

BACHELOR OF VOCATION (PHARMACEUTICAL CHEMISTRY)**SYLLABUS FOR GENERAL COMPONENT**

Semester	Course Code	Course Title	General Component	
			Credit	Marks
Semester I	PHA-BV-T101	Pharmaceutics I	04	100
	PHA-BV-T102	General Chemistry I	04	100
	PHA-BV-T103	Human Anatomy and Physiology	04	100
	Total		12	300
Semester II	PHA-BV-T201	General Chemistry II	04	100
	PHA-BV-T202	Fundamentals of Biochemistry	04	100
	PHA-BV-T203	Analytical Chemistry I	04	100
	Total		12	300
Semester III	PHA-BV-T301	Pharmacognosy and Phytochemistry	04	100
	PHA-BV-T302	Pharmaceutics II	04	100
	PHA-BV-T303	Medicinal Chemistry I	04	100
	Total		12	300
Semester IV	PHA-BV-T401	Foundation Course (English)	04	100
	PHA-BV-T402	Microbiology	04	100
	PHA-BV-T403	Medicinal Chemistry II	04	100

	Total		12	300
Semester V	PHA-BV-T501	Foundation Course (Environmental Studies)	04	100
	PHA-BV-T502	Pharmacology I	04	100
	PHA-BV-T503	Analytical Chemistry II	04	100
	Total		12	300
Semester VI	PHA-BV-T601	Foundation Course (Eastern Himalayan Studies)	04	100
	PHA-BV-T602	Pharmacology II	04	100
	PHA-BV-T603	Entrepreneurship Development	04	100
	Total		12	300

B. Voc. Pharmaceutical Chemistry
Semester I
BVPC 101: Pharmaceutics I

COURSE OBJECTIVES:

1. To make student understand the different dosage forms and routes of administration.
2. To understand the important physical properties of compounds and its impact in preparation and stability of drug formulation.
3. To understand the common processes used in manufacturing of drug formulations.
4. To make student learn the basic calculations, a pharmaceutical chemistry professional is expected to do in his/her professional life.

Unit – 1

Introduction to Different dosage forms: Classification as per Routes of administration, physical state (solid, liquid, semisolids, and inhalations).

Environmental control in Pharmaceutical Industry (Air, Water, Humidity and Temperature)

Packaging materials: Containers and Closures, Types of Glass.

Unit – 2

Modes of Heat Transfer: (Conduction, Convection, Radiation, Induction)

Brief about: Evaporation, Distillation, Precipitation, Crystallization, Filtration and techniques of filtration.

States of Matter: Solid, Liquid, Gas, Amorphous, Polymorphism and pseudo polymorphism, Glassy state, Hygroscopic, Efflorescent, Deliquescent.

Buffers and Buffer capacity, Viscosity and viscometers.

Units – 3

Pharmaceutical calculations

Posology, Factors affecting drug dose, Alligation, Alcohol Calculations, Percent calculations, Calculation of doses of infants, adults and elderly Isotonicity, Displacement Value, Molar concentration, parts per million (ppm), Dilutions and types of dilution.

Units – 4

Practical (*Any four*)

1. Preparation of syrup IP.
2. Preparation of emulsion.
3. Preparation of suspension.
4. Preparation of buffers and determination of buffer capacity.
5. Determination of viscosity.
6. Preparation of syrup: simple syrup IP.
7. Preparation of suspension: calamine lotion.
8. Preparation of mouth wash: antiseptic mouthwash.

Recommended Books for the syllabi are:

1. A.J. Winfield, J. A Rees, I. Smith, Pharmaceutical Practice, 4th editions, Elsevier publication. Don A.B. and T.W G. Pharmacy Calculations, CBS Publisher
2. Cooper and Gunn's, Dispensing for Pharmaceutical students, ed. S.J. Carter, 12th edition. CBS Publisher.
3. Judith A. R Ians et al. Introduction of Pharmaceutical Calculations, Pharmaceutical Press.
4. C.V.S, S. Pharmaceutical engineering, Principles and Practice, Vallabh Prakashan.
5. K.S. Pharmaceutical Engineering New age International publisher.
6. P., M. Elementary Chemical engineering, Tata Mac GrawHill.

B. Voc. Pharmaceutical Chemistry

Semester I

BVPC 102: General Chemistry I

COURSE OBJECTIVES:

1. To learn fundamentals of chemical bonds, stereochemistry.
2. To learn basic chemical functional groups of compounds with respect to their physical and chemical properties.
3. To learn the simple organic chemical reactions.
4. To identify organic compounds by testing their physical and chemical properties.

Unit – 1 (Organic)

Molecular orbitals, Bonding and Antibonding orbitals, Covalent bond, Hybrid orbitals, Bond dissociation energy, Polarity of bonds, Polarity of molecules, Structure and physical properties, Intermolecular forces, Intramolecular forces, Atomic orbital, Hybridization, Sigma and pi bonds, Conjugation, Bond length and Bond energies. Structure, Nomenclature, Preparations and Reactions of: Alkanes, Alkenes, Alkynes; Cycloalkanes, Dienes, Benzene, polynuclear aromatic compounds, Alkyl halides, Alcohol, Ethers, Epoxides, Amines, Phenols, Aldehydes and Ketones, Carboxylic acids, carbocations, carbanions, carbenes, nitrene and nitrenium ions.

Unit-2 (Inorganic)

A. Acids and bases-acid base theory, specification of acidity and basicity, inorganic acid (boric acid HCL, HNO₃, H₃PO₄), inorganic acids (H₂SO₄), inorganic bases (strong ammonia solution, calcium hydroxide, KOH, Na₂CO₃, NaOH, soda lime).

B. Buffers- theory and mechanism, pharmaceutical buffer selection, pharmaceutical buffer system, preparation of pharmaceutical buffer.

C. Antioxidant- theory, the selection of antioxidants, antioxidants (hypophosphorous acid, sodium bisulphite, sodium thiosulphate, sodium nitrite, nitrogen).

D. Pharmaceutical accepted glass-chemistry of glass, types of test employed for glass.

E. Water: purified water, water of injection, bacteriostatic water for injection, sterile water for injection.

Unit- 3 (Physical)

Gaseous and Solid State Chemistry, Behaviour of Gases: Kinetic theory of gases, deviation from behaviours and explanation. Solid State: Crystalline structures, lattices, physical properties, Bragg's law, Miller indices, Adsorption: Freundlich and Gibbs adsorption isotherms, Langmuir theory of adsorption.

The Liquid State: Physical properties (surface tension, viscosity, refractive index, optical rotation, dipole moments and chemical constituents). Solutions: Ideal and real solutions, solutions of gases in liquids, colligative properties, partition coefficient, conductance and its measurement, Debye Huckel theory.

Unit 4

Practical (*Any four*)

1. Synthesis and characterization of Aspirin.
2. Identification of functional group.
3. Limit test for chloride.
4. Demonstration of Paper Chromatography.
5. Synthesis of benzamide from benzoyl chloride.
6. Limit test for sulphate
7. Essay of hydrogen peroxide.
8. Synthesis of p-bromo aniline from p-bromo acetanilide.
9. Essay of zinc oxide.
10. Preparation and standardization of normal and molar solutions (acid/base).

Recommended Books for the syllabi:

1. B.S. Bahl G.D. Tuli, Arun Bahl, Essentials of Physical Chemistry, Reprinted 24th Edition, S. Chand and Company Ltd. New Delhi, 2004.
2. L.M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry, 8th Edition, Oxford University Press, Bombay, 1994.
3. S. Glasstone, Textbook of Physical Chemistry, 2nd Edition, Rajiv Beri for Macmillan India Limited, New Delhi, 1995.
4. J.B. Yadav, Advanced Practical Physical Chemistry, 15th Edition, Goel Publishing House, Meerut, 1997.
5. W.J. Moore, Physical Chemistry, 5th Edition, Orient Longman Pvt. Ltd., New Delhi, 2004.
6. I. Das, A Sharma, N.R. Agrawal, An Introduction to Physical Chemistry, Revised 2nd Edition, New Age International Publishers, New Delhi, 2005.
7. B. Viswanathan, P.S. Raghwan, Practical Physical Chemistry, 1st Edition, Viva Books Pvt. Ltd., 2005.
8. D.P. Shoemaker, C.W. Garland, J.W. Nibler, Experiments in Physical Chemistry, 5th Edition McGraw Hill International Edition, New York, 1989.
9. S. Glasstone, D. Levis, Elements of Physical Chemistry, 2nd Edition, Macmillan and Company Limited, 1970.
10. R.M. Verma. A Textbook of Physical Chemistry, Volume – I & II, 1st Edition, CBS Publishers and Distributors, Delhi, 1992.
11. P.W. Atkins, Physical Chemistry, 5th Edition, Oxford University Press, UK, 1994.
12. P.S. Rachavan, M.S. Shethi, Concepts and Problems in Physical Chemistry, 1st Edition, Discovery Publishing House, New Delhi, 1997.
13. A.W. Adamson, Physical Chemistry of Surfaces, 5th Edition, A Wiley Interscience Publication, New York, 1990.
14. C.K. Vemulapathi, Physical Chemistry, 1st Edition, Prentice-Hall of India Pvt. Ltd. New Delhi, 1997

15. C.R. Metz, Schaum's Solved Problems Series, 2000 solved problems in Physical Chemistry, 2nd Edition, McGraw Hill Publishing Company, USA, 1989
16. R. Chang, Physical Chemistry with Applications to Biological Systems, 2nd Edition, Macmillan Publishing Co., New York, 1981.
17. Prof. S.K. Dutta, Principles of Physical Chemistry and Biophysical Chemistry, 1st Edition, Books and Allied .1. Morrison & Boyd, Organic Chemistry , Prentice-Hall, 6th Ed. 2001.
18. March J. Advanced Organic Chemistry, MacGraw-Hill, 3rd Ed., 1985.

Reference Books:

1. Solomon & Fryhle, Organic Chemistry, Wiley, 8th 2004.
2. Shriner & Morill, The systematic Identification of Organic Compounds, Wiley, 8th 2004.
3. Furniss, Vogel's Textbook of Practical Organic Chemistry, Pearson education, 5th 2004.
4. Eliel E, Stereochemistry of Carbon Compounds, McGraw-Hill, 7th 1962
5. Eliel E, Elements of Stereochemistry, Wiley, 3rd, 1969.
6. Cahn & Dermer, Introduction to Chemical Nomenclature, Butterworths, 3rd, 1979.
7. Warren S, Organic Synthesis-The disconnection approach, Wiley, 4th, 1982
8. Wheland G Advanced Organic Chemistry, Wiley, 3rd, 1960
9. Kagan H. Organic Stereochemistry.

B. Voc. Pharmaceutical Chemistry

Semester I

BVPC 103: Human Anatomy and Physiology

COURSE OBJECTIVES:

1. To understand structure and functions of each body components from cellular level to system level.
2. To understand how functions of each cell is integrated to make the entire body function with complete co-ordination.
3. To understand the various diseases related to disturbances in the body function.
4. To learn fundamentals of health, various dimensions of health, understanding of basic terminologies.

Unit – 1

- a) Introduction & Scope of Human Anatomy & Physiology, Basic terminology used in these subjects.
- b) Structural & functional organization of cell, its components and functions, Body fluids & its composition. Transport mechanisms across the cell membrane, Cell cycle.
- c) Elementary tissues of the human body: Epithelial, connective muscular and nervous tissues, their sub-type and characteristics.
- d) Sense Organs: Basic anatomy and physiology of the eye (vision), ear(hearing), taste buds, nose (smell) and skin (superficial receptors).

Unit – 2

- a) Osseous system: structure, composition and functions of skeleton, classification of joints, types of movements at joints, Disorders of joints.
- b) Skeletal muscles: Their gross anatomy, physiology of muscle contraction.
- c) Central Nervous System: Functions of different parts of brain and spinal cord, Neurohumoral transmission in the Central Nervous System, reflex action, electroencephalogram, Physiology and functions of the autonomic nervous system.
- d) Respiratory system: Anatomy of respiratory organs, functions of respiration, mechanism and regulation of respiration, respiratory volumes and capacity.
- e) Digestive System: Gross anatomy of the GIT with special reference to liver. Digestion of protein, carbohydrate, and fat.

Unit – 3

- a) Haemopoietic system: Composition and function of blood, blood groups and their significance, mechanism of coagulation, formation of lymph and its composition. Reticulo-endothelial system and its function, blood disorder.
- b) Cardiovascular system: Anatomy and physiology of heart, blood circulation and cardiac cycle, blood pressure regulation and maintenance, ECG and heart sounds. CVS disorders
- c) Urinary system: Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid base balance.
- d) Reproductive system: Male and Female reproductive system and their hormones. Physiology of menstruation, coitus and fertilization.
- e) Endocrine System: Basic anatomy and physiology of pituitary with relation to hypothalamus (HPA axis), thyroid, adrenal and pancreas.

Unit – 4

Practical (*Any four*)

1. Study of different anatomical terminology of human body.
2. Study of different parts and SOP of compound microscope.
3. Study of various tissue permanent slides.
4. Determination of Haemoglobin content of blood.
5. Determination of blood group.
6. RBC count.
7. WBC count (Total Leukocyte Count).
8. Differential Leukocyte Count (DLC)
9. Determination of bleeding time and clotting time.
10. Determination of blood pressure.

Recommended Books for the syllabi:

1. Anne M.R. Agur & Ming J. Lee: Grant's Atlas of Anatomy, Lippincott, Williams and Wilkins B.D.
2. Chaurasia's Human Anatomy (3 Volumes) CBS Publishers & Distributors.
3. B. Young, J. W. Heath: Wheater's functional Histology-a Text and Colour Atlas, Churchill Livingstone.

4. Human anatomy and Physiology-I, Dr N.B. Sridhara Murthy, Sowmya B.A ,(Nirali Prakashan)
5. Human anatomy and Physiology-II, Dr Mahesh Prasad et. al: (Nirali Prakashan)
6. Bullock B.L. & Henze R.L. Focus on Pathphysiology, Lippincott Chatterjee, C.C. Human Physiology (Medical Allied Agency, Calcutta)
7. Basic anatomy and physiology, N.Muruges, (Sathya publishers)
8. Human anatomy and physiology, Dr. S. B. Bhise, Dr A. V. Yadav,(Nirali Prakashan)
9. Chummy S. Sinnatamby: Last's Anatomy – Regional and Applied, Churchill Libingstone.
10. Remedial Biology, Natural sciences, Dr Kuntal Das, (Nirali Prakashan)
11. Gandhi, T.P. et. al: Human Anatomy, Physiology & Health Education (B.S. Shah Prakashan, Ahmedabad).
12. Garg K et. al: A Text Book of Histology (CBS Publishers, New Delhi).
13. Ghai, C.L.: A Text book of practical physiology (Jaypee Brothers Medical Publisher).

B. Voc. Pharmaceutical Chemistry

Semester II

BVPC 201: General Chemistry II

COURSE OBJECTIVES:

1. To learn the structure, preparation, properties and uses of various inorganic compounds.
2. To learn the simple organic reaction.
3. To quantify these physical properties and methods to alter the same so as to avail desired levels.

Unit-1(Organic)

Stereochemistry: Isomerism and nomenclature and associated physiochemical properties, optical activity, stereoisomerism, specification of configuration, Reactions involving stereoisomers, chirality, chiral reagents conformations, stereochemistry of specific reactions and intermediates, Stereoselective and stereospecific reactions, Nucleophilic and electrophilic aromatic reactions. Relation between Kinetics and mechanism of SN1 and SN2 reactions, stereochemical implications

Factors affecting nucleophilic substitution reactions:-

- a. Effects of solvent.
- b. Effect of structure.
- c. Effect of nucleophile.
- d. Effect of leaving group.
- e. Application of these in preparation and reactions of alkyl halides, alcohols.
- f. Nucleophilic substitutions at aryl carbon atom.
- g. Elimination reactions.
- h. Elimination reaction & factors effecting it
- i. E1, E2 and E1 (cb) mechanism.
- j. Orientation in E1 and E2 (Saytzeff and Hoffmann rule).
- k. Elimination versus substitution symmetry conservation of orbital symmetry and rules Electrocyclic, cycloaddition and sigmatropic reaction neighbouring group effect, transition metal complexes as catalyst for organic reactions.

Unit- 2 (Inorganic)

Diagnostic drugs, pharmaceutical necessities- preservatives, complexation and chelation-application in pharmacy, sources of impurities and their control, limit test for iron, arsenic, lead, heavy metals, chloride and sulphate: Gastrointestinal agents (Acidifying agents: dilute hydrochloric acid; sodium bicarbonate, aluminium hydroxide gel, aluminium phosphate: Saline cathartics: sodium potassium tartarate and magnesium sulphate. An outline methods of preparation, uses, sources of impurities, test of purity and identification and special tests, if any, of the following classes of inorganic pharmaceuticals included in IP 96, gases and vapours inhalants (oxygen), anaesthetics (nitrous oxide), topical agents-protective (calamine, titanium dioxide, talc, kaolin), astringent (zinc oxide, zinc sulphate) and anti- infective (boric acid, H₂O₂, iodine, povidone iodine, potassium permanganate, silver nitrate.).

Unit- 3 (Physical)

Thermodynamics

First, second and third laws, zeroth law, absolute temperature scale, phase euquilibria and phase rule.

Chemical Kinetics: Zero, first and second order reactions, complex reactions, theories of reaction kinetics, characteristics of homogeneous and heterogeneous catalysts, acid base and enzyme catalysis.

Photochemistry: Consequences of light absorption, Jablenski diagram, Lambert-Beer Law, Quantum efficiency.

Unit- 4

Practical (Any four)

1. Determination of viscosity and specific gravity of a liquid.
2. Determination of surface tension of a liquid.
3. Study of the effect of temperature on viscosity and surface tension of the given liquid.
4. Validation of Freundlich and Langmuir adsorption isotherm using charcoal and acetic acid.
5. Preparation and standardization of normal and molar solution of NaOH.

6. Preparation and standardization of normal and molar solution of hydrochloride acid.
7. To determine normality, molarity, %, w/v, and gm/litre of any solution.
8. Standardization of analytical weights and calibration of volumetric apparatus.
9. Non-aqueous titrations: preparation and standardization of perchloric acid and sodium/potassium/lithium methoxides solutions; Estimations of some Pharmacopoeial products
10. Paper chromatography of red and blue ink.

Recommended Books for the syllabi:

1. GR Chatwal, Pharmaceutical Chemistry-Inorganic, volume-1, 2nd edition, Himalaya Publishing House, Mumbai, 2005.
2. G. Svehal, Vogel's Qualitative Analysis, 6th edition, Orient Longman Pvt. Ltd, New Delhi, 1994.
3. Dr.A.V Kasture, De. S.G. Wadodkar, pharmaceutical chemistry-I, 1st edition, Nirali Prakashan, Pune, 1993.
4. A.H. Backett, J.b. Stenlake, Practical Pharmaceutical Chemistry, first Indian edition, CBS Publishers, Delhi, 1987, page 13 and 114.
5. B.S. BAHU (S.CHAND)-Physical Chemistry.
6. S.M.Muherji (Organic Chemistry).

B. Voc. Pharmaceutical Chemistry

Semester II

BVPC 202: Fundamental Biochemistry

COURSE OBJECTIVE:

1. To learn the structure and function of various biological macromolecule.
2. To learn the basic metabolic process occurs within the human body.

Unit – 1

Carbohydrates

Nomenclature, structure, classification and biological significance of carbohydrates. Metabolism: Glycolysis, TCA cycle. Biological oxidation: Electron Transport Chain and Oxidative phosphorylation.

Unit – 2

Lipids and Nucleic acids: Definition, structure, classification and function of lipid. Fatty acids, Triacyl glycerols, glycerophospholipids, sphingolipids, steroids and other biologically important lipids. Oxidation of fatty acids.

Nucleic acids, types, composition, structure and functions. Central Dogma of molecular genetics; DNA replication, transcription and translation (schematic representation only).

Unit – 3

Proteins and Enzymes

General structure and classification of amino acids. Structure of protein; primary, secondary, tertiary and quaternary structure. Enzyme: function of enzyme, classification of enzyme, mechanism of action, enzyme kinetics, enzyme inhibition. Enzymes and iso enzymes in clinical diagnosis. Coenzyme classification, role of vitamin as coenzyme, biological significance, metal as coenzyme and its biological significance.

Unit – 4

Practical (*Any four*)

1. Qualitative identification of carbohydrates, proteins and fats.
2. Preparation of sodium phosphate buffer, potassium phosphate buffer, phosphate buffered saline.
3. Determination of pH.
4. Determination of pKa value of L-cysteine
5. Determination of isoelectric point
6. Preparation and standardisation of normal and molar solution of acid and base.
7. Estimation of protein.
8. Separation of amino acids by TLC.

9. Analysis of fatty acid

Recommended books for the syllabi:

1. Dr. U. Satyanarayana, Biochemistry, 2nd edition, Books and allied (P).2004.
2. A.White Philip Handler, E.L. Smith, R.L. Hill Lehman, Principles of Biochemistry, 6th Edition, Tata McGraw Hill Publishing Company Ltd., 2004.
3. D.L. Nelson, M.M. Cox, Lehninger Principles of Biochemistry, 4th edition, W.H, Freeman & Company, 2005.
4. P.C. Champe, R.A. Harvey, Biochemistry, 2nd edition, Lippincott-Raven Publishers, 1994
5. R.K. Murray, D.K. Granner, P.A. Mayes. V.W. Rodwell, Harper's Illustrated Biochemistry, 26th edition, McGraw Hill Publisher, 2003.
6. W.H. Elliott, C.C. Elliott, Biochemistry & Molecular Biology, 1st edition, Oxford University Press, 1997.
7. G.L. Zubay, W.W. Parson, D.E Vance, Principles of Biochemistry, 1st edition, WCB publishers, 1995.
8. E.E. Conn and P.K. Stumpf, G. Vruening. R.H. Doi, outlines of Biochemistry, 5th edition, John Wiley& Sons, New York 1999.
9. D.B. Marks, Board Reviw series, Biochemistry, 2nd edition, Harwal Publishing, 1994.

B. Voc. Pharmaceutical Chemistry
Semester II
BVPC 203: Analytical Chemistry I

COURSE OBJECTIVES:

1. To make student learn the basic principles of various analytical techniques commonly used in Quality control department of any Pharmaceutical industry.
2. To provide the hands-on-on experience by actually conducting these assays in the lab.

Unit – 1

Introduction to Pharmaceutical Analysis: Errors and its types, Accuracy, precision, Linearity, LOQ and LOD, Standard Deviation, Co-efficient of Variance, Confidence Limit

Unit – 2

Volumetric Analysis or Titrimetric Analysis:

Non-Aqueous Titration- Introduction and types of solvents (Aprotic, Protogenic, Protophilic, Amphiprotic solvents). Method of determining end point, applications, Non – aqueous titration with acid and base.

Acid-base Titration- Common ion effect, Henderson Haselbalch Equation.

Redox Titration- Principle, Cerric Ammonium sulphate (CAS), Indicators used, and Applications. Precipitation Titration.

Complexometric titration-Introduction, Complexing agent, end point determination, types of complexometric titration and applications.

Diazotisation Titration: Principle, Procedure, Types and application. Primary and secondary standards

Units – 3

Potentiometry – Introduction, Nerst equation, Reference electrodes, Indicator electrodes, Memberane/Ion selective electrodes, Measurement of emf and pH, Application of Potentiometry.

Conductometry – Introduction, Measurement of conductivity, Determination of cell constant.

Nephelometry and Turbidometry – Introduction, Principle, Choice of method, Factors responsible for producing uniform turbidity. Factors responsible for intensity of scattered radiation. Instrumentation, Pharmaceutical Applications.

Units – 4

Practical (*Any four*)

1. Handling of Analytical Balance and calibration of fractional weights.
2. Determination of normality, molarity and molality.
3. Preparation and standardization of 0.1N NaOH.
4. Assay of Aspirin.
5. Preparation and standardization of 0.1N HCL.
6. Assay of Sodium Hydroxide IP.
7. Preparation and standardization of 0.1N Potassium Permanganate solution.
8. Preparation and standardization of 0.1N Sodium Thiosulphate solution.
9. Determination of conductivity of a salt solution.
10. Acid base titration.
11. Determination of iodine in salt.

Recommended Books for the syllabi:

1. Dr. A.V. Kasture, Dr. K.R. Mahadik, Dr. S.G. Wadodkar, Dr. H.N. More, A Textbook of Pharmaceutical Analysis, Volume – 1, 8th Edition, Nirali Prakashan, Pune, 2002.
2. R.A. Day and A.L. Underwood, Quantitative Analysis, 6th Edition, Prentice-Hall of India Pvt. Ltd. New Delhi, 1993.
3. K.A., Connors, A Textbook of Pharmaceutical Analysis, 3rd Edition. John Wiley & Sons. New York 1982.
4. J.H. Kennedy, Analytical Chemistry [principles, 2nd Edition, Saunders College Publishing, New York 1990.

5. D.A. Skoog, D.M. West, F.J. Holler, Fundamentals of Analytical Chemistry, 7th Edition Saunders College Publishing, New York 1996.
6. The India Pharmacopoeia 2007, Volume – I, II & III, Controller of Publication, 2007.
7. R.M. Verma, Analytical Chemistry, 2nd Edition, CBS Publishers, New Delhi, 1991.
8. S.M. Khopkar, Basic Concepts of Analytical Chemistry, 2nd Edition, New Age International Publishers, New Delhi, 1998.
9. Textbook of Pharmaceutical Analysis, S. Ravi Shankar, 3rd Edition, Rx publications.

B. Voc. Pharmaceutical Chemistry

Semester III

BVPC 301: Pharmacognosy and Phytochemistry

COURSE OBJECTIVES:

1. To learn general morphological and microscopical characters of crude drugs.
2. To understand general methods of checking purity of herbal drugs.
3. To understand and learn the importance of phytochemicals as medicine and the methods used for extraction and identification of secondary metabolites.

Unit-1

Introduction to Pharmacognosy

Definition, scope, history and development of Pharmacognosy. Sources and classification of crude drugs, cultivation, collection, processing and storage of crude drugs, importance and factors influencing cultivation of medicinal plant, quality control of crude drugs, adulteration and evaluation.

Unit- 2

Plant tissue and morphology

Plant tissue of simple and complex and tissue system, morphology of root, stem, bark, wood, leaf, flower, fruit and seed, modification of root, stem and leaf, histology of root, stem and leaf.

Unit-3

Secondary Metabolites – Definitions and classifications.

Basic principle of extraction. Different methods employed for extraction. Different type of extracts and their preparations. Factors affecting the extraction process. Extraction and

pharmacological properties of Taxol and Opium. Phytochemical screening of alkaloids, saponins, steroid, flavonoids, tannins, resins, anthraquinones, volatile oil, glycosides, carbohydrates, proteins and fats in different extracts. General methods for separation and isolation of phytoconstituents.

Unit-4

Practical (*Any four*)

1. Microscopic examination of root, stem and leaf (monocot plant).
2. Microscopic examination of root, stem and leaf (dicot plant).
3. Preparation of herbarium sheets.
4. Preparation of extract.
5. To perform qualitative phytochemical tests of the extract.
6. To perform the TLC of given sample.

Recommended books for the syllabi:

1. Pharmacognosy: C.K. kokate, A.P. Purohit, S.B. Gokhale, Nirali Prakashan, Pune, 39th edition, 2007.
2. Trease and Evan's Pharmacognosy: W.C Evans, W.B. Saunders Co, Singapore, 15th edition 2008.
3. Pharmacognosy and pharmacobiotechnology, Ashutosh Kar, New Age International Pvt. Ltd. Publishers, 2nd edition,2007.
4. Textbook of Pharmacognosy, Mohammed Ali, CBS publishers.
5. A Text Book of Pharmacognosy: C.S Shah, J.S Quadry, B.S Shah Prakashan, Ahemedabad, 8th edition,1990.
6. Herbal Drug Technology, Second Edition, Agrawal & Paridhavi
7. Pharmacognosy, N.M Patel,V.C Jain, Atul Kabra, Pee Vee(regd.)
8. Textbook of Pharmacognosy, Fifth Edition, T.E. Wallis
9. Experimental Phytopharmacognosy, Dr. S.S. Khadabadi, Nirali prakashan.
10. Pharmacognosy and phytochemistry, part I and II, Vinod D. Rangari, Carrier Publications, 1st edition, Reprint, 2007.
11. Pharmacognosy V.E. Tylar, L.R. Brady, J.E. Habbers, Lea and Febgir Philadelphia, 8th edition, 1981.

12. Mukherji P.K, Quality control of Herbal Drugs, Busines Horizon Pharma, Publishers, 1st edition, 2002.
13. Essentials of Pharmacognosy, S.H Ansari, Birla Publications Pvt. Ltd, 1st edition, 2005-2006.

B. Voc. Pharmaceutical Chemistry

Semester III

BVPC 302: Pharmaceutics II

COURSE OBJECTIVES:

1. To understand the important physical properties of compounds and its impact in preparation and stability of drug formulation
2. To understand the common processes used in manufacturing of drug formulations and equipments used for manufacturing process.
3. To get knowledge about drug delivery systems.

Unit – 1

Rheology: Reynold's no., and its importance. Types of flow-Laminar flow, Intermediate flow, Turbulent flow. Newtonian and non-Newtonian flow, Thixotrophy, importance of types of flow in pharmaceutical processing.

Micrometrics: Particle size characterization and instrumentation.

Surface and interfacial phenomenon: surface tension and surfactant.

Adsorption: Types, factors affecting adsorption. Kinetics rates and order of reaction.

Solubility: Factors affecting solubility, bioavaibility, drug release in biological system.

Unit – 2

Tablets: classification, excipients, granulation, compression, coating, problems in tablet and film defects.

Some machines and equipment's for tablet processing.

Friability test, Disintegration test and Dissolution test.

Capsules: Types, capsule filling machines, gelatine and its type, microencapsulation.

Units – 3

Introduction to drug delivery systems

Fast dissolving tablets, effervescent tablets, oral films. Brief about: Oral controlled drug delivery system, Mucoadhesive drug delivery system, Colon specific drug delivery system, Transdermal drug delivery system.

Units – 4

Practical (*Any four*)

1. Performs dissolution of some tablets samples.
2. Performs disintegration of some tablets samples.
3. Determine the flow property of any sample by angle of repose.
4. Perform the friability test of any sample.
5. Formulation of various tablets.
6. Formulation of creams.

Recommended books for the syllabi:

1. C.V.S, S. Pharmaceutical engineering, Principles and Practice, VallabhPrakashan.
2. K.S. Pharmaceutical Engineering New age International publisher.
3. P., M. Elementary Chemical engineering, Tata MacGraw Hill.
4. Physical Pharmacy By Alfred Martin
5. Physical pharmaceutics, E. Shotton, Indian edition, oxford press.
6. Physicochemical principles of pharmacy, 5th edition, Alexander T. Florence and David Attwood., Pharmaceutical press.

B. Voc. Pharmaceutical Chemistry

Semester III

BVPC 303: Medicinal Chemistry-I

COURSE OBJECTIVE:

1. To learn the structure, structure activity relationship, physicochemical properties and therapeutic uses of drugs belonging to various therapeutic classes.

Unit-1

Chemical naming, structure activity relationship, physicochemical and steric, aspects, mode of action and use of:

a. General anaesthetic agents: Introduction, medicinal aspects of anaesthetics, mode of action, gases and volatile liquid anaesthetics, intravenous anaesthetics of fixed anaesthetics, toxicity of general anaesthetics (divinely ether, ethyl chloride, cyclopropane, thiopentone sodium, ketamine).

b. Local anaesthetic agents: introduction, SAR, benzoic acid derivatives, aminobenzoic acid derivatives. Lidocaine derivatives, miscellaneous, toxicity, mode of action (benzocaine, procaine hydrochloride, mepivacaine, lidocaine, cinchocaine hydrochloride).

c. Sedatives hypnotics: introduction, classification, SAR, barbiturates, amides and imides, alcohols and their carbamate derivatives, aldehydes and their derivatives, mode of action, pharmacologitone sodium, thiopentone sodium) non barbiturates (official drugs).

d. Anticonvulsants: Introduction, classification of epilepsy, SAR, barbiturates (official drugs) hydantoin, oxazolidinediones, succinamides, miscellaneous dregs, phenytoin sodium, troxidne.

Unit –2

Chemical naming, structure activity relationship, physicochemical and steric aspects, mode of action and uses of:

a. CNS stimulants: CNS stimulants of natural origin, synthetic CNS stimulants (nikethamide, methylxanthines and modified methylxanthines (theophylline)).

b. Psychopharmacological agents: antipsychotics, phenothiazines(chlorpromazine, trifluoperazine, butyrophenones, miscellaneous), antidepressants- TCA (amitriptyline), MAO inhibitors, atypical antidepressants, anti-anxiety drugs-meprobamate and related drugs, benzodiazepines (diazepam).

c. Hallucinogens: hallucinogenic agents related to indoles, phenethylamines, cannabinoids.

d. Diuretics: Carbonic anhydrase inhibitors (acetazolamide and dichlorphenamide), Thiazides and related drugs (bendrofluzide), High ceiling diuretics, aldosterone antagonists, other potassium sparing diuretics, osmotic diuretics.

Unit-3

a. CVS agents: introduction, cardiac glycosides, SAR, mechanism of action, toxic effects, etiology antihypertensive agents- ganglion blocking agents, antiadrenergic agents, drugs acting directly on smooth muscles, drugs acting in CNS (propranolol) antianginals and vasodilators- esters of nitrous and nitric acid, side effects (nitroglycerine), antiarrhythmic and antifibrillatory drugs classification of antiarrhythmic drugs, mechanism of action, side effects antilipemic drugs, promethazine).

b. Steroids: Introduction, Nomenclature, Stereochemistry, simple reactions of cholesterol, classification of sterols, sex hormones, cardiac glycosides. Bile acids, saponins.

Unit-4

Practical:

Synthesis of any four drugs as indicated in theory.

Recommended Books for the syllabi:

1. Wilson and Gisworld's textbook of Organic, medicinal and Pharmaceutical Chemistry, J.N Delagado and W.A.R Remers, Eds, J. Lipponcott Co Philadelphia.
2. Principles of medicinal chemistry by W.C Foye, Lea &Febiger, Philadelphia.
3. Burger's Medicinal Chemistry, H.E Wolff, Ed, John Wiley & Sons, New York Oxford university press, oxford.
4. Singh and Kapoor "A text book of pharmaceutical and medicinal chemistry" Vallabh Prakashan, New Delhi.
5. Strategies for Organic drugs Synthesis & design by Daniel Lednicer, Johawiley & sons., USA
6. Organic Chemistry by L. Finar, vol. I & II, ELBS Longman, London.
7. Kar, A medicinal chemistry, New Age international Publication, New Delhi, 2007.
8. Ladu, B.N., Mandel H.G & E.L Way, Fundamentals of drug metabolism & disposition, William & Wilkins Co. Baltimore.
9. Taylor, J.B and Triggle, D.J comprehensive Medicinal Chemistry II, vol. 1-8, Quantita.

B. Voc. Pharmaceutical Chemistry
Semester IV
BVPC 401: Foundation Course (English)

Sikkim University approved syllabi for Foundation Course (English)

B. Voc. Pharmaceutical Chemistry

Semester IV

BVPC 402: Microbiology

COURSE OBJECTIVES:

1. This course will cover topics of importance and scope of microbiology; increase the understanding of relationships of microbes to human health and diseases and also to learn the means of control and treatment.
2. To learn the basics of handling of microorganism, sterilization techniques and microbial identification.

Unit-1

Introduction to Microbiology

Scope of microbiology, classification of microbes. identification of microbes: staining techniques, microscopy. Nutrition, growth, cultivation, isolation and identification of bacteria, actinomycetes, fungi, viruses.

Unit-2

Control of microbes by physical and chemical methods:

Disinfection, factors influencing disinfectants, dynamics of disinfection, disinfectants, antiseptics and their evaluation.

Sterilization: different methods, validation of sterilization methods and equipments, sterility testing of pharmaceutical products, clean area classification, validation of aseptic room.

Preservative efficacy, Microbial assay of antibiotics and vitamin B12.

Unit-3

Immunology

Immune system, cellular and humoral immunity, antigen-antibody reactions and their applications, hypersensitivity, active and passive immunization products, their preparation, standardization and storage.

Unit-4

Practical (*Any four*)

1. Demonstration of the instruments commonly used in microbiology laboratory.

2. Sterilization and disinfection methods.
3. Preparation of various growth media.
4. Isolation of microorganism by serial dilution technique.
5. Isolation of pure culture by streak plate, pour plate and spread plate techniques.
6. Sub culturing of microorganism by different methods: slants, stabs, culture plate techniques.
7. Staining techniques (Simple staining, Gram Staining).
8. Microscopic examination of bacteria.
9. Antibiotic susceptibility test.
10. Determination of Minimum inhibitory concentration.

Recommended books for the syllabi:

1. G. gunnz & S.J. Carter “cooper & gunn’s tutorial Pharmacy”, 6th ed., pitman medical publishing co.London 1972.
2. W.B. Hugo and A.D Russell “Pharmaceutical Microbiology”, Blackwell scientific publication,oxford,1987.
3. A Textbook of Microbiology; D K Maheshwari & R C Dubey, S.Chand publisher.
4. A Textbook of Pharmaceutical Microbiology; Prahlad Singh Mehra, I.K. International Publishing House Pvt. Ltd. New Delhi.
5. Experiments in Microbiology, Plant Pathology and Biotechnology; K.R. Aneja, New Age International Publishers.
6. Remington’s Pharmaceutical sciences” Gennaro A.R ed.. 18th Ed, Mack Publishing Co, Easton, pa, USA,1990.
7. L.M. Prescott, G.P. Jarly, D.A Klein,” Microbiology” 2nd, Ed Wm. C. Brown publishers, Oxford, 1993.
8. S.P. Vyas, V.K.dixit,” pharmaceutical Biotechnology”1st ed. CBS Publishers & distributors, New Delhi,1998.
9. N.K Jain” Pharmaceutical Microbiology” Vallabh Prakashan, Delhi.

B. Voc. Pharmaceutical Chemistry

Semester IV

BVPC 403: Medicinal Chemistry-II

COURSES OBJECTIVES:

The course is designed to make students familiar with the principles of medicinal chemistry as applied to pharmaceuticals and to study the synthetic approaches and structure activity relationship of different therapeutic class of drugs.

Unit-1

Chemical nomenclature, mechanism of action, synthesis of the agent mention in the bracket, structure activity relationship & therapeutic uses.

- a. Sulphonamides and fluoroquinolones (sulphanilamide, sulphaguanidine, sulphathiazole, sulphafurazolesulphamerizine, sulphamethoxazole).
- b. Antimalarials (chloroquin, prinaquin, mepacrin hydrochloride, pyrimethamine).
- c. Antimycobacterials (antileprotic & antitubercle agents) (isoneazid, para amino salicylic acid).
- d. Antifungal agents (metronidazole, fluconazole).

Unit-2

The following classes of drugs will be discussed in relation to: introduction, chemical classification (if any), chemical nomenclature, mechanism of action, synthesis of the agent mention in the bracket, structure activity relationship & therapeutic uses.

- a. Antiviral drugs including Anti- HIV drugs (amantadine).
- b. Antineoplastic agents (methotrezate, chlorambucil, mustine, thio TEPA, cyclophosphomide, 6- merceptopurine hydroxyl urea).

c. Antiseptics and disinfectants.

d. Antibiotics.: Beta–lactams, aminoglycosides, tetracyclines, macrolides, polyene & polypeptide antibiotics, chloramphenicol, (ampicillin, carbenicillin, cephalixin, penicillin V, chloramphenicol).

Unit-3

Combinatorial chemistry: Introduction, principle, importance of new drug discovery, various synthetic approaches and library purification, HTS. Drug design, molecular modelling, QSAR.

Unit-4

Practicals:

Synthesis of any four drugs as indicated in the theory.

Recommended Books for the syllabi:

1. Wilson and Gisworld's textbook of Organic, medicinal and Pharmaceutical Chemistry, J.N Delagado and W.A.R Remers, Eds, J. Lipponcott Co Philadephia.
2. Principles of medicinal chemistry by W.C Foye, Lea &Febiger, Philadelphia.
3. Burger's Medicinal Chemistry, H.E Wolff, Ed, John Wiley & Sons, New York Oxford university press, oxford.
4. Singh and Kapoor "A text book of pharmaceutical and medicinal chemistry" Vallabh Prakashan, New Delhi.
5. Strategies for Organic drugs Synthesis & design by Daniel Lednicer, Johawiley& sons., USA
6. Organic Chemistry by L. Finar, vol. I & II, ELBS Longman, London.
7. Kar, A medicinal chemistry, New Age international Publication, New Delhi, 2007.
8. Ladu, B.N.,Mandel H.G & E.L Way, Fundamentals of drug metabolism & disposition, William & Wilkins Co. Baltimore.
9. Taylor, J.B and Triggle,D.J comprehensive Medicinal Chemistry II, vol. 1-8, Quantita.

B. Voc. Pharmaceutical Chemistry

Semester V

BVPC 501: Foundation Course (Environmental Studies)

Sikkim University approved syllabi for Foundation Course (Environmental Studies)

B. Voc. Pharmaceutical Chemistry

Semester V

BVPC 502 -Pharmacology I

COURSE OBJECTIVES:

1. To learn general concepts how the drug produces effect and what factors can contribute in producing the drug effects.
2. To learn the mechanism of action, pharmacological effect, pharmacokinetics, adverse effects, therapeutic application of various classes of drugs.

Unit-1

General Pharmacology:

Introduction to pharmacology, sources of drugs, dosage forms and routes of administration.

Pharmacodynamics: General principles of drug action. Molecular basis of drug targets.

Pharmacokinetics: Absorption, distribution, metabolism and excretion of drugs. Principles of pharmacokinetics, bioavailability and bioequivalence, pharmacogenetics, adverse drug reaction, drug interactions, bioassays & preclinical studies. Clinical trials.

Unit-2

Pharmacology of Peripheral Nervous system:

Neurohumoral transmission (autonomic and somatic), Parasympathomimetics, parasympatholytics, sympathomimetics, adrenergic receptor and neuron, blocking agents, ganglionic stimulants and blocking agents, neuromuscular blocking agents, basics of ANS disorders.

Unit-3

Pharmacology of Respiratory System:

Drugs used in treatment of Bronchial asthma, Dry cough and COPD (Mucolytics, Expectorants, Antitussives).

Pharmacology of Nitric oxide, endothelins, ANP, purines.

Unit-4

Practical (*Any four*)

1. Introduction to Experimental Pharmacology.
2. Study of basic instruments used for isolated tissue experiments.
3. Study of different laboratory animals.
4. Different routes of drug administration in animals.
5. Study of some instruments used in detection of disease pathophysiology: Microscope, student's organ bath, Glucometer, Semi auto-analyser.
6. Introduction to CPCSEA its construction and its function (CPCSEA guidelines)
7. To study various methods of euthanasia.

Recommended Books for the syllabi:

1. Pharmacological Basis of Therapeutics by Goodman & Gillman.
2. Pharmacology and pharmacotherapeutics by Satoshkar & Bhandarkar.
3. Principles of Pharmacology by Sharma & Sharma.
4. Essentials of Medical Pharmacology by K.D. Tripathi.
5. Pharmacology by Rang & Dale.
6. Fundamentals of Experimental Pharmacology by M.N. Ghosh.
7. Handbook of Experimental Pharmacology by S.K. Kulkarni.
8. Essentials of Pharmacotherapeutics, F.S.K. Barar.
9. Pharmacology by V.J. Sharma.
10. Lippincot's Pharmacology by Heavy & Champ.
11. Practicals in Pharmacology by Dr. Goyal.
12. Medical Pharmacology by Goth.
13. Pharmacology by Gaddum
14. Elements of Pharmacology by Dr. Derasari & Dr. Gandhi.

B. Voc. Pharmaceutical Chemistry

Semester V

BVPC 503: Analytical Chemistry II

COURSE OBJECTIVES:

1. To make student learn the basic principles of various analytical techniques commonly used in quality control department of any pharmaceutical industry.
2. To provide the hands-on-on experience by actually conducting these assays in the lab.

Unit – 1

Chromatography: Definition and Classification of Chromatography

Paper Chromatography-Introduction, Principle of separation, Practical requirement, method and applications.

Thin Layer chromatography- Introduction, Principle, Advantages of TLC, Practical requirement, method, Applications and HPTLC.

Column Chromatography- Principle, details about practical requirement, factors affecting column efficiency, advantages and disadvantages and applications.

High Performance Liquid Chromatography- Introduction, Principle of separation, practical requirement, instruments, columns, mobile phase, detectors, method, parameters used in HPLC and applications.

Gas Chromatography- Introduction, Principle of separation, practical requirement, instruments, columns, mobile phase, detectors, method and applications, parameters used in GC.

Unit – 2

Spectroscopy: Introduction

UV-Visible Spectroscopy- Principle, Electronic transition, types of electronic transition, Instrumentation, and applications of UV and visible spectroscopy.

Infrared Spectroscopy- Introduction, Principle, Types of vibrations, Instrumentation, Absorption of common functional groups, and applications.

Mass Spectroscopy- Introduction, Principle, Instrumentation, Types of Mass Spectrometers, Types of Peak and Applications.

NMR- Introduction, Principle, Instrumentation, Solvent requirement, Shielding and Deshielding, Chemical Shift, Reference Standard and Applications.

Flame photometry and Atomic Absorption spectroscopy- Principle, Components, Instrumentation, and Applications.

Units – 3

Miscellaneous Method:

Kjehldahl method and Karl Fischer Titration.

Units – 4

Practical (*Any four*)

1. Demonstration of paper Chromatography
2. Separation and identification of various components by TLC or paper chromatography.
3. To find concentration of given acid by pH meter.
4. To estimate nitrogen by Kjehldahl method.
5. Demonstration of Karl Fischer Apparatus.
6. Demonstration of HPLC.
7. Demonstration of UV–Visible Spectrophotometer.
8. Determination of concentration using UV–Visible Spectrophotometer.

Recommended books for the syllabi:

1. Dr. A.V. Kasture, Dr. K.R. Mahadik, Dr. S.G. Wadodkar, Dr. H.N. More, A Textbook of Pharmaceutical Analysis, Volume – 1, 8th Edition, NiraliPrakashan, Pune, 2002.
2. R.A. Day and A.L. Underwood, Quantitative Analysis, 6th Edition, Prentice-Hall of India Pvt. Ltd. New Delhi, 1993.
3. K.A., Connors, A Textbook of Pharmaceutical Analysis, 3rd Edition. John Wiley & Sons. New York 1982.
4. J.H. Kennedy, Analytical Chemistry [principles, 2nd Edition, Saunders College Publishing, New York 1990.

5. D.A. Skoog, D.M. West, F.J. Holler, Fundamentals of Analytical Chemistry, 7th Edition Saunders College Publishing, New York 1996.
6. The India Pharmacopoeia 2007, Volume – I, II & III, Controller of Publication, 2007.
7. R.M. Verma, Analytical Chemistry, 2nd Edition, CBS Publishers, New Delhi, 1991.
8. S.M. Khopkar, Basic Concepts of Analytical Chemistry, 2nd Edition, New Age International Publishers, New Delhi, 1998.
9. Text Book of Pharmaceutical Analysis by S.Ravi Shankar Rx Publication.
10. Elementary Organic Spectroscopy by Y.R Sharma, Published by S. Chand.

B. Voc. Pharmaceutical Chemistry
Semester VI
BVPC 601: Foundation Course (Eastern Himalayan Studies)

Sikkim University approved syllabi for Foundation Course (Eastern Himalayan Studies)

B. Voc. Pharmaceutical Chemistry
Semester VI
BVPC 602: Pharmacology II

COURSES OBJECTIVES:

To learn the mechanism of action, pharmacological effects, pharmacokinetics, adverse effects, therapeutic application of various classes of drugs with special attention to drugs acting on cardiovascular, urinary, gastrointestinal system.

Unit-1

Pathophysiology and Drugs used in: Congestive Cardiac Failure, Angina, Myocardial Infarction, Cardiac Arrhythmias, hypertension, Hyperlipidemia and Atherosclerosis, Anemia, Coagulation disorders, Shock.

Unit-2

Pharmacology of Gastro Intestinal Tract: Antacid, antiemetics, antidiarrhoeal, laxatives, appetizer, demulcents, mucolytics, Adsorbants, Astringents, Digestants. Pathophysiology and drugs used in pepticulcer & inflammatory Bowel Disease.

Unit-3

Drugs Acting on Urinary System. Fluid and electrolyte balance, Diuretics, Anti diuretics, Urine acidifying and alkalinizing agents. Concepts of RIA, Radioligand Studies, ELISA.

Unit-4

Practical (Any four)

1. To study PD₂ value of Ach/Histamine using rat/G.pig ileum using simulation software.
2. Mydriatic effect of drug (Atropine) on rabbit's eye.

3. Miotic effect of drug (Pilocarpine) on rabbit's eye.
4. To study dose ratio of Carbachol/ Ach & Physostigmine/ Ach using rat ileum using simulation software.
5. To study PA2 value of Atropin/Mepyramine using rat/G.pig ileum using simulation software.
6. To find out nature of unknown drug using rat ileum using simulation software.
7. To study the effect of various drugs acting on neuromuscular junction using simulation software.
8. Estimation of serum triglyceride level in supplied sample.
9. Estimation of serum Cholesterol level in supplied sample.

Recommended Books for the syllabi are:

1. Pharmacological Basis of Therapeutics by Goodman & Gillman.
2. Pharmacology and pharmacotherapeutics by Satoshkar & Bhandarkar.
3. Principles of Pharmacology by Sharma & Sharma.
4. Essentials of Medical Pharmacology by K.D. Tripathi.
5. Pharmacology by Rang & Dale.
6. Fundamentals of Experimental Pharmacology by M.N. Ghosh.
7. Handbook of Experimental Pharmacology by S.K. Kulkarni.
8. Essentials of Pharmacotherapeutics, F.S.K. Barar.
9. Pharmacology by V.J. Sharma.
10. Lippincot's Pharmacology by Heavy & Champ.
11. Practicals in Pharmacology by Dr. Goyal.
12. Medical Pharmacology by Goth.
13. Pharmacology by Gaddum.
14. Elements of Pharmacology by Dr. Derasari & Dr. Gandhi.

B. Voc. Pharmaceutical Chemistry
Semester VI
BVPC 603: Entrepreneurship Development

COURSE OBJECTIVE:

The objective of the course is to equip the students with knowledge on entrepreneurial development, creativity and skills essential for business plan development.

Unit-1

Introduction

Entrepreneurship: Introduction to Entrepreneur, Entrepreneurship and Enterprise, Importance and Relevance of the Entrepreneur, Factors Influencing Entrepreneurship, Pros and Cons of being an Entrepreneur, Women Entrepreneurs, Problems and Promotion, Types of Entrepreneurs, Characteristics of a Successful Entrepreneur, Competency Requirement for Entrepreneurs.

Unit-2

Entrepreneurial traits, motivation and development Types of startups; Entrepreneurial class Theories; Entrepreneurial leadership; International Entrepreneurship- Opportunities and challenges; Source of innovative ideas; Entrepreneurship and creativity; Techniques for generating ideas, Impediments to creativity.

Unit-3

Entrepreneurial Development Institutions and Policy initiatives

Implementation of the Project: Financial Assistance through SFC's, SIDBI, Commercial Banks, KVIC, NABARD. Financial incentives and Tax Concessions for MS&MEs, Policies for North Eastern Region; Role of government in entrepreneurship development; recent trends, Vision 2020 of Sikkim.

Unit-4

Business Plan Development, Launching, Feedback and Follow-up Preparing the Business Plan (BP): Typical BP format, Financial Aspects of the BP, Marketing Aspects of the BP, Human Resource Aspects of the BP, Technical

Aspects of the BP, Social Aspects of the BP, Preparation of BP, and Common Pitfalls to be avoided in Preparation of a BP. An Overview of the Steps involved in Starting a Business Venture, Location, Clearances and Permits Required, Formalities, Licensing and Registration Procedures. Launching the Enterprise: Trade license, Approvals and Clearance, Registration Project Control; Feed Back and Follow-up. Activity: Course will involve development of feasible Business Plan by students in Groups. Case studies may be developed and discussed for better understanding of the prevalent scenario.

Suggested readings:

1. Ramachandran, K., Entrepreneurship Development, Tata McGraw Hill, India
2. Kumar, Arya, (2010) Entrepreneurship: Creating and Leading an Entrepreneurial Organization, Pearson, India.
3. Hishrich., Peters, (2008) Entrepreneurship: Starting, Developing and Managing a New Enterprise, Irwin.
4. Roy, Rajeev, Entrepreneurship, Oxford University Press.
5. Kuratko, D.F., and T. V. Rao,(2010) Entrepreneurship: A South-Asian Perspective, Cengage Learning.
6. Government of India, Reports of the committee on Development of small and medium entrepreneurs.