses of Sulfonamides and Co –trimoxazole, Penicillins and Cephalosporins, Tetracycline and Chloramphenicol, Macrolides, Amino glycosides, Polyenes and Polypeptide antibiotics, Quinolones and Fluoroquinolones, Chemotherapy of Tuberculosis and Leprosy Antifungal antibiotics, Anthelmentics drugs, Chemotherapy of Protozoal infections- Malaria, Amoebiasis, Girdiasis etc. Chemotherapy of Cancer (Neoplasms), Antiviral agents and Treatment of AIDS.

SECTION-B

3. **Hormones and related drugs**: Introduction to endocrine pharmacology, Pituitary hormones , Thyroid and antithyroid drugs, Hormones of Pancreas and hypoglycemic agents, Adrenal corticosteroids and corticosteroids, Gonadal hormones and their inhibitors, Oral contraceptives, drugs regulating Calcium Homeostasis.
4. **Pharmacology of drugs acting on Respiratory system:** Mucolytics, Expectorants, Antitussives, Asthma.
5. Opiods, NSAIDS, and Antipyretics-Analgesic. Drug for rheumatoid arthritis and gout.

Subject code: P-5.5

Subject : Pharmacology-II

PRACTICAL **45 Hours (3 hrs. /week)**

1. To demonstrate the CRC of suitable drugs (Ach/Histmine) on tissue preparation of animals
2. To perform the Interpolation bioassay of suitable drugs (Ach/ Histamine) on tissue preparation of animals
3. To perform the Matching type bioassay of suitable drugs (Ach/ Histamine) on tissue preparation of animals
4. To perform the multiple point bioassay of suitable drugs (Ach/ Histamine) on tissue preparation of animals
5. To study the drug induced catatonia in animals (Any one animal model-like baclofen/ clonidine/haloperidol/Pentazocine induced).
6. To study the effects of drugs on locomotor activity using Actophotometer.
7. To study the Analgesic activity using suitable method. (Hot Plate, Tail Flick/Caudal Immersion, Acetic Acid/Formalin-Induced**). Perform any three**
8. To study the anti-inflammatory activity property of Indomethacin.
9. To study Anticonvulsant activity using MES/ PTZ.
10. To study the drug induced catatonia (extrapyramidal side effect) in rats.
11. To study the effect of hepatic microsomal enzyme induction on the duration of action of phenobarbital sodium.

Note

- Suitable animal preparation- Any experiment suitable to demonstrate the concept- It could be either in-vivo or in-vitro, The animal selected may be mice, rat, rabbit, guinea pig as

admissible as per prevailing Government/CPCSEA guidelines. In case of in-vitro preparations- any tissue preparation from above animals or various tissues from goat may be obtained from slaughter house/ abattoir /butcher shop.

- Agonist- Any agonist that can exhibit activity using the given preparation as reported in standard books/journals may be selected e.g.-Adrenaline and other catecholamines, Acetyl Choline, Histamine, Serotonin, oxytocin etc.
- Antagonist- Any antagonist that can exhibit blocking activity of above mentioned agonists in the given preparation as reported in standard books/journals may be selected.

Recommended Books

1. Goodman Gilman, The Pharmacological basis of therapeutics. Mc-graw Hill New Delhi.
2. Foster R.W. Basic Pharmacology, Arnold, New Delhi.
3. Stahl S. M.. Essential Psychopharmacology Cambridge University Press New Delhi.
4. Dipiro J.L. Pharmacotherapy Handbook. Tata McGraw Hill New Delhi.
5. Official books - Indian Pharmacopoeia, British Pharmacopoeia, United States Pharmacopoeia.
6. Tripathi K.D. Essentials of medical Pharmacology Jaypee New Delhi.
7. Barar F.S.K. Essentials of Pharmacotherapeutics, S. Chand & Company Ltd. New Delhi.
8. Rang H.P., Dale M.M. et. al. Pharmacology. Churchill L Ivingstone, New Delhi.
9. Katzung B.G .Basic & Clinical Pharmacology Mc-graw Hill, New Delhi.
10. Lewis's Pharmacology. Churchill Livingstone London.
11. Harvey R.A., Champe P.C. Lippincott's Illustrated Reviews-Pharmacology. Lippincott Williams & Wilkins, Pennsylvania.
12. Ghosh M.N. Fundamentals of Experimental pharmacology. Hilton & Company Kolkata.
13. Vogel G.H. Drug discovery and evaluation. Springer Germany.
14. Goyal R.K. Practicals in pharmacology. B.S. Shah Prakashan Ahmedabad.
15. Kulkarni S.K. Handbook of Experimental Pharmacology. Vallabh Prakashan. New Delhi.
16. Pillai, K. K. Experimental Pharmacology. CBS Publishers New Delhi.

17. Grover, J.K. Experiments in Pharmacy and Pharmacology Vol-II.CBS publishers New Delhi.
18. Perry W. L. M. Pharmacological Experiments on Isolated preparations. E.&S.Livingstone, London.
19. Kasture S.B.Text book of Experimental Pharmacology, Career Publication Nashik.
20. Official books - Indian Pharmacopoeia, British Pharmacopoeia, and United States Pharmacopoeia.
21. Related research papers from various journals.

Subject code: T-5.6
Subject : Biopharmaceutics-I
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1) **Introduction to Biopharmaceutics:**

Concept of Bio-pharmaceutics scope and its importance various terms used and their role in related discipline.

2) **Absorption:**

GI absorption of drug, cell membrane structure and physiology Mechanism of drug absorption. Routs of drug administration (oral & non oral) Factors influencing drug absorption & bioavailability.

3) **Distribution :**

Factors influencing distribution of drugs. Volume of distribution. Plasma protein binding and its clinical significance. Tissue protein binding of drug.

SECTION-B

4) **Elimination:**

Mechanism of bio-transformation. Hepatic metabolism - chemical pathway & factors affecting it. Renal excretion Non-renal excretion

5) **Bioavailability and bioequivalence**

Definition, Objectives of bioavailability, parameters of bioavailability. Determination of AUC Methods of enhancement of bioavailability (solubilization, pro-drugs and enhancement of dissolution characteristics & bioavailability enhancers) Drug dissolution rate & bioavailability Theories of dissolution. In vitro drug dissolution testing models. In-vitro in-vivo correction. Various invitro and in vivo models.

Bioequivalence - Pharmaceutical equivalents, biological equivalents, therapeutic equivalents. Selection of animal.

Recommended Books

1. Biopharmaceutics and pharmacokinetics - Milo Gibaldi; Lea and Febiger book publication.
2. Biopharmaceutics and pharmacokinetics - An introduction - Robert E. Notary.
3. Biopharmaceutics - Swarbrick, Lea & Febiger book publications.
4. Remington Pharmaceutical Sciences.
5. Applied Biopharmaceutics and pharmacokinetics - Leon Shargel
6. Biopharmaceutics and pharmacokinetics - A treatise D.M.- Brahmankar & S.B. Jaiswal.
7. Clinical pharmacokinetics – concept & application- Malcohm Rowland C., Thomas N. Tozer, Lea & Febiger Book.
8. Applied bio-pharmaceutics & pharmacokinetics – Leon Shargel 3. Bio-pharmaceutics & pharmacokinetics – Milo Gibaldi.
9. Bio-pharmaceutics & pharmacokinetics – An introduction – Rober E. Notary.
10. Pharmacokinetics Milo Gibaldi & Donald Perrier.
11. Bio-pharmaceutics & pharmacokinetics – P.L. Madan
12. Handbook of clinical pharmacokinetics – Gibaldi & Pancot.

Syllabus Prescribed for B. Pharm. Semester –VI
(Introduced from the Academic Session 2012-13)

SEMESTER-VI

Subject Code	Subject	Maximum Marks (Credits)		Total Marks (Credits)
		Theory	Practical	
6.1	Pharmaceutics-IV	80 (04)	80 (04)	160 (08)
6.2	Medicinal Chemistry-II	80 (04)	80 (04)	160 (08)
6.3	Pharmaceutical Analysis-II	80 (04)	80 (04)	160 (08)
6.4	Pharmacognosy-IV	80 (04)	80 (04)	160 (08)
6.5	Biopharmaceutics-II	80 (04)	80 (04)	160 (08)
6.6	Clinical Pharmacy	80 (04)	—	80 (04)
6.7	Project	80 (04)		80 (04)
	Total			960 (48)

Subject code: 6.1
Subject : Pharmaceutics – IV
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Cosmetology and cosmetic preparations:** Fundamental of cosmetic science, structure and functions of skin and hair, formulation, packing and evaluation of the following class of cosmetics.
2. **Hair products :** Shampoos, Hair creams, Hair dyes.
3. **Skin products :** Moisturizing, cleansing, vanishing creams, Face powder,
4. **Dentrifries products :** Tooth paste, tooth powder.

SECTION-B

1. **Manicure products :** Lipsticks, nail polish.
2. **Surgical products :** Primary wound dressing, absorbents, surgical cotton, surgical gauzes etc., bandages, adhesive tape, protective cellulosics, hemostastics, official dressings, absorbable and nonabsorbable sutures, ligatures and catgut's, medical prosthetic and organ replacement materials.
3. **Blood products and Glandular products :** Collection, processing and storage of Whole human blood, concentrated human RBCs, dried human plasma, human fibrinogen, human thrombin, human normal immunoglobulin, human fibrin-foam, plasma substitutes - ideal requirements, pvp, dextrans. Glandular products like Insulin, pancreatin, thyroid and adrenal products.

Subject code: P-6.1
Subject : Pharmaceutics – IV
PRACTICAL **45 Hours (3 hrs. /week)**

1. Collection, processing storage and fractionation of blood.
2. Formulation and Evaluation of various types of cosmetics for skin, hair, dentifrice and manicure preparations.
3. Evaluation (quality test) of surgical dressings, (cotton, gauge, bandage and Adhesive tapes).

Recommended Books:

1. Avis K E, Lachman L and Lieberman H A, Marcel Dekker Inc. Pharmaceutical Dosage Forms; Parenteral Medications, Vols. 1 & 2, NY.
2. Bean H S, Beckett A H, and Carless A H Advances in Pharmaceutical Sciences, Vol 1-4 Academic Press, London.

3. Carter S J, Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS Publishers, Delhi.
4. Carter S J, Cooper and Gunn's Tutorial Pharmacy CBS Publishers, Delhi.
5. Remington's, the science and Practice of Pharmacy, Mack Publishing Co. Easton, Pernsybrania.
6. Sagarin & Balsam M.S., Cosmetic Science and Technology, Vol-1-3. 2nd ed. John Wiley sons, NY.
7. Stoklosa MJ, Pharmaceutical calculation, Lea and Febiger, Philadelphia.
8. Thomssen S.G., Modern Cosmetics, Universal Publishing Corporation, Bombay.
9. Harry's Cosmeticology.

Subject code: T-6.2
Subject : Medicinal Chemistry-II
THEORY **45 Hours (3 hrs. /week)**

Section A

1. **Basic principles of medicinal chemistry:** Physico-chemical aspects (optical, geometric and bioisosterism) of drug molecules and biological action. Drug-receptor interaction including transduction mechanism
2. **Drug metabolism:** Phase I and phase II reactions, biological factors affecting drug metabolism, inducers and inhibitors of drug metabolism, significance of drug metabolism in medicinal chemistry, principles of prodrug design

Section B

1. **History, development, classification, recent development, mode of action (biochemical and molecular basis wherever applicable), SAR, IUPAC and synthesis of drugs of following classes**
   Sympathomimetic agents including biosynthesis and metabolism of adrenergic neurotransmitters, adrenoreceptor blockers, cholinergic agents, cholinesterase inhibitors, anticholinergic agents including antispasmodics, ganglionic stimulants and blockers, neuromuscular blockers

Subject code: P-6.2
Subject : Medicinal Chemistry –II
PRACTICAL **45 Hours (3 hrs. /week)**

1) Laboratory scale preparation by conventional / microwave synthesis of selected drugs from course content and characterization by melting point / boiling point / thin layer chromatography / ultra-violet spectroscopy / IR spectroscopy.
2) Establishing the pharmaceutical standards of drug synthesized

Books Recommended

1. J. N. Delagado and W. A. R. Remers, Eds, Wilson and Giswold's Textbook of Organic, Medicinal and Pharmaceutical Chemistry, J. Lipponcott Co. Philadephia.
2. W. C. Foye, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
3. H. E. Wolff, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York Oxford University Press, Oxford.
4. Daniel Lednicer, Strategies for Organic Drug Synthesis & Design, John Wiley & sons, USA.
5. B. N. Ladu, H. G. Mandel & E. L. Way, Fundamental of Drug Metabolisum & Disposition, William & Wilkins co., Baltimore.
6. I. L. Finar, Organic Chemistry, Vol. I & II, ELBS/ Longman, London.
7. Vogel's Text book of Practical Organic Chemistry, ELBS/ Longman, London
8. Mann & Saunder, Practical Organic Chemistry, Orient Longman, London.
9. Shriner, Hermann, Morrill, Curtin & Fuson, The Syntematic Identification of Organic Compounds, John Wiley & Sons. USA.
10. R.M. Silverstein, G. Claytron Bassel's, T. C. Movvill, Spectormetric identification of Organic compounds, John Wiley & Sons, USA

Subject code: T-6.3
Subject : Pharmaceutical Analysis – II
THEORY **45 Hours (3 hrs. /week)**

Section-A

1. **Gravimetric Analysis**
   Basic concepts, precipitation techniques, co-precipitation, post-precipitation.Various steps involved in gravimetric analysis. Application to I.P. product: Assay of sodium sulphate, assay of aluminiumin alum by oxime reagent.
2. **Introduction to Solvent Extraction and its application**
   Principles of solvent extraction, Distribution ratio, efficiency of extraction, separation factor
   Practical aspects of solvent extraction (factor affecting liquid-liquid extraction)
   Selection criterion of solvent extraction, Method of extraction: Batch, counter-current, continuous extraction, stripping extraction and pH effect, soxhlet extraction method, salting out effect.
3. **Basic concept in spectroscopy**
   Introduction- Electromagnetic radiation, wavelength, wave number, frequency, atomic spectra, molecular spectra. Classification of

analytical methods, selecting an analytical method, classification of instrumental methods.

Instrumentation- Light Sources (IR, Visible, UV), Monochromators (Filters, Gratings), Cells (silicia, glass, quartz, cells for IR spectrophotometers), Detectors (Photo tubes, Photo diodes, read out system), Spectrophotometers (Single Beam, Double Beam).

UV-Visible Absorption Spectroscopy

Introduction, origin and theory of UV spectra, Bathochromic and Hypsochromic shift, choice of solvent, Beer-Lamberts Law, optimum conditions for spectrophotometric measurements, single component analysis, use of standard absorptivity value, use of calibration graph, multiple component analysis (simultaneous equation method, difference spectroscopy, derivative spectroscopy, chemical derivatization (colorimetric) reactions – diazotization, condensation, acid dye, oxidation). Determination of lamada max. by Woodward-Fischer rule.

Section-B

1. **Fluorescence and Phosphorescence Spectroscopy**

   Molecular luminescence, measurement of fluorescence, factor affecting fluorescence, quantitative aspects of fluorescence, Excitation and emission spectra, Instrumentation, advantages and disadvantages, applications and synchronous fluorescence.

2. **Atomic Emission and Atomic Absorption Spectroscopy**

   Principle, difference between atomic absorption spectroscopy and flame emission spectroscopy, advantages of AAS over Flame emission spectroscopy, limitation, instrumentation of atomic emission and atomic absorption spectroscopy, single and double beam spectrophotometer, pharmaceutical application of atomic emission and atomic absorption spectroscopy

3. **Miscellaneous methods of Analysis:-** Kjeldahl's method of nitrogen estimation. Oxygen flask combustion techniques.

Subject code: P-6.3
Subject : Pharmaceutical Analysis –II
PRACTICAL **45 Hours (3 hrs. /week)**

List of Experiments :

1. **Gravimetric analysis :-**Determination of alum by oxime reagent, Determination of sodium sulphate.
2. Calibration of UV-VIS spectrophotometer as per I.P.
3. Determination of lamda max of drug.
4. To determine isosbestic point of an indicator.
5. UV spectrophotometric estimations of drug and from their formulations.

6. Assay by fluorimetry of a given drug. (e.g. Quinine Sulphate)
7. Determination of $Na^+$and K^+ by flame photometry after preparation of calibration curve.
8. **Miscellaneous Method** Nitrogen determination by Kjeldhal's method.

Recommended Books

1. D.A.Skoog, D.M.West, F.J.Holler, S.R.Crouch, Fundamentals of Analytical Chemistry, 8th edition, 2004, Thomson Asia Pvt. Ltd.
2. Kenneth A. Connors, A textbook of Pharmaceutical Analysis, 3rd edition, 2002, John Wiley & Sons, New York, USA.
3. F.W.Fifield, D.Kealey, Principles and Practice of Analytical Chemistry, 5th edition, 2000, Blackwell Science, Oxford, U.K.
4. Gary D. Christian, Analytical Chemistry, 6th edition, 2004, John Wiley & Sons, New York, USA.
5. R.A.Day, Jr, A.L.Underwood, Quantitative Analysis, 6th edition, 2001, Prentice Hall of India.
6. Practical Pharmaceutical Chemistry Vol. – I & II – 4th Edition – 1986 – A.H.Beckett & J.B.Stenlake – CBS Publishers, New Delhi.
7. A. R. Gennaro, Remington: The Science and Practice of Pharmacy Vol. I & II – 20th Edition – 2001 – Lippincott, Williams & Wilkins, New York, USA.
8. The Indian Pharmacopoeia, Latest Edition, the Controller of Publications, Government of India, New Delhi
9. S.Ahuja, S.Scypinski, Handbook of Modern Pharmaceutical Analysis, 2001, Academic Press, New York, USA.
10. A.V.Kasture, K.R.Mahadik, S.G. Wadodkar, H.N.More, A Textbook of Pharmaceutical Analysis, Vol. I, 6th edition, 2002, Nirali Pprakashan, New Delhi.
11. D.C.Lee, M.L.Webb, Pharmaceutical Analysis, 2003, Blackwell Science, Oxford, U.K.
12. T.Higuchi, E.Brochmann-Hanssen, Pharmaceutical Analysis, 2002, CBS Publishers, New Delhi.
13. Lena Ohannesian, A.J.Streeter, Handbook of Pharmaceutical Analysis, 2002, Marcel Dekker, Inc. New York, USA.
14. P.Parimoo, Pharmaceutical Analysis, 2nd edition, 1991 CRC Press, New York.
15. The Indian Pharmacopoeia, Latest edition, the Controller of Publications, Government of India, New Delhi.
16. The British Pharmacopoeia.
17. The United State Pharmacopoeia.
18. J. Mendham, R.C.Denney, J.D.Barnes, M.Thomas, Vogel's Textbook of Quantitative Chemical Analysis, 6th edition, 2002, Pearson Education Asia Ltd.
19. D.A. Skoog, F.J. Holler,T.A. Neiman, Principles of Instrumental Analysis, 5th edition, 2003, Thomson Asia Pvt. Ltd.

Subject code: T-6.4
Subject : Pharmacognocy-IV
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Alkaloids:** Definition, general properties, chemical tests, general method of isolation of alkaloids, sources, diagnostic characters, chemistry, uses, substitute, adultrants and identification test of-
   a) Pyridine – piperidine: Tobacco, Areca and Lobelia.
   b) Tropane : Belladonna, Hyoscyamus, Datura, Duboisia, Coca and Withania.
   c) Quinoline and isoquinoline: Cinchona, Ipecac, Opium.
   d) Indole: Ergot, Rauwolfia, Catharanthus, Nux-vomica and Physostigma.
   e) Imidazole: Pilocarpus.
   f) Steroidal: Veratrum and Kurchi.
   g) Alkaloidal amine: Ephedra and Colchicum.
   h) Glycoalkaloid: Solanum.
   i) Purines: Coffee, Tea and Cola.

2. **Essential oils:** Introduction, Definition, general properties, chemical nature, chemical tests and classification. General methods of isolation and analysis of volatile oils. Sources diagnostic characters, chemical constitutents and uses of oil of Mentha, coriander, cinnamon, cassia, lemon peel, orange peel, lemon grass, citronella, caraway, dill, spearmint, clove, fennel, nutmeg, eucalyptus, chenopodium, cardamom, valerian, musk, palmrosa, gaultheria, sandal wood.

SECTION-B

3. **Phytochemical screening :** Selection of method (Preparation of an extract), Screening for alkaloids, polycyclic compounds, saponnis, sterols, cardenolides and bufadienolide, flavonoids and leucoanthocydins, tannins and poly phenols, anthraquinones.

4. Natural antioxidants and Neutraceuticals, Aromatherapy.

5. The historic concept of drugs administration in traditional system of medicines, studies of traditional drugs, common vernacular names, botanical sources, morphology, chemical nature of chief constituents, pharmacology, categories and common uses and marketed formulations of following indigenous drugs- amla, kantkari, shatavari, guduchi, bhilwa, kaligiri, bach, rasana, punarnawa, shitrak, apamarga, gokhuru, shankhapushpi, brahmi, adulsa, arjuna, ashoka, jyotishmati, methi, lashun, palash, guggul, gymnema, shilajit, nagarmotha and neem.

Subject code: P-6.4
Subject : Pharmacognocy-IV
PRACTICAL **45 Hours (3 hrs. /week)**

1. Morphological, Histological, Microchemical and chemical study of- Datura leaf
2. Morphological, Histological, Microchemical and chemical study of- Cinchona
3. Morphological, Histological, Microchemical and chemical study of- Rauwolfia
4. Morphological, Histological, Microchemical and chemical study of- Vasaka
5. Morphological, Histological, Microchemical and chemical study of- Isapgol seed
6. Morphological, Histological, Microchemical and chemical study of- Caraway fruit
7. Morphological, Histological, Microchemical and chemical study of- Cassia bark
8. Morphological, Histological, Microchemical and chemical study of- Kurchi bark
9. Morphological, Histological, Microchemical and chemical study of- Aswagandha
10. Morphological, Histological, Microchemical and chemical study of- Liquorice
11. Identification of powdered crude drugs and their combinations with the help of organoleptic, microscopic, micro-chemical and chemical methods. (Minimum 5 Expt.).
12. Few exercises on isolation of active principles from crude drugs.
13. Establishment of thin layer chromatographic profiles of some volatile oils and extracts containing alkaloids and glycosides.
14. Spotting of crude drugs mentioned in theory
15. Successive extraction and qualitative test for different extract.
16. Thin layer chromatographic study of different natural products.

Recommended Books :

1. Pharmacognosy by G.E. Trease, W.C. Evans, ELBS.
2. Pharmacognosy by Varro E.Tyler, Lynn. R.Brady, James E.Robbers.
3. Text Book of Pharmacognosy by T.E. Wallis, CBS Pub. Delhi.
4. Plant Physiology of Frank B.Salisburry, Cleon. W.Ross, CBS Pub. Delhi
5. Diosgenin and other steroid drug precursors by Asolkar,CSIR.
6. Antibiotics,Isolation&Seperationby Weinsted.M.I.Wagman,G.H.
7. Hormone Chemistry by W.R.Butt.
8. Quantitative analysis & Steroids by Gorog.S.
9. Steroids by Feiry & Feisher.
10. Alkaloids Chemical & Biological by S.W.Pelletier.

11. Biotechnology of Industrial antibiotics by E.vardemme.
12. Chromatography of Alkaloids by Vapoorte, Swendson.
13. Elements of chromatography by P.K.Lala.
14. Introduction to chromatography theory & Practicals by V.K. Srivastava, K.Kishore.
15. Principles of Biotechnology by Leininger.
16. Jenkins Quantitative Pharmacuetical Chemistry by A.N.Knevell.
17. Handbook of vitamins by L.J.Machlein.
18. Clerk's Isolation & Identification of drugs by A.C.Mottal.
19. Selected Topics in Exp-Pharmacology by Seth.V.K.
20. Burger's Medicinal Chemistry by wolff.M.I.
21. Wilson & Gisvolds Text Book of organic Medicinal and Pharmacuetical Chemistry by Deorge.R.F.
22. Phytochemical methods of chemical analysis by Harbone.
23. Organic chemistry vol.II by I.L.Finar.
24. The Essential oil by Gunther.E.
25. The use of Pharmacological techniques for the evaluation of natural products by B.N.DhavanR.C.Srimal. CDRI, Lucknow.
26. Physical methods in organic chemistry by J.C.P.Schwartz.
27. Techniques in organic chemistry by Weiss Creger.
28. Practical Pharmacognosy by Dr.C.K. Kokate.
29. Practical Pharmacognosy by Dr.P.K.Lala.
30. Herbal medicines – Janne Barnes, Linda. A.Anderson.
31. Chinese materia medica – Yaru – PingZhu.
32. Natural products from plants – Peter.B.Kanfman.
33. Selection, Preparation and pharmacological evaluation of plant material, M.Williamson, DT.Okpako.
34. Indian Pharmacopoeia 2007
35. Herbal Pharmacopoeia.

Subject code: T-6.5
Subject : Biopharmaceutics-II
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Introduction to pharmacokinetics**.
   Basic concept, Definition & introduction to absorption rate constant, bio-availability, volume of distribution, elimination half life, elimination rate constant, clearance, extraction ratio, area under curve, protein binding and tissue binding – Calculation of parameters from plasma and urine data.
2. **Therapeutic regimens**
   - Therapeutic response and toxicity.
   - Constant rate regimens.
   - Multiple dose regimens.

3. **Compartment modeling**
   - Concept of compartment modeling, open and closed models.
   - One compartment open model- IV bolus, IV infusion extra vascular administration
   - Multi compartment modeling – 2 compartment and 3 compartments models, determination of compartment models.
4. **Non linear pharmacokinetics**
   - Saturable enzymatic elimination process, drug elimination by capacity limited pharmacokinetics, mixed drug elimination, time dependent pharmacokinetics, bio-availability of drug that follow nonlinear pharmacokinetics, non-linear pharmacokinetics due to protein binding (eq. Phenytoin)

SECTION-B

1. **Pharmacokinetics basis of variability in clinical response** :-
   Genetics Age and weight, Disease altering / affecting pharmacokinetic parameter. (special reference to hepatic and renal disease)
2. **Drug interactions:-**
   Classification altered absorption and distribution, therapeutic implication causes of drug interaction, alteration in drug metabolism
3. Assessment of AUC, estimation of elimination half life from urine data, estimation of absorption kinetics from plasma concentration data, mean residence time, amount of drug in body on accumulation to plateau, distribution of drugs extensively bound to plasma proteins, blood plasma concentration ratio. Estimation of creatinine clearance under non-steady conditions.
4. **Problems based on all above chapters**.

Subject code: P-6.5
Subject : Biopharmaceutics-II
PRACTICAL **45 Hours (3 hrs. /week)**

1. Experiments for determination of pharmacokinetics parameters & bioavailability based on salivary & urinary excretion of drug formulations using human volunteers.
2. To study the influence of simulated gastric & intestinal pH on stability & hydrolysis of drugs.
3. Establishment of standard curve of a drug substance.
4. Influence of vehicle on drug availability from topical dosage forms in-vitro.
5. Comparative in-vitro release rate studies of marketed formulations.
6. Determination of bioavailability of marketed formulations by plasma concentration method.
7. Determination of bioavailability of marketed formulations by urinary excretion method.

8. Effect of protein binding by egg albumin; dialysis method.
9. Determination of pharmacokinetic parameters, determination and evaluation of bioavailability of drug administered by IV, IM and P.O. Practice numericals based on the portions covered under theory syllabus.

Recommended Books

1. Biopharmaceutics and pharmacokinetics - Milo Gibaldi; Lea and Febiger book publication.
2. Biopharmaceutics and pharmacokinetics - An introduction - Robert E. Notary.
3. Biopharmaceutics - Swarbrick, Lea & Febiger book publications.
4. Remington Pharmaceutical Sciences.
5. Applied Biopharmaceutics and pharmacokinetics - Leon Shargel
6. Biopharmaceutics and pharmacokinetics - A treatise D.M.- Brahmankar & S.B. Jaiswal.
7. Clinical pharmacokinetics – concept & application- Malcohm Rowland C., Thomas N. Tozer, Lea & Febiger Book.
8. Applied bio-pharmaceutics & pharmacokinetics – Leon Shargel 3. Bio-pharmaceutics & pharmacokinetics – Milo Gibaldi.
9. Bio-pharmaceutics & pharmacokinetics – An introduction – Rober E. Notary.
10. Pharmacokinetics Milo Gibaldi & Donald Perrier.
11. Bio-pharmaceutics & pharmacokinetics – P.L. Madan
12. Handbook of clinical pharmacokinetics – Gibaldi & Pancot.

Subject code: T-6.6

Subject : Clinical Pharmacy

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. Definition, scope, history and development of clinical pharmacy.
2. **Introduction to daily activities of a clinical pharmacist:** Drug therapy monitoring (medication chart review, clinical review, pharmacist intervention), Ward round participation, Medication history, Patient counseling).
3. **Patient data analysis:** Clinical laboratory tests used in evaluation and interpretation of disease state like: Haematological, Liver function, Renal function, Thyroid function test.
4. **Prescribing guidelines for** Paediatric patients, Geriatric patients, Pregnancy and breast feeding.
5. **Drug and poison information:** Introduction to drug information resource available, Systemic approach in answering drug information queries, Critical evaluation of drug information and literature, Preparation of return and verbal reports, establishing a drug information centre.

   Poison informations –organisation and information resources.

SECTION-B

6. **Clinical pharmacokinetics:** Physiological pharmacokinetics models, determination of drug clearance and volume of distribution, Renal and non-Renal clearance, Organ extraction and models of hepatic clearance, Estimation and determination of bioavailability, Multiple dosing, Calculation of loading and maintenance dose, Dose adjustment in renal failure, Hepatic dysfunction patient.
7. **Designing and conducting of clinical trials:** Guidelines for good clinical research practice and Ethical requirements, various phases of clinical trials, Monitoring and auditing of clinical trials.
8. **Monitoring of drug therapy:** Therapeutic, Pharmacokinetic and pharmacodynamic monitoring of drug therapy.
9. **Adverse reactions to drug:** Incidence, classifications, and surveillance methods of adverse reactions to drugs.
10 **Pharmacogenetics:** Pharmacokinetic and Pharmacodynamic aspects of pharmacogenetics.
11. **Drug interaction:** Different types of interactions with drugs and their incidence, Clinical aspects of Pharmacokinetic and pharmacodynamic drug interaction.

Recommended Books

1. Bennett P.N, Brown M.J. Clinical Pharmacology Churchill living stone New Delhi.
2. Melmon & Morrelli's Clinical Pharmacology. Mc-Graw Hill. New Delhi.
3. Raymond J.M. Niesink, John de vries. Hollinger M.A. Toxicology-Principle and applications, CRC, Florida
4. Remington's Pharmaceutical Science and practice pharmacy. Lippincott Williams and Wilkins, New Delhi.
5. Clinical Pharmacy & Therapeutics- Eric T Hefindal. Williams & Wilkins Publications.
6. Clinical Pharmacokinetics- Rowland and Tozer, Williams and Wilkins Publications.
7. Biopharmaceuticals and Applied Pharmacokinetics- Leon Shargel, Prentice and Hall publications.
8. Parrthsarthi G, Hansen Kavin Nytort & Nahata Milap C. A Textbook of Clinical Practice: Essential Concepts & skills, Orient Longman.
9. Roger walker, Clive Edwards, Clinical Pharmacy & therapeutics, 3rd International Edition, Churchill Livingstone.
10. Dr. Tipnis H. P, Dr. Bajaj Amrita, Clinical Pharmacy, Career Publication.
11. Grahame-Smith D.G. & Aronson J.K. Oxford textbook of clinical Pharmacology and drug therapy. Oxford University press London

Subject code: P-6.7

Subject : Project

45 Hours (3 hrs. /week)

Project

The topic for the **project shall be based on the practical work /theoretical/ review oriented /any topic from current Pharmaceutical development** and shall be assigned to him/her by the respective guide from faculty members immediate from the date of the commencement of the sixth semester.

Evaluation of the project should be based on Introduction and information retrieval systems, Organization of material and references in the project report, Representation, Skill in oral presentation, Questioning and defending, and finally on the report. The report shall be submitted in hard bound to the respective guide/Head of Department/ Library.

*****

ENVIRONMENTAL STUDIES

Total Marks : 100

PART-A

SHORT ANSWER PATTERN 25 Marks

1. The Multidisciplinary nature of environmental studies

. Definition, scope and importance.

. Need for public awareness. (2 lecture hours)

2. Social Issues and the Environment

. From Unsustainable to Sustainable development

. Urban problems related to energy

. Water conservation, rain water harvesting, watershed management

. Resettlement and rehabilitation of people; its problems and concerns.
Case studies.

. Envionmental ethics : Issues and possible solutions.

. Climate change, global warming, acid rain, ozone layer depletion, nuclear
accidents and holocaust. Case studies.

. Wasteland reclamation.

. Consumerism and waste products.

. Environment Protection Act.

. Air (Prevention and Control of Pollution) Act.

. Water (Prevention and Control of Pollution) Act.

. Wildlife Protection Act.

. Forest Conservation Act.

. Issues involved in enforcement of environmental lesislation.

. Public awareness. (7 lecture hours)

3. Human Population and the Environment

. Population growth, variation among nations.

. Population explosion - Family Welfare Programme.

. Environment and human health.

. Human Rights.

. Value Education.

. HIV / AIDS.

. Women and Child Welfare.

. Role of Information Technology in Environment and human health.

. Case Studies. (6 lecture hours)

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PART-B
ESSAY TYPE WITH INBUILT CHOICE

50 Marks

4. Natural resources :

. **Renewable and non-renewable resources :**

. Natural resources and associated problems.

- Forest resources : Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies.
- Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.
- Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

. Role of an individual in conservation of natural resources.

. Equitable use of resources for sustainable lifestyles.

(8 lecture hours)

5. Ecosystems

. Concept of an ecosystem.

. Structure and function of an ecosystem.

. Producers, consumers and decomposers.

. Energy flow in the ecosystem.

. Ecological succession.

. Food chains, food webs and ecological pyramids.

. Introduction, types, characteristic features, structure and function of the following ecosystem :-

- Forest ecosystem
- Grassland ecosystem
- Desert ecosystem

- Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) (6 lecture hours)

6. Biodiversity and its conservation

. Introduction - Definition : genetic, species and ecosystem diversity.

. Biogeographical classification of India.

. Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.

. Biodiversity at global, National and local levels.

. India as a mega-diversity nation.

. Hot-spots of biodiversity.

. Threats to biodiversity : habitat loss, poaching of wildlife, manwildlife conflicts.

. Endangered and endemic species of India.

. Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. (8 lecture hours)

7. Environmental Pollution

. **Definition**

. Causes, effects and control measures of :-

- Air pollution
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear hazards

. Solid Waste Management : Causes, effects and control measures of

. Role of an individual in prevention of pollution.

. Pollution case studies.

. Diaster management : floods, earthquake, cyclone and landslides. (8 lecture hours)

PART-C

ESSAY ON FIELD WORK

25 Marks

8. Field work

. Visit to a local area to document environmental assets - river / forest / grass land / hill / mountain

. Visit to a local polluted site - Urban / Rural / Industrial / Agricultural

. Study of common plants, insects, birds.

. Study of simple ecosystems - pond, river, hill slopes, etc.

(5 lecture hours)

(**Notes :** i) Contents of the syllabys mentioned under paras 1 to 8 shall be for teaching for the examination based on Annual Pattern.

ii) Contents of the syllabys mentioned under paras 1 to 4 shall be for teaching to the Semester commencing first, and

iii) Contents of the syllabys mentioned under paras 5 to 8 shall be for teaching to the Semester commencing later.

LIST OF REFERENCES :-

1) Agarwal, K.C., 2001, Environmental Biology, Nidi Publ. Ltd., Bikaner.

2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email : mapin@icenet.net **(R)**

3) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.

4) Clark R.S., Marine Pollution, Clanderson Press Oxford **(TB)**

5) Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T., 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.

6) De A.K., Environmental Chemistry, Wiley Eastern Ltd.

7) Down to Earth, Certre for Science and Environment **(R)**

8) Gleick, H.P. 1993, Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press. 473p.

9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural Histroy Society, Mumbai **(R)**

10) Heywood, V.H. & Watson, R.T. 1995, Global Biodiversity Assessment, Ca mbridge Univ. Press 1140p

11) Jadhav, H & Bhosale, V.M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi. 284 p.

12) Mckinney, M.L. & Schoch, R.M. 1996, Environmental Science Systems & Solutions, Web Enhanced Edition. 639 p.

13) Mhaskar A.K., Matter Hazardous, Techno-Science Publications **(TB)**

14) Miller T.G.. Jr., Environmental Science, Wadsworth Publishing Co. **(TB)**

15) Odum, E.P., 1971, Fundamentals of Ecology, W.B.Saunders Co., U.S.A., 574p.

16) Rao M.N. & Datta A.K.,1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd. 345 p.

17) Sharma B.K., 2001, Environmental Chemistry, Goel Publ. House, Meerut.

18) Survey of the Environment, The Hindu **(M)**

19) Townsend C., Harper J., and Michael Begon, Essentials of Ecology, Blackwell Science **(TB)**

20) Dr. Deshpande A.P., Dr. Chudiwale A.D., Dr.Joshi P.P. & Dr. Lad A.B. : Environmental Studies, Pimpalapure & Company Pub., Nagpur.

21) डॉ. विठ्ठल घारपुरे : पर्यावरणशास्त्र, पिंपळापुरे ॲन्ड कंपनी पब्लिशर्स, नागपूर .

22) Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media **(R)**

23) Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications **(TB)**

24) Wagner K.D., 1998, Environmental Management, W.B.Saunders Co., Philadelphia, USA 499p.

(M) Magazine

(R) Reference

(TB) Textbook

25) Environmental Studies : R.Rajgopalan, Oxford Uni. Press, New Delhi, 2005

26) Environmental Chemistry and Pollution Control, Dasganu Prakashan, Nagpur : Dr.N.W.Ingole, Dr. D.M.Dharmadhikari, Dr.S.S.Patil.

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Final B.Pharmacy Prospectus No. 2014147
Semester-VII Examination - Winter-2013,
Semester-VIII Examination - Summer-2014

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I N D E X
Final B.Pharmacy (Semester-VII & VIII)
(Prospectus No.2014147)

Syllabus prescribed for B.Pharm. Semester-VII
(Implemented from the Academic Session 2013-14)

SEMESTER-VII

Subject Code	Subject	Maximum Marks		Total Marks
		Theory	Practical	
7.1	Pharmaceutics-V	80	80	160
7.2	Medicinal Chemistry-III	80	80	160
7.3	Pharmacology-III	80	80	160
7.4	Pharmacognosy-V	80	80	160
7.5	Pharmaceutical Analysis-III	80	80	160
7.6	Pharmaceutical Jurisprudence	80	ð	80
7.7	Seminar (One per each Student)	80	ð	80
Total				960

Subject code: T-7.1
Subject : Pharmaceutics – V
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Capsules:**
   Advantages and disadvantages of capsule dosage form, material for production of hard gelatin capsules, size of capsules and method of capsule filling. Soft gelatin capsule, capsule shell and capsule content, importance of base absorption, minim/gm factors in soft capsules, quality control, stability testing and storage of capsule dosage forms.
2. **Tablets**
   a) Classification of different types of tablets, tablet excipients, granulation technology on large scale by various techniques, physics of tablet making, different types of tablet compression machinery and equipment employed, processing problems of tablets and evaluation of tablets.
   b) **Coating of tablets:** Types of coating, film-forming materials, formulation of coating solution, equipments for coating, film defects and evaluation of coated tablets.

SECTION-B

3. **Parenteral products**
   a) Preformulation factors, routes of administration, water for injection, pyrogenicity, nonaqueous vehicles, isotonicity and methods of its adjustment.
   b) Formulation details, containers and closures and selection.
   c) Prefilling treatment, washing of containers and closures, preparation of solution and suspension, filling and closing of ampoules, vials, infusion fluids, lyophilisation and preparation of sterile powders, equipment for large-scale manufacture and evaluation of parenteral products.
   d) Aseptic Techniques: Source of contamination, methods of prevention, design of aseptic area, laminar flow bench services and maintenance.
4. **Packaging materials for pharmaceutical products:**
   Packaging components, types, specifications and methods of evaluation, stability aspect of packaging, packaging equipments, factors influencing choice of containers, legal and other official requirements for containers, package testing.
5. **Good Manufacturing practices**

Subject code: P-7.1
Subject : Pharmaceutics – V
PRACTICAL **45 Hours (3 hrs. /week)**

1. Experiments to illustrate preparation stabilization, physical and biological evaluation of pharmaceutical products like powders, capsules, tablets, parenterals, etc.
2. Coating of tablets - sugar coating and film coating.
3. Evaluation of materials used in pharmaceutical packaging.
4. Evaluation of packages- containers & closures.
5. To study influence of pH, salt form & Pharmaceutical adjuvants on dissolution of drugs.

BOOKS RECOMMENDED:

1. Ansel, H.C. ñIntroduction to Pharmaceutical Dosage Formsò, K M Varghese & Co., Mumbai, latest edition.
2. Lachman L, Liberman H.A. & Kanig J.L., ñThe Theory & Practice of Industrial Pharmacyò, Lea & Febiger, Philadelphia.
3. Beans, H.S., Beckett A.H. & Carless, ñAdvances in Pharmaceutical Scienceò
4. Pharmaceutical dosage forms: Tablets volume 1 ï 3 by Liberman and Lachman

5. Pharmaceutical dosage forms: Parenteral medications Vol-1, 2 by Liberman and Lachman.
6. Bentleyôs Textbook of Pharmaceutics.
7. Remingtonôs Pharmaceutical Sciences (RPS).
8. Modern Pharmaceutics by Banker and Gilberts.
9. Hard Capsules by Ridgway. K. Pharmaceutical Press, London.
10. Aulton M.E., Pharmaceutics ï The Science of Dosage form Design, ELBS/Churchill Livingstone.

11. Avis K E, Lachman L and Lieberman H A, Marcel Dekker Inc. Pharmaceutical Dosage Forms; Parenteral Medications, Vols. 1 & 2, NY.
12. Bean H S, Beckett A H, and Carless A H Advances in Pharmaceutical Sciences, Vol 1-4 Academic Press, London.
13. Carter S J, Cooper and Gunnôs Dispensing for Pharmaceutical Students, CBS Publishers, Delhi.
14. Carter S J, Cooper and Gunnôs Tutorial Pharmacy CBS Publishers, Delhi.
15. Remingtonôs, the science and Practice of Pharmacy, Mack Publishing Co. Easton, Pernsybrania.
16. Sagarin & Balsam M.S., Cosmetic Science and Technology, Vol-1-3. 2nd ed. John Wiley sons, NY.
17. Stoklosa MJ, Pharmaceutical calculation, Lea and Febiger, Philadelphia.
18. Thomssen S.G., Modern Cosmetics, Universal Publishing Corporation, Bombay.
19. Harryôs Cosmeticology.

*****

Subject code: T-7.2
Subject : Medicinal Chemistry-III
THEORY **45 Hours (3 hrs. /week)**

Section A

1. History, development, classification, recent development, mode of action (biochemical and molecular basis wherever applicable), SAR, IUPAC and synthesis of drugs of following classes

Cardiac diseases: antihypertensives, cardiotonics, antiarrythmics, anticoagulants, antithrombotics, thrombolytics, antianginals, coronary vasodilators, Hypolipoproteinemic drugs, diurectics and antidiuretics.

Section B

History, development, classification, recent development, mode of action, SAR, IUPAC of following class and synthesis of drugs of following classes
Local anaesthetics, Sedative-hypnotics, antiepileptics, antipsychotics, antianxiety agents, central nervous system stimulants and psychodelics, Steroids and related drugs, Immunomodulators.

Subject code: P-7.2
Subject : Medicinal Chemistry –III
PRACTICAL **45 Hours (3 hrs. /week)**

1) Laboratory scale preparation by conventional / microwave synthesis of selected drugs from course content and characterization by melting point / boiling point / thin layer chromatography / ultra-violet spectroscopy / IR spectroscopy
2) Establishing the pharmaceutical standards of drug synthesized

Books Recommended

1. J. N. Delagado and W. A. R. Remers, Eds, Wilson and Giswoldôs Textbook of Organic, Medicinal and Pharmaceutical Chemistry, J. Lipponcott Co. Philadephia.
2. W. C. Foye, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
3. H. E. Wolff, Ed. Burgerôs Medicinal Chemistry, John Wiley & Sons, New York Oxford University Press, Oxford.
4. Daniel Lednicer, Strategies for Organic Drug Synthesis & Design, John Wiley & sons, USA.
5. B. N. Ladu, H. G. Mandel & E. L. Way, Fundamental of Drug Metabolisum & Disposition, William & Wilkins co., Baltimore.
6. I. L. Finar, Organic Chemistry, Vol. I & II, ELBS/ Longman, London.
7. Vogelôs Text book of Practical Organic Chemistry, ELBS/ Longman, London
8. Mann & Saunder, Practical Organic Chemistry, Orient Longman, London.
9. Shriner, Hermann, Morrill, Curtin & Fuson, The Syntematic Identification of Organic Compounds, John Wiley & Sons. USA.
10. R. M. Silverstein, G. Claytron Basselôs, T. C. Movvill, Spectormetric identification of Organic compounds, John Wiley & Sons, USA

Subject code: T-7.3
Subject : Pharmacology-III
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Immunopharmacology:** Pharmacology of immunosuppressants and stimulants.
2. **Drug Acting on Blood and Blood forming agent:** Coagulants and anti-coagulants, Haemopoietics, Thrombolytics and anti platelet, plasma expanders.
3. **Cardiovascular system:** Anti-hypertensive, Anti anginal and other anti-ischemic drugs, Anti arrhythmic drugs, Cardiac glycoside and Drugs used for therapy of Congestive Cardiac Failure, Drugs used in Hyperlipidemia.

SECTION-B

4. **Drug acting on Kidney:** Diuretics and Anti-diuretics.
5. **Gastro-Intestinal system:** Anti-Ulcer drugs and Antacids, Laxative and purgatives, Emetic and Anti emetics agents.
6. **Pharmacology of drugs acting on Nervous System:** General considerations (Introduction), Skeletal muscle relaxants, Local and general anesthetics, Pharmacology of Alcohol, Drugs used in Parkinsonism, Sedatives and hypnotics, CNS stimulants, Anti-Convulsants, Psychiatric disorders and their treatment (Antipsychotics, anxiolytics and antidepressants),.

Subject code: P-7.3
Subject : Pharmacology-III
PRACTICAL **45 Hours (3 hrs. /week)**

I] Various pharmacological techniques (In vitro) on isolated tissue preparation of animals

1. To establish Dose Response Curve of suitable agonists using suitable animal tissue preparations. (Like uterus, vas deferens, ileum, colon, trachea, smooth muscle etc.)
2. To study the shift in D.R.C by Antagonists for above agonists-covering concept of reversible and irreversible antagonism.

II] Pharmacological techniques (Invivo study)

3. Antisecretory and ulceroprotective effect of cimetidine or other related drugs in pylorus ligated rats.
4. To study the effect of drugs on Grip strength in animals by Pole climbing/ simple rope tides method.

5. To determine the LD50 value of important drug/drugs given official in I.P.
6. To study the experimental models for diuretics.
7. To study the experimental models anxiolytic.

III] Surgical techniques

8. To study the various surgical techniques like adrenoctomy, ovarectomy, Pancrectomy etc.

Note

- Suitable animal preparation- Any experiment suitable to demonstrate the concept- It could be either in-vivo or in-vitro, The animal selected may be mice, rat, rabbit, guinea pig as admissible as per prevailing Government/CPCSEA guidelines. In case of in-vitro preparations- any tissue preparation from above animals or various tissues from goat may be obtained from slaughter house/ abattoir /butcher shop.
- Agonist- Any agonist that can exhibit activity using the given preparation as reported in standard books/journals may be selected e.g.-Adrenaline and other catecholamines, Acetyl Choline, Histamine, Serotonin, oxytocin etc.
- Antagonist- Any antagonist that can exhibit blocking activity of above mentioned agonists in the given preparation as reported in standard books/journals may be selected.

Recommended Books

1. Goodman Gilman, The Pharmacological basis of therapeutics. Mc-graw Hill New Delhi.
2. Foster R.W. Basic Pharmacology, Arnold, New Delhi.
3. Stahl S. M.. Essential Psychopharmacology Cambridge University Press New Delhi.
4. Dipiro J.L. Pharmacotherapy Handbook. Tata McGraw Hill New Delhi.
5. Official books - Indian Pharmacopoeia, British Pharmacopoeia, United States Pharmacopoeia.
6. Tripathi K.D. Essentials of medical Pharmacology Jaypee New Delhi.
7. Barar F.S.K. Essentials of Pharmacotherapeutics, S. Chand & Company Ltd. New Delhi.
8. Rang H.P., Dale M.M. et. al. Pharmacology. Churchill L Ivingstone, New Delhi.
9. Katzung B.G .Basic & Clinical Pharmacology Mc-graw Hill, New Delhi.
10. Lewisôs Pharmacology. Churchill Livingstone London.

11. Harvey R.A., Champe P.C. Lippincottôs Illustrated Reviews-Pharmacology. Lippincott Williams & Wilkins, Pennsylvania.
12. Ghosh M.N. Fundamentals of Experimental pharmacology. Hilton & Company Kolkata.
13. Vogel G.H. Drug discovery and evaluation. Springer Germany.
14. Goyal R.K. Practicals in pharmacology. B.S. Shah Prakashan Ahmedabad.
15. Kulkarni S.K. Handbook of Experimental Pharmacology. Vallabh Prakashan. New Delhi.
16. Pillai, K. K. Experimental Pharmacology. CBS Publishers New Delhi.
17. Grover, J.K. Experiments in Pharmacy and Pharmacology Vol-II.CBS publishers New Delhi.
18. Perry W. L. M. Pharmacological Experiments on Isolated preparations. E.&S.Livingstone, London.
19. Kasture S.B.Text book of Experimental Pharmacology, Career Publication Nashik.
20. Official books - Indian Pharmacopoeia, British Pharmacopoeia, and United States Pharmacopoeia.
21. Related research papers from various journals.

Subject code: T-7.4
Subject : Pharmacognocy-V
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. Application of column, paper and thin layer chromatographic techniques for the isolation of phytopharmaceuticals. Application of chromatographic techniques in evaluation of herbal drugs with reference to withanolides, andrographolides, sinnosides, gymnemic acid, medicagosides/ascoticoside, Ephedrine.
2. Isolation Techniques: General methods used for the isolation and characterization of alkaloids, lipids, glycosides, proteins, volatile oils, bioflavonoids, steroids, terpenoids and resins.
   Isolation, characterization and estimation of: Caffeine, Eugenol, Rutin, Solanine, Piperine, Tannic acid, Diosgenin, Hesperidine, Berberine, Calcium sennosides, Rutin, Glycyrrhizin, Menthol, Ephedrine, Quinine, Andrographolides, Guggul lipids and Katha industry in India.
3. Plant Biotechnology: ?Historical developments of plant tissue culture, types of cultures, nutritional requirements, growth & maintenance.

Callus, protoplast, hairy root and cell suspension culture. Production of secondary metabolites, viz. Shikonin and Taxol. Biotransformation, immobilization of cells and enzymes. Gene transfer in plants, application of plant biotechnology. Application of plant tissue culture in Pharmacognosy.

SECTION-B

4. Worldwide trade of crude drugs and volatile oils: Plants based industries and research institutes, Intellectual Property Rights with special reference to phytoconstituents. Regulation pertaining to trade drugs
5. Biological sources, preparation, identification tests and uses of the following enzymes: Diastase, Papain, Pepsin, Trypsin, Pancreatin.
6. Natural allergens and photosensitizing agents & fungal toxins
7. Overview of the plants used in management of Cancer, Diabetes, Inflammation, Liver disorder, Central nervous system, hypertension and AIDS.
8. WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants

Subject code: P-7.4
Subject : Pharmacognocy-V
PRACTICAL **45 Hours (3 hrs. /week)**

1. Macroscopical and microscopical evaluation including Quantitative microscopy.
2. Estimation of secondary metabolites like alkaloids, terpenoids and flavonoids by different methods.
4. Estimation of plant phytoconstituents using modern methods like UV and HPTLC.
5. Extraction and isolation of volatile oils.
6. Extraction and isolation of phytoconstituents (Minimum five).
7. Evaluation of crude drugs as per WHO guidelines.
8. Application of TLC and paper chromatography in phytochemical evaluation of crude drugs.
9. Isolation of known marker compounds by column chromatography (Demonstrative)
10. Systematic analysis of crude drugs from unknown origin.
11. Tissue culture - Preparation of culture media, selection and preparation of ex-plant, callus culture.
12. Chemical evaluation of powdered drugs & Enzymes.
13. Chromatographic studies of some herbal formulations.
14. Review of recent literatures appearing on Phytopharmaceuticals used as antiallergic, antimicrobials, anti-inflammatory, anticancer, antidiabetic, antihepatotoxic and immunomodulators.

Recommended Books

1. Kokate, C.K. Practical Pharmacognosy, Vallabh Prakashan, Delhi.
2. Wallis T.E. Analytical Microscopy, J&A Churchill Ltd, London.
3. Ganborg & Wetter, Plant Tissue Culture Methods, National Research Council of Canada,
4. Saskatchewan.
5. Clarke ECG, Isolation & Identification of drugs. The Pharmaceutical Press, London.
6. Trease, G.E. & Evans, W.C. ñPharmacognosyò Bailliere Tindall East Bourne, U.K.
7. Tyler V.E. etal Pharmacognosy, Lea & Febiger Phjadelphia.
8. Wallis T.E. Text book of Pharmacognosyò J&A Churchill Ltd. London.
9. Qadry J.S., ñ Pharmacognosyò B.S.Shah Prakashan.ò
10. Atal & Kapur, Cultivation & Utilization of Medicinal Plants, RRL, Jammu.
11. Stahl. E, Thin Layer Chromatography. A laboratory handbook, Springer Verlog, Berlin.
12. Street H.E. Tissue Culture & Plant Science, Academic Press, London.
13. Kokate, C.K. Gokhale AS, Gokhale SB, Cultivation of Medicinal Plants, Nirali Prakashan.
14. Mohammed Ali,ò Pharmacognosy & Plant Cultivationò.
15. Indian Pharmacopoeia.
16. The wealth of India (Raw material & Industrial products)
17. Compendium of Indian Medicinal Plants. Volume-1 to 9.
18. Cultivation & Utilization of Aromatic plants by Atal & Kapoor.
19. Indian Medicinal Plants by Kirtikar & Basu.
20. Photochemistry Prakrukun by Wanger.
21. Natural Products by Ikan R. Israel Uni. Press, Jarusalem,1969.
22. Ayurvedic Pharmacopoeia.
23. Indian Herbal Pharmacopoeia.
24. WHO guidelines for standardization.

Subject code: T-7.5
Subject : Pharmaceutical Analysis-III
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. Intrared Spectroscopy

Introduction, range of IR radiation, Requirements of IR radiation, correct wavelength radiation electric dipole, theory of IR absorption spectroscopy, modes of vibration of atoms in polyatomic molecules, stretching and bending vibration (their types), interpretation of IR spectra, quantitative analysis, routine maintenance, Dispersive and FT-IR instruments, instrumentations- single beam, double beam

spectrophotometer, application to pharmaceuticals, limitations of IR spectrophotometry.

2. **Raman Spectroscopy**

Introduction, Excitation of Raman spectra, Difference between Raman and IR spectroscopy, Raman and Rayleigh scattering, Instrumentation, advantages and disadvantages, applications.

3. **Polarimetry**

Theory of optical activity, Polarization of light, measurement and production of polarized light, Specific and molecular rotation, Linear, Circular and elliptically polarized light, optical rotatory dispersion (ORD), Circular dichroism (CD), Cotton effect (CD), Applications of ORD and CD, Instrumentation, Polarimeter and Applications.

SECTION-B

1. Refractometry

Specific and Molar Refraction, Refractive index, Measurement of RI (Angle of Refraction), Snellôs Law, Instrumentation and applications.

2. **Nephelometry and Turbidometry**

Introduction, Principle, Instrumentation, Application

3. **Electrochemical Methods**

Principles, Theory, Intrumentation and Applications of

Conductometry, Potentiometry, Amperometry, Coulometry, Polarography, Pulse Polarography, Electrogavimetry.

4. Thermal Analysis

Introduction, Principle, Definitions, Types, Instrumentation, Applications of

Thermogravimetric Analysis (TGA)
Differential Thermal Analysis (DTA)
Differential Scanning Calorimetry (DSC)

Subject code: P-7.5
Subject : Pharmaceutical Analysis-III
PRACTICAL **45 Hours (3 hrs. /week)**

List of Experiments :

1. Calibration of conductometer and estimation of conductivity of distilled water.
2. Conductometric titrations
3. Calibration of pH meter and measurement of pH.
4. Potentiometric titrations
5. To determine the pKa value of tribasic acid by using pH meter.
6. Determination of refractive index by Abbeôs Refractometer

7. Polarimetric analysis of some carbohydrates
8. Demonstration: To prepare sample in KBr pellet, record its IR spectrum and compare it qualitatively with reported IR in IP/BP
9. Identification of functional groups using IR analysis.

Recommended Books

1. D.A.Skoog, D.M.West, F.J.Holler, S.R.Crouch, Fundamentals of Analytical Chemistry, 8th edition, 2004, Thomson Asia Pvt. Ltd.
2. Kenneth A. Connors, A textbook of Pharmaceutical Analysis, 3rd edition, 2002, John Wiley & Sons, New York, USA.
3. F.W.Fifield, D.Kealey, Principles and Practice of Analytical Chemistry, 5th edition, 2000, Blackwell Science, Oxford, U.K.
4. Gary D. Christian, Analytical Chemistry, 6th edition, 2004, John Wiley & Sons, New York, USA.
5. R.A.Day, Jr, A.L.Underwood, Quantitative Analysis, 6th edition, 2001, Prentice Hall of India.
6. Practical Pharmaceutical Chemistry Vol. ï I & II ï 4th Edition ï 1986 ï A.H.Beckett & J.B.Stenlake ï CBS Publishers, New Delhi.
7. A. R. Gennaro, Remington: The Science and Practice of Pharmacy Vol. I & II ï 20th Edition ï 2001 ï Lippincott, Williams & Wilkins, New York, USA.
8. The Indian Pharmacopoeia, Latest Edition, the Controller of Publications, Government of India, New Delhi
9. S.Ahuja, S.Scypinski, Handbook of Modern Pharmaceutical Analysis, 2001, Academic Press, New York, USA.
10. A.V.Kasture, K.R.Mahadik, S.G. Wadodkar, H.N.More, A Textbook of Pharmaceutical Analysis, Vol. I, 6th edition, 2002, Nirali Pprakashan, New Delhi.
11. D.C.Lee, M.L.Webb, Pharmaceutical Analysis, 2003, Blackwell Science, Oxford, U.K.
12. T.Higuchi, E.Brochmann-Hanssen, Pharmaceutical Analysis, 2002, CBS Publishers, New Delhi.
13. Lena Ohannesian, A.J.Streeter, Handbook of Pharmaceutical Analysis, 2002, Marcel Dekker, Inc. New York, USA.
14. P.Parimoo, Pharmaceutical Analysis, 2nd edition, 1991 CRC Press, New York.
15. The Indian Pharmacopoeia, Latest edition, the Controller of Publications, Government of India, New Delhi.
16. The British Pharmacopoeia.
17. The United State Pharmacopoeia.
18. J. Mendham, R.C.Denney, J.D.Barnes, M.Thomas, Vogelôs Textbook of Quantitative Chemical Analysis, 6th edition, 2002, Pearson Education Asia Ltd.

19. D.A. Skoog, F.J. Holler,T.A. Neiman, Principles of Instrumental Analysis, 5th edition, 2003, Thomson Asia Pvt. Ltd.

Subject code: T-7.6
Subject : Pharmaceutical Jurisprudence
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1) **History of pharmacy legislation in India :**
Origin and nature of pharmaceutical legislation in India, reports of commissions,
2) **Study of the following with latest amendments:**
   a) **Pharmaceutical ethics - Critical** study of code of pharmaceutical ethics drafted by PCI regarding to pharmacist in relation to his job, to his trade and to medical profession.
   b) **Pharmacy Act 1948 -** Introduction, objectives, definitions, Education Regulations and approval, registration of pharmacists, central and state councils, amendments to the pharmacy Act.
   c) **Drugs & Cosmetics Act 1940 and Rules 1945 -** Introduction, definitions, general study of the schedules with special references to the C,C1,F.G.H.P & X, salient features of the storage and labeling conditions of drugs, administration, manufacture, sales and import of drugs, provision for ayurvedic, unani drugs and cosmetics, as amended to date.
   d) **Medicinal & toilet preparations (Excise duties) Act 1955 -** Objectives, background, definitions, manufacture and warehousing of alcohol preparations, procedures, offenses and penalties, as amended to date.
   e) **Narcotic drugs and Psychotropic Substances Act 1985 and Rules–** Introduction, objectives, definitions, prohibited and controlled operations, enforcement, manufacture, cultivation of poppy plants, sales of opium, import and export of narcotics, as amended to date.
   f) **Drugs Price Control Order -** Objectives, definitions, schedules to the order, sales prices of bulk drugs, prices and price list MAPE calculations, as amended to date.

SECTION-B

Business Management

1) **Concept of Management:**
Administrative Management (Planning, Organizing, Staffing, Directing and Controlling), Entrepreneurship development, Operative Management (Personnel, Materials, Production, Financial, Marketing,

time/space, Margin/Morale). Principles of Management (Co-ordination, Communication, Motivation, Decision-making, Leadership, Innovation, Creativity, Delegation of authority/ Responsibility, Record Keeping).

2) **Pharmaceutical Marketing:**
Function, buying, selling, transportation, storage, finance, feedback, information, channels of distribution, wholesale, retail, departmental stores, multi shop & mail order business.

3) **Production Management:**
A brief exposure of the different aspects of production management (visible & invisible inputs, methodology of activities, performance evaluation, techniques, process - flow, process know - how, maintenance management)

Recommended Books:

1. Drugs & Pharmacy Laws in India - by Bharati H.K.
2. A Text Book of Forensic Pharmacy - by Mittal B.M.
3. Professional Pharmacy - by Schroff M.L.
4. Principles of Pharmaceutical Marketing - by Smith.
5. Production Management & Control - by Baral Nikhil.
6. Promotion Management - by Hegde, Copper & Balchandran.
7. Manufacturing Management -by Moore F.G.
8. Theory & Practice of Industrial Pharmacy - by Leon Lachman.
9. Original Laws Published by Govt. of India.

Subject code: T - 7.7
Subject : Seminar **45 Hours (3 Hrs. /week)**

Seminar (one per each student)

The topic for the seminar shall be assigned to him/her by the faculty members of Seventh semester & topic should be decided from the syllabus of same semester, with immediate from the date of the commencement of the seventh semester.

Evaluation of seminar shall be based on the communication, representation and skill in oral presentation.

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Sant Gadge Baba Amravati University, Amravati

B. Pharm Eight Semester Syllabus

SEMESTER-VIII

Subject Code	Subject	Maximum Marks		Total Marks
		Theory	Practical	
8.1	Pharmaceutics-VI	80	80	160
8.2	Medicinal Chemistry-IV	80	80	160
8.3	Pharmaceutical Analysis-IV	80	80	160
8.4	Pharmacognocy-VI	80	80	160
8.5	Clinical Pharmacotherapeutics	80	ð	80
8.6	Communication Skill	80	ð -	80
		Total		800

Subject code: 8.1
Subject : Pharmaceutics – VI
THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Prolonged Action Pharmaceuticals:**
Sustained release, Controlled release drug delivery systems: Benefits, limitations, oral products terminology, types and construction of products, evaluation, parenteral products, absorption and evaluation.

2. **Micro-encapsulation:**
Types of microcapsules, importance of micro encapsulation in pharmacy, microencapsulation by Co-acervation phase separation, multi-orifice centrifugation, spray drying, spray congealing, polymerization, air suspension technique, pan coating and other techniques. Evaluation of microcapsules.

3. **Novel Drug delivery systems:**
Transdermal drug delivery systems, Osmotic drug delivery systems, Liposomes,
Nanospheres, Resealed Erythrocytes.

SECTION-B

4. **Design, development and process validation methods:**
   Design, development and process validation methods for pharmaceutical operations involved in the production of pharmaceutical products with special reference to tablets and suspensions.
5. Polymer science and application in formulation design.
6. Stabilization and stability testing protocol for various pharmaceutical products.

Subject code: P-8.1

Subject : Pharmaceutics – VI

PRACTICAL **45 Hours (3 hrs. /week)**

1. Formulation of oral S.R.Products & their evaluation by *in-vitro* dissolution profile.
2. Preparation and evaluation of microcapsules by employing various techniques.
3. Stability evaluation of various dosage forms and their expiration dating.
4. Any other experiments illustrative of the theory of syllabus.

Books Recommended

1. L. Lachman, H. A. Liberman, and J. L. Kanig: Theory and practices of Industrial Pharmacy, 3rd Edition, 1986.
2. M. E. Aulton: Pharmaceutics: The science of dosage form design, ELBS publisher, 1988.
3. Robinson and Lee: Controlled drug delivery: Fundamentals and applications, 2nd Edition, Marcel Dekker, Inc., 1987.
4. J.S Warbrick: Novel drug delivery systems, Vol. 14
5. G.S. Banker and C.T.Rhodes: Modern Pharmaceutics, 2nd Edition, Marcel Dekker, 1990.
6. Remingtonôs Pharmaceutical Sciences, 18th Edition, Mack Publishing Company, 1990.
7. Cooper and Gunnôs Tutorial Pharmacy, 6th Edition, CBS Publishers and Distributors, 1999.
8. N. K. Jain: Advances in controlled and novel drug delivery system, 1st Edition, CBS Publishers and Distributors, 2001.
9. A. Kydonieus: Treatise on controlled drug delivery, Marcel Dekker, Inc., 1991.

10. H. A. Liberman,, L. Lachman, and J. B. Schwartz: Pharmaceutical dosage forms: **Tablets**, Vol. 1,2 and 3, 2nd Edition Marcel Dekke r, 1989.
11. L. Krowezynski: Extended release dosage forms, CRC press, Inc., Boca Raton, 1987.
12. A. L. Brody and K. S. Marsh: Encyclopedia of packaging technology, 2nd Edition, John Wiley and Sons Inc., 1997.
13. P. P. Sharma: How to practice GMPs, 2nd Edition, Va ndana Publications, 1995.
14. J. Swarbrick, and J. C. Boylan: Encyclopedia of pharmaceutical Technology, Vol 1-18, Marcel Dekker, 1988.
15. World Health Organizationôs guidelines on good manufacturing practices and inspection (available at http://www.who.int)
16. ñControlled drug deliveryò (available at NC State Universityôs web sites http://www5.bae.ncsu.edu)
17. S. D. Bruck: Controlled drug delivery, Vol. I and II.
18. Ansel, H.C. ñIntroduction to Pharmaceutical Dosage Formsò, K M Varghese & Co., Mumbai, latest edition.
19. Lachman L, Liberman H.A. & Kanig J.L., ñThe Theory & Practice of Industrial Pharmacyò, Lea & Febiger, Philadelphia.
20. Beans, H.S., Beckett A.H. & Carless, ñAdvances in Pharmaceutical Scienceò
21. Pharmaceutical dosage forms: Tablets volume 1 ï 3 by Liberman and Lachman
22. Pharmaceutical dosage forms: Parenteral medications Vol-1, 2 by Liberman and Lachman.
23. Bentleyôs Textbook of Pharmaceutics.
24. Remingtonôs Pharmaceutical Sciences (RPS).
25. Modern Pharmaceutics by Banker and Gilberts.
26. Hard Capsules by Ridgway. K. Pharmaceutical Press, London.
27. Aulton M.E., Pharmaceutics ï The Science of Dosage form Design, ELBS/Churchill Livingstone.

Subject code: T-8.2

Subject : Medicinal Chemistry-IV

THEORY 45 Hours (3 hrs. /week)

SECTION-A

1. **Principles of Drug Design**
   - **A) Drug Discovery**
     - a) Historical Perspectives
     - b) Drug Discovery strategies in Direct Drug Design (structure based) and indirect drug design
     - c) Target selection and lead identification
       - i) Natural product sources
       - ii) Fermentation / Microbial sources
       - iii) Synthetic
   - **B) QSAR**
     - a) Parameters- Lipophilicity, electronic, steric factors
     - b) Quantitative models
       - i) Hansch Analysis
       - ii) FreeWilson Analysis
       - iii) Mixed approach
       - iv) Other QSAR approaches
     - c) Application of Hansch and Free Wilson Analysis

SECTION-B

2. **A) Enzymes Peptides in drug design**
   - **B) Molecular modeling in drug analysis**

     Introduction to molecular modeling: Concept and methods
     - a) Molecular mechanics- Force fields (Potential energy function)
     - b) Energy minimization methods- steepest, descent, conjugate, gradient, Newton method (Non-mathematical)
     - c) Conformational analysis
       - i) Systematic search
       - ii) Monte carlo simulations
       - iii) Molecular dynamic simulations
   - **C) Ligand design based on 3D structure of receptor / enzyme.**
3. Concept and brief introduction to gene therapy , nucleotidomimetics. (antisense oligonucleotides)
4. Concept and brief introduction to genetic engineering in medicinal chemistry

Subject code: P-8.2

Subject : Medicinal Chemistry –IV

PRACTICAL 45 Hours (3 hrs. /week)

1) Workshop on modeling molecular structure with suitable method
2) Laboratory scale preparation by conventional / microwave synthesis of selected drugs from course content and characterization by melting point / boiling point / thin layer chromatography / ultra-violet spectroscopy / IR spectroscopy
3) Establishing the pharmaceutical standards of drug synthesized
4) Determination of partition coefficient, dissociation constant and molar refractivity of compounds for QSAR analysis

Books Recommended

1. Fundamentals of Medicinal Chemistryï Gareth Thomas, John Wiley & Sons.
2. A Textbook of Drug Design and Development edited by Povl Krogasgaard.
3. Computer ï Aided Drug Design Edited by Thomas J. Perum. C. L. Propst
4. Advanced Computer Assisted Techniques in Drug Discovery by Han Vande Waterbeemd.
5. A Guidebook on Molecular Modeling and Drug Design by Cohen.

Subject code: T-8.3

Subject : Pharmaceutical Analysis-IV

THEORY 45 Hours (3 hrs. /week)

SECTION-A

1. **Quality Assurance**

   Statistics & Statistical quality control: Statistics in Q.C., definition of terms, normal distribution, *t*-test, *f*-test, linear regression, correlation coefficient. Methods of statistical analysis as applied to sampling and interpretation of results, regression lines, sampling procedures. GMP, CGMP, GLP, TQM, quality review and quality documentation. Introduction to various agencies imparting quality standards, ISO 9000, WHO etc.

   Regulatory control, regulatory drug analysis and interpretation of analytical data.

Validation, quality audit: quality of equipments, validation of equipments and validation of analytical procedure. ICH guidelines (need in particular).

2. **Chromatography**

Terminology, retention time and retention volume, adjusted retention volume, specific retention volume, relative retention volume, height equivqlent to theoretical plate (HETP), rate and plate theory, resolution, partition coefficient, classification of chromatography methods.

a) Planer Chromatography

i. **Paper Chromatography:** Theory, development techniques and applications.

ii. **Thin-Layer Chromatography:** Theory, selection of adsorbent, preparation of plates, spotting, development of chromatogram, detection of components, and application.

iii. **HPTLC:** Introduction, theory and applications.

b) Column Chromatography: Theory, column packing techniques, efficiency of column, Van-Deemter equation in detail, capacity factor, & other performance parameter.

i. **Gas Chromatography:** Introduction, carrier gases, columns, injection system, detectors, thermal conductivity detectors (TCD), electron capture detectors (ECD), thermo-ionic detectors (TID), flame ionization detectors (FID), nitrogen-phosphorus detectors (NPD), photo-ionization detector (PID), head space analysis, applications, programmed temperature gas chromatography (PTGC), gas chromatography-mass spectroscopy (GCMS).

ii. **HPLC:** Instrumentation, pumps (reciprocating pumps, displacement & pneumatic pumps), mobile phase reservoirs, solvent temperature systems, isocratic elution, gradient elution, injection system. Detectors: photometric detectors (single wavelength, multi wavelength, variable wavelength, diode array, fluorescence detector), RI detector, electrochemical detector), Columns, Introduction to LC-MS & UPLC.

SECTION-B

1. **Nuclear Magnetic Resonance Spectroscopy (NMR)**
Introduction to NMR, basic principle involved, instrumentation, chemical shift, factors affecting chemical shift, spin-spin coupling, coupling constant, applications, quantitative analysis.
2. **Electron Spin Resonance (ESR)** Introduction, Principal involved, Application.
3. **Mass Spectroscopy**
Principle and Theory, Ion sources, Types of ions & peaks fragmentation patterns, instrumentation, applications, introduction to Mass spectroscopy- mass spectroscopy (MS-MS).
4. **X-ray Diffraction**
Laue Photographic method, Braggôs X-ray spectrophotometry, Rotating crystal methods, powder method.
5. **Radioimmunoassays**
Principle & Application

Subject code: P-8.3
Subject : Pharmaceutical Analysis-IV
PRACTICAL 45 Hours (3 hrs. /week)

List of Experiments :

1. UV spectrophotometric estimations of drug and from their formulations
2. To perform experiments on paper, thin layer and column chromatography.
3. Complete analysis of APIs/Excipients as per I.P.
4. To perform evaluation test of glass container.
5. To determine water vapor transmission of polyethylene bottles.
6. HPLC (Demonstration only)
7. GC (Demonstration only)

Recommended Books

1. D.A.Skoog, D.M.West, F.J.Holler, S.R.Crouch, Fundamentals of Analytical Chemistry, 8th edition, 2004, Thomson Asia Pvt. Ltd.
2. Kenneth A. Connors, A textbook of Pharmaceutical Analysis, 3rd edition, 2002, John Wiley & Sons, New York, USA.
3. F.W.Fifield, D.Kealey, Principles and Practice of Analytical Chemistry, 5th edition, 2000, Blackwell Science, Oxford, U.K.

4. Gary D. Christian, Analytical Chemistry, 6th edition, 2004, John Wiley & Sons, New York, USA.
5. R.A.Day, Jr, A.L.Underwood, Quantitative Analysis, 6th edition, 2001, Prentice Hall of India.
6. Practical Pharmaceutical Chemistry Vol. ï I & II ï 4th Edition ï 1986 ï A.H.Beckett & J.B.Stenlake ï CBS Publishers, New Delhi.
7. A. R. Gennaro, Remington: The Science and Practice of Pharmacy Vol. I & II ï 20th Edition ï 2001 ï Lippincott, Williams & Wilkins, New York, USA.
8. The Indian Pharmacopoeia, Latest Edition, the Controller of Publications, Government of India, New Delhi
9. S.Ahuja, S.Scypinski, Handbook of Modern Pharmaceutical Analysis, 2001, Academic Press, New York, USA.
10. A.V.Kasture, K.R.Mahadik, S.G. Wadodkar, H.N.More, A Textbook of Pharmaceutical Analysis, Vol. I, 6th edition, 2002, Nirali Pprakashan, New Delhi.
11. D.C.Lee, M.L.Webb, Pharmaceutical Analysis, 2003, Blackwell Science, Oxford, U.K.
12. T.Higuchi, E.Brochmann-Hanssen, Pharmaceutical Analysis, 2002, CBS Publishers, New Delhi.
13. Lena Ohannesian, A.J.Streeter, Handbook of Pharmaceutical Analysis, 2002, Marcel Dekker, Inc. New York, USA.
14. P.Parimoo, Pharmaceutical Analysis, 2nd edition, 1991 CRC Press, New York.
15. The Indian Pharmacopoeia, Latest edition, the Controller of Publications, Government of India, New Delhi.
16. The British Pharmacopoeia.
17. The United State Pharmacopoeia.
18. J. Mendham, R.C.Denney, J.D.Barnes, M.Thomas, Vogelôs Textbook of Quantitative Chemical Analysis, 6th edition, 2002, Pearson Education Asia Ltd.
19. D.A. Skoog, F.J. Holler,T.A. Neiman, Principles of Instrumental Analysis, 5th edition, 2003, Thomson Asia Pvt. Ltd.
20. P. A. Sewell and B. Clarke, Chromatographic Separation, AOCL, Wiley.
21. S. Lindsay, High Performance Liquid Chromatography, Analytical Chemistry by Open Learning (ACOL), Wiley.
22. J. E. Willett, Gas Chromatography, Wiley.
23. Veronika Meyers, Practical High Performance Liquid Chromatography

Subject code: T-8.4

Subject : Pharmacognocy-VI

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. Quality control and Standardization of herbal drugs: Importance of standardization of raw materials, extracts and formulations with examples, WHO guidelines for assessment of crude drugs, extracts and medicines. Study of different methods used for standardization of crude drugs and analytical techniques with special reference to newer industrial methods with suitable examples (TLC, HPTLC and HPLC) for determination of chromatographic markers, spectroscopic techniques and assay methods. Standardization of extracts, study of standardization of crude drugs including quantitative microscopy of : Punarnava, Aswagandha, Kalmegh, Brahmi, Phyllanthus, Tinospora cardifolia and ashoka. Determination of heavy metals in herbal preparation and alcohol contents in Aristas and Asavas.
2. Herbal formulations: Alternative system of medicine, Principles involved in Ayurveda, Sidha, Unani, Chinese and Homeopathic system of medicines. Preparation of Ayurvedic formulations like Aristas, Asava, Ghutika, Tailia, Churna, Avaleha, Ghrita and Bhasms; Unani formulations like Majoons, Safoofs.
3. Herbal cosmetics: Introduction and concept of herbal cosmetics in preparation of- Shampoos (Soapnut), conditioners (Amla, Henna, Hibiscus, Tea), hair darkeners (Amla, Henna), skin care (Aloe, turmeric).
4. Neutraceuticals, Herbs as health foods.

SECTION-B

5. Utilization and Industrial Production of Phytoconstituents such as Calcium, Sennosides, Diosgenin, Solasodine, Podophyllotoxin, quinine, ephedrine, Cardiac glycosides, andrographolides, phyllanthin, withanolides.
6. Role of Medicinal and Aromatic Plants in National Economy: Phytopharmaceuticals of commercial significance. A brief account of Plant based Industries & Institutions involved in work on Medicinal & Aromatic plants in India. Utilization & Production of Poppy, Ergot, Cinchona, Ipecac, Tropane Alkaloids, Vinca, Aloes, Senna, Ispaghula, Digitalis, Dioscora & Solanum Khasianum.
7. A brief introduction to Plant bitters and sweeteners.
8. General methods of screening natural products for the following Biological activities- a) Anti-inflamatory Activity. b) Hypoglyceimic.

c) Diuretic. d) Cardiac Activity. e) Hepato protective Activity, f) Anticancer agents.

9. Introduction of WHO guidelines on GMPôS of Herbal medicines.

Subject code: P-8.4

Subject : Pharmacognocy-VI

PRACTICAL **45 Hours (3 hrs. /week)**

1. Macroscopical and microscopical evaluation including Quantitative microscopy.
2. Estimation of secondary metabolites like alkaloids, terpenoids and flavonoids by different methods.
4. Estimation of plant phytoconstituents using modern methods like UV and HPTLC.
5. Extraction and isolation of volatile oils.
6. Extraction and isolation of phytoconstituents (Minimum five).
7. Evaluation of crude drugs as per WHO guidelines.
8. Application of TLC and paper chromatography in phytochemical evaluation of crude drugs.
9. Isolation of known marker compounds by column chromatography (Demonstrative)
10. Systematic analysis of crude drugs from unknown origin.
11. Tissue culture - Preparation of culture media, selection and preparation of ex-plant, callus culture.
12. Chemical evaluation of powdered drugs & Enzymes.
13. Chromatographic studies of some herbal formulations.
14. Review of recent literatures appearing on Phytopharmaceuticals used as antiallergic, antimicrobials, anti-inflammatory, anticancer, antidiabetic, antihepatotoxic and immunomodulators.

Recommended Books

1. Kokate, C.K. Practical Pharmacognosy, Vallabh Prakashan, Delhi.
2. Wallis T.E. Analytical Microscopy, J&A Churchill Ltd, London.
3. Ganborg & Wetter, Plant Tissue Culture Methods, National Research Council of Canada, Saskatchewan.
4. Clarke ECG, Isolation & Identification of drugs. The Pharmaceutical Press, London.
5. Trease, G.E. & Evans, W.C. ñPharmacognosyò Bailliere Tindall East Bourne, U.K.

6. Tyler V.E. etal Pharmacognosy, Lea & Febiger Phjadelphia.
7. Wallis T.E. Text book of Pharmacognosyò J&A Churchill Ltd. London.
8. Qadry J.S., ñ Pharmacognosyò B.S.Shah Prakashan.ò
9. Atal & Kapur, Cultivation & Utilization of Medicinal Plants, RRL, Jammu.
10. Stahl. E, Thin Layer Chromatography. A laboratory handbook, Springer Verlog, Berlin.
11. Street H.E. Tissue Culture & Plant Science, Academic Press, London.
12. Kokate, C.K. Gokhale AS, Gokhale SB, Cultivation of Medicinal Plants, Nirali Prakashan.
13. Clarke ECG, Isolation & Identification of drugs. The Pharmaceutical Press, London.
14. Mohammed Ali,ò Pharmacognosy & Plant Cultivationò.
15. Indian Pharmacopoeia.
16. Indian Herbal Pharmacopoeia.
17. The wealth of India (Raw material & Industrial products)
18. Compendium of Indian Medicinal Plants. Volume-1 to 9.
19. Cultivation & Utilization of Aromatic plants by Atal & Kapoor.
20. Indian Medicinal Plants by Kirtikar & Basu.
21. Photochemistry Prakrukun by Wanger.
22. Natural Products by Ikan R. Israel Uni. Press, Jarusalem,1969.
23. Ayurvedic Pharmacopoeia.
24. WHO guidelines for standardization.

Subject code: T-8.5

Subject : Clinical Pharmacotherapeutics

THEORY **45 Hours (3 hrs. /week)**

SECTION-A

1. **Cardiovascular System:** Hypertension, Congestive cardiac failure, Ischemic heart disease, Arrhythmias, Hyperlipidemias.
2. **Respiratory system:** Asthma, Chronic obstructive airways diseases.
3. **Haematological diseases:** Anemiaôs, drug induced haematological diseases.
4. **Gastrointestinal system:** Peptic ulcer diseases, inflammatory bowel diseases, hepatitis, jaundice & cirrhosis, diarrhoea & constipation, drug induced liver diseases.
5. **Renal System:** Acute and Chronic renal failure, Drug induced renal diseases.

SECTION-B

6. **Endocrine system:** Thyroid disease, Oral contraceptives, Diabeties.
7. **Neuro-psychiatric disorders**: Schizophrenia, depression, anxiety, sleep disorders, drug induced psychosis.
8. **Infectious diseases:** Respiratory tract infections, urinary tract infections, tuberculosis, leprosy, malaria, helmenthiasis, HIV and opportunistic infections, fungal infections.
9. **Toxicology:** General principles of Acute, Sub acute and chronic toxicity. Poison, Types and Classification and General treatment of Poisoning. Signs, Symptoms and treatment of acute and chronic poisoning due to barbiturates, alcohol, Morphine, Insecticide, Snake bite, Heavy metals (Lead, Arsenic, Mercury).

Recommended Books :

1. Bennett P.N, Brown M.J. Clinical Pharmacology Churchill living stone New Delhi.
2. Melmon & Morrelliôs Clinical Pharmacology. Mc-Graw Hill. New Delhi.
3. Craig C.R, Stitzel R.E. Modern Pharmacology with Clinical application, Lippincott Williams & Wilkins, New York.
4. Raymond J.M. Niesink, John de vries. Hollinger M.A. Toxicology-Principle and applications, CRC, Florida
5. Klaassen C.D, Casarett & Doullôs. Toxicology. The basic science of poison Mc-Graw Hill, New Delhi.
6. Remingtonôs Pharmaceutical Science and practice pharmacy. Lippincott Williams and Wilkins, New Delhi.
7. Katzung B.G. Basic & Clinical Pharmacology. Mc-Graw Hill, New Delhi.
8. Clinical Pharmacy & Therapeutics- Eric T Hefindal. Williams & Wilkins Publications.
9. Eric T. Herfindel, Dick. R. Gourley. Textbook of therapeutics, Drug & disease management.
10. Parrthsarthi G, Hansen Kavin Nytort & Nahata Milap C. A Textbook of Clinical Practice: Essential Concepts & skills, Orient Longman.
11. Roger walker, Clive Edwards, Clinical Pharmacy & therapeutics, 3rd International Edition, Churchill Livingstone.
12. Grahame-Smith D.G. & Aronson J.K. Oxford textbook of clinical Pharmacology and drug therapy. Oxford University press London.

Subject code: T-8.6

Subject : Communication skill

THEORY **45 Hours (3 hrs. /week)**

SECTION – A

COMPRENHENSION OVER AN UNSEEN PASSAGE

Comprehension –A word study:-

Synonym,antonym,meanings,matching words,adjectives,adverbs,prefix and correct forms of commonly misspelled words, understanding of given passage.

Comprehension –B word study:-

Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of not only but also, if clause, since, may, can, could, would, too etc.

Active and passive forms, negative and interrogative, punctuatuation and capitalization.

PRINCIPLES OF COMMUNICATIONS

Theoretical background ï importance of communications, its process, model of communication, its process, model of communication its components and barriers

SECTION – B

PRINCIPLES OF COMMUNICATIONS

Verbal communication, its significance, types of written communication and its style organizations of text (Titles summaries, headings .sequencing, signaling, cueing etc.)Important text factors (length of paragraph, sentences, words, clarification and text difficulty).Evaluation of written communication for its effectively and subject content.

ASPECTS OF PROFESSIONAL COMMUNICATION:-

Specific formats for written communication like ï business correspondence, format reports, technical proposals, research papers and articles, advertising and graphics. Format for day - to - day communication like applications,notices,minutes,quotations,orders, enquiries etc.

Types of graphics and pictorial devices.

Oral communication - face to face communication, group discussion and personal interviews.

Methodology of conduction of meeting, seminars, symposia, conference and workshop .

BOOKS RECOMMENDED:

1) Krishna Mohan, Meera Banerjee: Developing communication skills, MacMillan India Limited.
2) Chrissie Wright (Editor): Handbook of practical communication skills, Jaico Publishing House.
3) Curriculum Development Centre ,TTTI WR ,Bhopal : A Course in Technical English,Somaiya Publication Pvt.Ltd.
4) F.Frank Candlin : General English for Technical Students, University of London Press Ltd.
5) Norman Lewis : Word Power Made Easy
6) http://www.teachingenglish.org.uk

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