RKDF UNIVERSITY

Scheme for Bachelor of Pharmacy

B. Pharm I Semester Scheme									
Subject Code	**Name of Subject**	**Teaching scheme**		**Credits**		**Examination Scheme**			
		T	**P**	**T**	**P**	**T**		**P**	
						Ext	**Int**	**Ext**	**Int**
BPH101[T]	Communication Skill	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH102A[T]	Remedial Mathematics Or	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH102B[T]	Remedial Biology	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
BPH102B[P]	Remedial Biology	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH103[T]	Introduction to Pharmacy	**4**	**-**	**4**		**70**	**30**	**-**	**-**
BPH103[P]	Introduction to Pharmacy	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH104[T]	Pharmaceutical Chemistry I (Inorganic chemistry)	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH104[P]	Pharmaceutical Chemistry I (Inorganic chemistry)	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH105[T]	Pharmaceutical Chemistry II (Organic Chemistry-I)	**4**	**-**	**4**	**-**	**70**	**30**	**-**	
BPH105[P]	Pharmaceutical Chemistry II (Organic Chemistry-I)	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
		20	**12/9**	**20**	**8/6**	**500**		**400/300**	
Total		**32/29 hrs/week**		**28/26**		**900/800**			

T- Theory, P- Practical

Course	B. Pharm	**Semester**	First
Branch	Pharmacy	**Duration**	60 Hrs [Theory]
Subject Code	BPH101[T]	**Subject Name**	Communication Skill

Syllabus

English Grammar: Parts of speech, articles, preposition, tenses, active and passive speech, direct and indirect speech.

Applied Grammar: Review of grammar and vocabulary, effective use of dictionary and phonetics.

Reading Comprehension: Reading and comprehension of selected materials, articles, magazines and journals related to pharmacy.

Presentation Techniques: Tips of presentation, oral reports, discussion, lectures/seminars, debate, telephonic conversation, notice and placard presentations.

Writing Skills: Proposal, writing formats, report writing, note taking, business letters, applications, covering letters, curriculum, vitae designing, summary writing.

Listening Comprehension: Media, audio, video, speeches and the likes.

Etiquettes and grooming.

Interviews- Tips and model interviews (video shooting and display).

Suggested Readings/Books:

Lesiker, Raymond. V and Maire E Hatley: Basic Business Communication, New York, Tata McGraw Hill

Wren and Martin, English Grammar.

Hamplyons Liz & Ben Heasley: Study writing, Cambridge, Cambridge University Press

Beaumont Digty and Colin Granger: English Grammar, An International reference practice book, London, Heinmann

Elison John,: The right word at the right A guide to the English, The Reader's Digest

Course	B. Pharm	Semester	First
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH102A[T]	Subject Name	Remedial Mathematics

Syllabus

Algebra: Laws of indices, Surds, pure and mixed Surds, Rationalization of surds, Equivalent fraction with a rational denominator of a surd, Square root, Cube root of surds. Modulus and arguments of a complex number, square root of a complex number. Solution of quadratic equations, theory of quadratic equations, solution of simultaneous equations and miscellaneous equations. Logarithms, Properties of logarithms, Arithmetical Geometrical and Hormonical progressions, permutation and combination. Binomial theorem with positive index.

Matrices, types of matrices, addition, subtraction, multiplication and transpose of matrices, adjoint and inverse of a matrix. Application of matrices in solving equations. Determinants and their properties, applications of determinants in the solution of linear equation.

Co-ordinate Geometry: Distance formula, area of a triangle and quadrilateral, Equations of a straight line, angle between straight lines, point o intersection of two straight lines, perpendicular distance of a point from the straight lines, Second degree equation representing two lines, Equation of circle.

Trigonometry: Measurement of angles relation between trigonometric ratio of an angle of a right angle triangle, complementary and supplementary angle, multiple and submultiple angles, product formulae sum and difference formulae of trigonometric ratios, identities of trigonometric ratios, relation between sides and angles of any triangle, area of a triangle, radius of circumscribed, inscribed circles.

Calculus: Limit of a function, limit at infinity, Differentiation of some function, product rule, quotient rile of differentiation, differentiation of inverse trigonometric function, implicit function, logarithmic from, parametric form, successive differentiation, tangent and normal, maxima and minima.

Suggested Readings/ Books:

1. Hall and Knight : Algebra
2. Loney S. L.: Coordinate geometry
3. Loney S. L..: Trigonometry
4. Prasad Gorakh: Differential Calculus
5. Prasad Gorakh : Integral Calculus.

Course	B. Pharm	**Semester**	First
Branch	Pharmacy	**Duration**	60 Hrs [Theory]
Subject Code	BPH102B[T]	**Subject Name**	Remedial Biology

Syllabus

Origin and evolution of life: An outline.

Classification and general treatment of Plant Kingdom.

Study of the following families of medicinal and aromatic plants- *Apocynaceae, Solanaceae, Labiatae, Papaveraceae, Umbelliferae, Leguminosae, Rubiaceae, Liliaceae and Scrofulariceae*.

Physiology of plants- Photosynthesis, respiration and transpiration.

Morphology, histology and structural organization of root, stem, bark, wood, leaf, flower, fruit and seed. Modifications of roots and stems.

Structure of plant cell, cell organelles, types of plant tissues and their functions.

Fundamental laws of inheritance- Mendel's law. Life cycle of a common angiosperm plant.

Classification and general treatment of animal kingdom.

Study of structure and life cycle of amoeba, plasmodium and disease causative helminthes and parasites (housefly and mosquito).

Basic study of the following systems of Human: GI, nervous, cardiovascular, genitourinary, musculo-skeletal, respiratory systems.

Fundamentals of parasitology: Life cycles of some animal parasites that cause human disease - malarial and filarial parasites and tape worm.

Suggested Readings/ Books:

- 10+2 Biology Text Books

Course	B. Pharm	**Semester**	First
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH102B[P]	**Subject Name**	Remedial Biology

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	First
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH103[T]	Subject Name	Introduction to Pharmacy

Syllabus

Introduction to Pharmacy: History and development of profession of Pharmacy and Pharmaceutical industry in India. Pharmacy as a career. A brief review of present Indian Pharmaceutical industry in global perspective. Development of Pharmacopoeia and National formulary. Code of ethics.

Introduction to dosage forms: Definition of drug. New drug and dosage form. The desirable properties and need of dosage forms. Classification of dosage forms and new drug delivery system.

Route of administration: Route of administration with respect to dosage form design, physiological consideration for various routes of administration.

Allopathic dosage form: Merits / demerits, importance..

Ayurvedic system of medicine: Theory, basic concept, diagnosis, various branches of treatment in ayurveda..

Homeopathic system of medicine: Theory, basic concept, diagnosis, treatment, source of homeopathic medicines.

Formulation considerations of aromatic waters, solutions, syrups, elixirs, infusions, decoctions, tinctures, spirits, extracts, jellies, mucilage, lotion and liniments, collodions, douches, gargles, enemas, eye drops, ear drops and nasal drops

Suggested Readings/ Books:

1. Ansel: Introduction to Pharmaceutical Dosages Forms
2. Remington's Pharmaceutical Sciences.
3. Indian Pharmacopeia.
4. British Pharmacopeia.
5. Jain & Sharma: The theory and practice of Professional Pharmacy
6. Jain: Pharmaceutical Arithmetic.
7. Badger and Banchero: An introduction to Chemical Engineering
8. Richardson and Coulson: Chemical Engineering.
9. McCabe and Smith: Introduction to Unit Operation.
10. Lachman,Lieberman and Kanig: Theory and Practice of Industrial Pharmacy.
11. Rowlin: Bentley's Text Book of Pharmaceutics.

Course	B. Pharm	**Semester**	First
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH103[P]	**Subject Name**	Introduction to Pharmacy

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	**Semester**	First
Branch	Pharmacy	**Duration**	60 Hrs [Theory]
Subject Code	BPH104[T]	**Subject Name**	Pharmaceutical Chemistry I (Inorganic chemistry)

Syllabus

Pharmaceutical Impurities:

Monograph and its importance, various aspects included in monographs as per IP. Impurities in pharmaceutical substances, sources, types and effects of impurities. Limit tests for heavy metals like lead, iron, arsenic, mercury, chloride and sulphate as per Indian Pharmacopoeia [IP].

A study of the following compounds with respect to their methods of preparation, assay and pharmaceutical uses of sodium citrate, calcium carbonate, copper sulphate, light & heavy kaolin, ammonium chloride & ferrous gluconate.

Essential and Trace Elements: Transition elements and their compounds of pharmaceutical importance, Iron and haematinics, mineral supplements; Cationic and anionic components of inorganic drugs useful for systemic effects;

Therapeutic classes of drugs: Following categories of compounds should cover its method of preparation, chemical, physical properties and uses.

1. Dentifrices, desensitizing agents, anticaris agents, complexing and chelating agents.
2. Anesthetics and respiratory stimulants.
3. Antiseptics, disinfectants, sterilants, protectives, & astringents.
4. Purgatives, laxatives & antidiarrhoeal agents.
5. Diagnostic agents.
6. Coagulants, anticoagulants & plasma expanders.
7. Gastrointestinal agents: Acidifying agents, Antacids, Protectives and Adsorbents, Cathartics.
8. Miscellaneous agents: Sclerosing agents, Expectorants, Emetics, Inorganic poisons and antidotes.

Pharmaceutical aids: Anti-oxidants, Preservatives, Filter aids, Adsorbents, Diluents, Excipients, Suspending agents, Colorants

Electrolytes: Physiological ions, Electrolytes used for replacement therapy, acid base balance and combination therapy.

Nuclear chemistry : Nuclear composition, forces and stability, isotope, radioactive emission, measurement of radioactivity, modes of decay, half life period, artificial radioactivity, application in pharmacy. Radiopharmaceuticals and contrast media- Radiopharmaceuticals, Radiopharmaceuticals preparation and radio opaque contrast media**.**

Suggested Readings/ Books:

J.H. Block, E. Roche, T.O. Soine and C.O. Wilson, "Inorganic Medicinal and Pharmaceutical Chemistry", Lea & Febiger, Philadelphia, P.A.

L.M. Artherden, Bentley and Drivers, "Textbook of Pharmaceutical Chemistry", S& Ed., Oxford University Press, Delhi.

Pharmacopoeia of India, Govt. of India, Ministry of Health.

Block, Roche, Soine & Wilson. Inorganic Medicinal & Pharmaceutical Chemistry. 1st edition, 1986. Varghese publishing house, Mumbai.

Chatwal. Pharmaceutical Chemistry Inorganic. 3rd edition, 2007. Himalaya publishing house, Mumbai.

Singh & Kapoor. Practical Pharmaceutical chemistry. 4th edition, 1998. Vallabh prakashan, Delhi.

Discher, C.A. et al., Modern inorganic pharmaceutical chemistry, Waveland press.

Course	B. Pharm	**Semester**	First
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH104[P]	**Subject Name**	Pharmaceutical Chemistry I (Inorganic chemistry)

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	First
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH105[T]	Subject Name	Pharmaceutical Chemistry II (Organic Chemistry-I)

Syllabus

Structure and Properties of Matter: The structural theory, the chemical bond, quantum mechanics, atomic orbitals, electronic configuration, molecular orbitals, intramolecular forces, bond dissociation energy, polarity of bonds, polarity of molecules, structure and physical properties including melting point, boiling point and solubility, acids and bases.

Role of Solvent: Secondary bonding, solubility of non-ionic and ionic solutes, protic and aprotic solvents, ion pairs, role of solvent in substitution reactions, phase-transfer catalysis. Relations of structure with properties like density, melting point, boiling point, solubility, etc.

Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions.

Water; Official water (Water, Purified water, Water for injection, Bacteriostatic water for injection, Sterile water for injection)

Stereo chemistry: Introduction, stereoisomerism, enantiomerism, diastereoisomerism, optical activity optical isomer, geometrical isomers, racemic modification, meso structure, enantiomer, configuration, chiral centre, reaction involving stereoisomers, stereoselective and stereospecific reactions

Introduction, structure, nomenclature, physical and chemical properties (including all type of reactions) of the following

- Alkane, alkene, alkyne, cycloalkane and dienes.
- Alkyl halides. Alcohols, ethers, carboxylic acids and their functional derivatives,
- Aldehydes and ketones, amines, dicarboxylic acids, malonic acid ester and its importance, acetoacetic acid ester and its importance,
- Saytzeff's rule, peroxide effect, Ozonolysis, Bayer's strain theory, Coulson and Moffitt's modification, addition reactions of conjugated dienes.

Suggested Readings/ Books:

- 1. Morrison, B.T., and Boyd, R.N., "Organic Chemistry", Prentics Hall of India Pvt. Ltd., New Delhi.
- 2. Vogel A.I., "Textbook of Practical Organic chemistry", ELBS/Longman.

- 3. Mann, F.G. and Saunders, B.C., “Practical Organic Chemistry”, ELBS/Longman
- 4. Finar, I.L. Organic Chemistry, Vol.-I and II, ELBS/Longman
- 5. Hendrikson, Organic Chemistry.

Course	B. Pharm	**Semester**	First
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH105[P]	**Subject Name**	Pharmaceutical Chemistry II (Organic Chemistry-I)

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

B. Pharm II Semester Scheme									
Subject Code	**Name of Subject**	**Teaching scheme**		**Credits**		**Examination Scheme**			
		T	**P**	**T**	**P**	**T**		**P**	
						Ext	**Int**	**Ext**	**Int**
BPH201[T]	Computer Science and Applications	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH201[P]	Computer Science and Applications	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH202[T]	Pharmacognosy - I	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH202[P]	Pharmacognosy - I	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH203[T]	Anatomy, Physiology And Health Education	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
BPH203[P]	Anatomy, Physiology And Health Education	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH204[T]	Applied Mathematics and Statistics	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH205[T]	Pharmaceutical Chemistry III (Organic Chemistry – II)	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH205[P]	Pharmaceutical Chemistry III (Organic Chemistry – II)	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
		20	**12**	**20**	**8**	**500**		**400**	
Total		**32 hrs/week**		**28**		**900**			

T- Theory, P- Practical

Course	B. Pharm	**Semester**	Second
Branch	Pharmacy	**Duration**	60 Hrs [Theory]
Subject Code	BPH201[T]	**Subject Name**	Computer Science and Applications

Syllabus

Introduction to Computers: Characteristics of computers, Historical perspectives of computers, Computer generations, types of computers and uses, Software, Hardware, Basic architecture and functions of CPU and its parts, Important I/O devices like Keyboard, Mouse, Printers, Video Monitors;

Number System: Decimal, Binary, Basic Binary arithmetic (Conversion to and from decimal numbers, Binary addition and subtraction;

Memory Storage: Memory Cells, Semiconductor and Magnetic core memory, ROM (its types), RAM, Cache and Virtual memory, Secondary storage devices and their organization (Hard disk, Floppy disk, CD, DVD).

Operating Systems: Definitions, Need, Organization, Functions, Types of Operating Systems, DOS, Windows, Handling Drives, Directories and files, Commands (Internal & External), Icons, Clipboard, Folders, Major differences between DOS & Windows.

Communication Networks Hardware and software components, Seven layers of OSI architecture, Network Topologies (Ring, Star, Fully Connected and Bus), LAN and WAN, Bounded and unbounded communication media, Internet, World Wide Web and I.T., Browsers, Important terminology regarding Internet applications, Electronic Mail, Potential uses and abuses of Internet.

Word Processing: Techniques, File manipulation, Formatting, Printing setups Table handling, Mail merge, etc. using MS-Word;

Spreadsheet Package: Worksheets, Formatting sheets, Calculations and graphing using formulae and functions, Import and export of data using MS-Excel.

Graphics: Objectives and types of graphics , Presentation packages, Slides designing, Diagrams and graphs, Import & Export data using MS-Power Point**;**

Data Security against Viruses: Definition of computer viruses, Detection, prevention and cure against viruses using anti-virus software packages.

Pharmaceutical Applications: Basics of computer use in various pharmaceutical and clinical applications like drug information services, hospital and community pharmacy, drug design, pharmacokinetics and data analysis.

Suggested Readings/ Books:

Fundamentals of Computers by Rajaraman, Prentice Hall of India.

Tiwari, NK, Computer Fundamental with Pharmacy Applications, Ist edition, 2008, Pharm Med Press

Course	B. Pharm	**Semester**	Second
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH201[P]	**Subject Name**	Computer Science and Applications

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Second
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH202[T]	Subject Name	Pharmacognosy - I

Syllabus

Introduction: Definition, historical background, present status and future scope of Pharmacognosy. Definition of selected Botanical terms and nomenclature used in Pharmacognosy. Significance of Pharmacognosy in various systems of medicine practiced in India viz: Ayurveda, Unani, Homeopathic and Siddha.

Classification of crude drugs: Alphabetical, Morphological, Taxonomical, Pharmacological, Chemical and Biogenetic classifications.

General Treatment with regard to occurrence, distribution, classification, chemistry and analysis of carbohydrates, lipids and proteins.

Organized and unorganized drugs: Detailed studies on unorganized drugs with source, collection, preparation, storage, diagnostic characters, constituents, chemical tests, substitutes, adulterants and uses.

Commerce in Crude Drugs: Collection, preparation, drying and storage of drugs with special emphasis on factors influencing quality of drugs.

Classification and general treatment of alkaloids and glycosides of different categories including methods of isolations physico chemical properties and chemical tests for identification.

Sources of Drugs: Terrestrial, marine and microbes as source of medicine.

Phytochemical Screening: Preparation of extracts, Phytochemical tests for detection of common plant constituents, Biosynthetic pathways for secondary plant constituents, General principles of formation of primary and secondary plant metabolites. Biogenesis of medicinally important glycosides, alkaloids, carbohydrates, lipids, volatile oils and steroids.

Radio Tracer Techniques and their utilization in elucidation of biosynthetic pathways in plants

Suggested Readings/ Books:

1. C.S. Shah & J. S. Quadry: Text Book of Pharmacognosy.
2. T. E. Wallis: Text Book of Pharmacognosy
3. Trease & Evans: Pharmacognosy.
4. Brady & Taylor: Pharmacognosy.
5. V. K. Kapoor & S.S. Handa: Text Book of Pharmacognosy.
6. C. K. Kokate, A.P. Purohit and S.B. Gokhale: Pharmacognosy.

Course	B. Pharm	**Semester**	Second
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH202[P]	**Subject Name**	Pharmacognosy - I

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Second
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH203[T]	Subject Name	Anatomy, Physiology and Health Education

Syllabus

Scope of Anatomy and Physiology: Scope, basic medical terminology. Structure of cell, its components and their functions. Elementary tissues of the human body: Epithelial, connective, muscular and nervous tissues, their sub-types and their characteristics.

The Blood: Composition and functions of blood, RBC, WBC, platelets. Homeostasis, blood groups, mechanism of clotting. Introduction to disorders of blood.

Lymphatic system: Composition, formation and circulation of lymph. Spleen and its functions.

Cardio vascular system: Anatomy of heart and blood vessels, physiology of blood circulation, cardiac cycle, conducting system of heart, heart sound, electrocardiogram, blood pressure and its regulation.

Digestive system: Gross anatomy of the gastro-intestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food. Disorders of digestive system.

Respiratory system: Structure of respiratory organs, functions of respiration mechanism and regulation of respiration, respiratory volumes and vital capacity.

Autonomic nervous system: Physiology and functions of the autonomic nervous system. Mechanism of neurohumoral transmission in ANS.

Central nervous system: Functions of different parts of brain and spinal cord. Neurohumoral transmission in the central nervous system, reflex action, electroencephalogram, specialized functions of brain, cranial nerves and their functions.

Sense organs: Structure and physiology of eye, ear, taste buds, nose and skin.

Skeletal system: Structure and function of skeleton. Articulation and movement. Disorders of bones and joints.

Urinary system: Various parts, structure and functions of the kidney and urinary tract. Physiology of urine formation and acid base balance and disorders.

Endocrine System: Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenal glands and pancreas. Local hormones. Introduction to disorders of various endocrine glands.

Reproductive system: Structure and functions of male and female reproductive system. Sex hormones, physiology of menstrual cycle, and various stages of pregnancy and parturition.

Heath Education:

Concepts of health and diseases, disease agents and prevention of diseases.

Classification of food, requirements, balanced diet, nutritional deficiency, disorders, their treatments and prevention.

Demography and family planning: Demography cycle, family planning, various contraceptive methods. Medical termination of pregnancy.

Suggested Readings/ Books:

Drake R.L. , Vogel W. , Mitchell AWM, "Anatomy for students" , Elsevier Publication

Tortora G.J. Derrockson B., "Principles of Anatomy and Physiology", John Willey & Sons

Guyton A.C., Halt J.E. "Text Book of Medical Physiology" , Harcourt India Pvt. Ltd.

Ross and Wilson "Anatomy and Physiology in Health and Illness" , Churchil Living Stone

C.C. Chaterjee, " Human Physiology, Vol. – I , Medical Allied Agencies, Calcutta

Hassan, William E. Hospital Pharmacy. Lea & Febiger, Philadelphia.

Remington's The Science & Practice of Pharmacy Mack Publishing Co. Easton, PA

Turco. S, and King, R.E. Sterile Dosage Forms. Lea & Febiger, Philadelphia.

Course	B. Pharm	**Semester**	Second
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH203[P]	**Subject Name**	Anatomy, Physiology and Health Education

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	**Semester**	Second
Branch	Pharmacy	**Duration**	60 Hrs [Theory]
Subject Code	BPH204[T]	**Subject Name**	Applied Mathematics and Statistics

Syllabus

Differential Equations: Definition and formation of differential equations, differential equations of first order and first degree in which variables are separable, homogeneous, reducible to homogeneous equations, linear differential equation form or equation reducible to linear equation form. Linear differential equations with constant coefficients**:** complementary functions,. Particular integrals

Laplace Transforms: Definition, transforms of elementary functions, properties of linearity and shifting, Inverse laplace transforms, transforms of derivatives, solution of ordinary and simultaneous differential equations.

Integral calculus

Integration by decomposition, by substitution, by parts and by successive reduction, integration of algebraic rational function, integration of trigonometric function

Statistics: Condensation of data collected, various forms of frequency distribution, tabular presentation of data, structure of a table, bar diagram, graphical representation of frequency distribution. Measure of central tendency**:** Calculation of arithmetic mean, geometric mean, median, quartiles and mode. Measure of dispersion**:** Range, quartile deviation, mean deviation, standard deviation, coefficient of variation.

Correlation and regression: Fitting of curves using least square principle. Interpolation: Graphical method, curve fitting, Newton's Gregory method, Newton-Binomal method, Largranges method.

Probability : Events, properties of probability, Bayes theorem, Binomial theorem, Distribution, Bionomial poisson, Normal and chi-square distribution, relationship between attributes, Calculation of coefficient of correlation and regression, regression lines, Significance tests, method of sampling, student test, paired t – test, f- test.

Suggested Readings/ Books:

1. Integral Calculus by Gorakh Prasad, Pothishala Prakashan, Pvt. Ltd, Allahabad.
2. Laplace and Fourier Transforms by Goyal and Gupta, pragati prakashan, Meerut.
3. Fundamental of Mathematical statistics by ray and Sharma.

4. Fundamental of Mathematical statistics by Gupta and Kapoor.

5. Integral Calculus by Gorakh Prasad.

Course	B. Pharm	Semester	Second
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH205[T]	Subject Name	Pharmaceutical Chemistry-III (Organic Chemistry-II)

Syllabus

Heterocyclic Chemistry: Nomenclature, structure, chemical reactions and synthesis of different heterocyclic.

- Five membered ring- Furan, Thiophene, Pyrrole,
- Six membred ring- Pyridine, Primidine
- Fused hetrocyclics- Imidazole, oxazole, thiazole, quinoline and isoquinoline, phenothiazine**.**
- Polynuclear aromatic hydrocarbons, naphthalene, phenanthrenes etc.
- Aryl halides (nucleophilic aromatic substitution reactions), *a, ß* -unsaturated Carbonyl compounds (electrophilic addition, Michael addition, Diels-Alder reaction).
- Reaction intermediates (Carbocation, carboanion, nitrines and nitrenium ion)
- **Neighboring group effects**
- **Catalysis by transition metal complexes**

Suggested Readings/ Books:

1. Morrison, B.T., and Boyd, R.N., "Organic Chemistry", Prentics Hall of India Pvt. Ltd., New Delhi. (Latest Edition).

2. Vogel A.I., "Textbook of Practical Organic chemistry", ELBS/Longman.

3. Mann, F.G. and Saunders, B.C., "Practical Organic Chemistry", ELBS/Longman

4. Finar, I.L. Organic Chemistry, Vol. I & II, The English Language Book Society, London and Longman Group Limited, London (Latest Edition).

5. Hendrikson, Organic Chemistry.

6. Acheson R. N., An Introduction to the Chemistry of Heterocyclic Compounds, Inter-sciences Publishers, New York (Latest Edition).

7. Atherden L.M.: Bentley and Driver's-Textbookof Pharmaceutical Chemistry, Oxford University Press, Delhi

8. Pandeya S.N.: A Textbook of Pharmaceutical Chemistry (Heterocyclics & Biomolecules) Vol-II, S.G.Publishers, Varanasi.

Course	B. Pharm	**Semester**	Second
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH205[P]	**Subject Name**	Pharmaceutical Chemistry-III (Organic Chemistry-II)

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

B. Pharm III Semester Scheme									
Subject Code	Name of Subject	Teaching scheme		Credits		Examination Scheme			
						T		P	
		T	P	T	P	Ext	Int	Ext	Int
BPH301[T]	Physical Pharmacy	4	-	4	-	70	30	-	-
BPH301[P]	Physical Pharmacy	-	3	-	2	-	-	60	40
BPH302[T]	Pharmaceutical Engineering – I	4	-	4	-	70	30	-	-
BPH302[P]	Pharmaceutical Engineering – I	-	3	-	2	-	-	60	40
BPH303[T]	Pathophysiology of Common Diseases	4	-	4	-	70	30	-	-
BPH304[T]	Pharmaceutical Engineering – II	4	-	4	-	70	30	-	-
BPH304[P]	Pharmaceutical Engineering – II	-	3	-	2	-	-	60	40
BPH305[T]	Pharmaceutical Chemistry IV (Chemistry of Natural Product)	4	-	4	-	70	30	-	-
BPH305[P]	Pharmaceutical Chemistry IV (Chemistry of Natural Product)	-	3	-	2	-	-	60	40
		20	12	20	08	500		400	
Total		32 hrs/week		28		900			

T- Theory, P- Practical

Course	B. Pharm	Semester	Third
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH301[T]	Subject Name	Physical Pharmacy

Syllabus

Matter and properties of matter : State of matter, change in the state of matter, latent heats and vapor pressure, sublimation-critical point, eutectic mixtures, gases, aerosols - inhalers, relative humidity, liquid complexes, liquid crystals, glassy state, solids crystalline, amorphous and polymorphism.

Micromeritics and powder rheology: Particle size and size distribution, average particle size, number and weight distribution, particle number, methods for determining particle volume, optical microscopy, sieving, sedimentation, measurement, particle shape, specific surface, methods of determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

Surface and interfacial phenomena: Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB classification, solubilization, detergency, adsorption at solid interfaces, solid- gas and solid-liquid interfaces, complex films, electrical properties of interface.

Viscosity and rheology : Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity by capillary, falling ball, rotational viscometers.

Dispersion Systems: Colloidal Dispersions: Definition, types, properties of colloids, protective colloids, applications of colloids in pharmacy.

Suspensions and Emulsions: Emulsions-types, theories and physical stability. 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, flocculation in structured vehicles, rheological considerations.

Diffusion and dissolution: Steady state diffusion, procedures and apparatus, dissolution and drug release, diffusion principles in biologic systems, vapor sorption and transmission, thermodynamics of diffusion, diffusion and ecology.

Complexation: Classification of complexes, methods of preparation, analysis and its applications.

Suggested Readings/ Books:

Sinko PJ."Martin's Physical pharmacy & Pharmaceutical sciences", 5th edition, 2006, B.I. Publications Pvt Ltd, New Delhi.

Carter SJ. "Cooper & Gunn's Tutorial Pharmacy", 6th edition, 200, CBS Publishers & Distributors, New Delhi.

Remington's The Science & Practice of Pharmacy Mack Publishing Co. Easton, PA

Gaud and Gupta " Practical Physical Pharmacy", I edition, reprint 2008, CBS Publisher and Distributor, New Delhi

Subhramanyam CVS. "Textbook of Physical Pharmaceutics", 2nd edition , 2007, Vallabh Prakashan, New Delhi.

Course	B. Pharm	**Semester**	Third
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH301[P]	**Subject Name**	Physical Pharmacy

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Third
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH302[T]	Subject Name	Pharmaceutical Engineering - I

Syllabus

Unit Operations: Introduction, basic laws.

Stoichiometry: Unit processes material and energy balances, molecular units, mole fraction, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, dimensionless equations, dimensionless formulae, dimensionless groups, different types of graphic representation, mathematical problems.

Flow of Fluid: Types of flow, Reynold's number, Viscosity, Concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure.

Material Handling Systems:

a. Liquid handling- Different types of pumps.

b. Gas handling- various types of fans, blowers and compressors.

c. Solid handling- Bins, Bunkers, Conveyers, Air transport.

Heat Transfer: Source of heat, heat transfer, steam and electricity as heating media, determination of requirement of amount of steam/electrical energy, steam pressure, Boiler capacity, Mathematical problems on heat transfer.

Dehumidification and Humidity Control: 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.

Refrigeration and Air Conditioning: Principles and applications of refrigeration and air conditioning.

Material of constructions: General study of composition, corrosion, resistance, properties and applications of the materials of construction with special reference to stainless steel, glass, ferrous silver, nickel and alloys, chromium, plastics, rubber. Corrosion and its prevention with reference to commonly used material in pharmaceutical plants.

Industrial hazards and Safety Precautions: Mechanical, Chemical, Electrical, fire and dust hazards. Industrial dermatitis, accident records etc.

Automated process control systems: Process variable, temperature, pressure, flow, level and vacuum and their measurement. Elements of automatic process control and introduction to automatic process control. Elements of computer aided manufacturing.

Suggested Readings / Books:

Badger, W.L. and Banchero, J.T. Introduction to Chemical Engineering. McGraw Hill International Book Co., London.

Brown, C.G. Unit Operations (Indian Ed.) CBS Publishers & Distributors.

McCabe , W.L. and Smith, J.C. and Harriolt, P.Unit Operations of Chemical Engineering.5th Edition McGraw Hill International Book Co., London.

Bhatt N.D. and Panchal, V.M. Machine Drawing Charocar Publishing House, Opp. Amul Dairy, Anand , 388001 (India) .

Course	B. Pharm	**Semester**	Third
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH302[P]	**Subject Name**	Pharmaceutical Engineering - I

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Third
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH303[T]	Subject Name	Pathophysiology of Common Diseases

Syllabus

Basic Principles of Cell Injury and Adaptation: Causes of Cellular injury, pathogenesis, morphology of cell injury. Intercellular alterations in lipids, proteins and carbohydrates, Cellular adaptation, atrophy, hypertrophy, hyperplasia, metastasis, dysplasia etc.

Basic Mechanisms involved in the process of inflammation and repair: Alterations in vascular permeability and blood flow, migration of WBCS, acute and chronic inflammation, mediators of inflammation, brief outline of the process of repair.

Pathophysiology of Inflammatory Diseases: Rheumatoid arthritis, gout, ulcerative colitis, peptic ulcer, asthma

Pathophysiology of cardiac Disorder: hypertension, angina, congestive heart failure, atherosclerosis, myocardial infarction, arrhythmia.

Pathophysiology of diseases of Microbes: various types of Hepatitis, tuberculosis, urinary tract infections, sexually transmitted diseases, AIDS

Pathophysiology of Liver and renal diseases: liver cirrhosis, jaundice, viral hepatitis, hepatocellular carcinoma, acute and chronic renal failure

Pathophysiology of CNS Disorders: epilepsy, psychosis, depression, mania, Alzheimer disease, Parkinson diseases

Pathophysiology of common diseases: Diabetes, anemia, Iatrogenic diseases, and common types of neoplasms like carcinoma of lung, skin cervix, colon & brief outline on different metabolic cancer, types of leukemias.

Suggested Readings/ Books:

1. Cotran, R.S., Kumar, V., Collins, T. Robbins Pathological Basis of Disease. 7th edt.2003 W.B. Saunders Co.New York.

2. J.T. Dipiro, R.L. Talbert, , G.C. Yee, G.R. Matzke, B.G. Wells, L. Michael Posey (eds.), Pharmacotherapy : A Pathophysiologic Approach, 6th ed.., The McGraw Hill Companies, Inc.,2005.

3. E.T. Herfindal and D.R Gourley, Text Book of Therapeutics: Drug and Disease Management, 7th ed., Lippincott Williams & Wilkins, USA, 2000.

4. Dennis L. Kasper, Eugene Braunwald, Anthony S. Fauci, Stephen L. Hauser, Dan L. Longo, J. Larry Jameson, and Kurt J. Isselbacher, (Eds.), Harrison's Principles of Internal Medicine, 16th ed., The McGraw Hill Companies, Inc., 2004.

Course	B. Pharm	Semester	Third
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH304[T]	Subject Name	Pharmaceutical Engineering - II

Syllabus

Size Reduction and Size Separation: 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, micronizer, quadro co-mil, multimill, etc.

Mixing: Theory of mixing, solid-solid, solid-liquid and liquid-liquid mixing equipments.

Filtration and Centrifugation: Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, etc. Factors affecting filtration, mathematical problems on filtration, optimum cleaning cycle in batch filters. Principles of centrifugation, industrial centrifugal filters, and centrifugal sedimenters.

Crystallization: Characteristics of crystals like-purity, size, shape, geometry, habit, forms size and factors affecting them. Solubility curves and calculation of yields. Supersaturation theory and its limitations, Nucleation mechanisms, Crystal growth, Study of various types of Crystallizers, tanks, Caking of crystals and its prevention.

Evaporation: Basic concept of phase equilibria, factor affecting evaporation, evaporators, film evaporators, single effect and multiple effect evaporators, Mathematical problems on evaporation.

Distillation: Raoult's law, phase diagrams, volatility; simple steam and flash distillations, principles of rectification, Calculation of number of theoretical plates, Azeotropic and extractive distillation. Mathematical problems on distillation.

Drying: Moisture content and mechanism of drying, rate of drying and time of drying calculations; classification and types of freeze drying dryers, Behaviour of solids during drying, MC,EMC,CMC and LOD dryers used in pharmaceutical industries and special drying methods. Mathematical problems on drying.

Extraction: Leaching process, factors affecting the efficiency of leaching process; : continuous counter - current extraction, diffusion batteries, continuous diffusion batteries, Dorr agitator, continuous counter current extraction, Cragg's apparatus.

Suggested Readings/ Books:

Carter SJ. "Cooper & Gunn's Tutorial Pharmacy", 6th edition, CBS Publishers & Distributors, New Delhi.

Badger WL, Banchero JT. “Introduction to Chemical Engineering”. McGraw Hill International Book Co., London.

Perry RH, Green DW. “Chemical Engineers Handbook”, 7th edition, 1998, McGraw Hill, International Editors Ltd, London.

Subramanyam CVS, Setty JT, Suresh S, Devi VK.” Pharmaceutical Engineering- Principles & practices”, 1st edition,2002, Vallabh Prakashan , Delhi.

Subramanyam CVS, Setty JT, Suresh S, Devi VK.” Practical Pharmaceutical Engineering”, 1st edition,2002, Vallabh Prakashan , Delhi.

Sudakar Reddy, Pharmaceutical Engineering : Practical Manual (Unit Operations), PharmaMed Press

Course	B. Pharm	**Semester**	Third
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH304[P]	**Subject Name**	Pharmaceutical Engineering - II

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Third
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH305[T]	Subject Name	Pharmaceutical Chemistry-IV (Chemistry of Natural Product)

Syllabus

Structure, Classification, properties of the following

Carbohydrates: (D-glucose, mutarotation and conformations, amino sugars, D-ribose, 2-deoxy D-ribose, disaccharides, maltose, lactose, sucrose, polysaccharides, starch, cellulose, dextrin, glycogen, inulin, dextrans,) Killiani-fischer synthesis, Ruff degredation.

Alkaloids: General method of determination structure of alkaloids, classification with an acquaintance with structure of alkaloidsof IP, structure elucidation of ephedrine, nicotine and xanthin derivative like caffeine, theobromine and theophylline.

Proteins: Alpha-amino acids, peptides, terminal residual analysis and synthesis. Fibrous and globular proteins, amino acids, nucleoproteins and nucleic acids.

Glycosides: Isolation alpha and beta D-methylglucoside, salicin, arbutin, amygdalin, sinigrin, anthraquinone glycosides, tannins, cardiac glycosides and saponins.

Nucleic acids: nucleic acid bases, nucleosides, nucleotldes.

Fats and oils: Phospholipids, glycolipids and lipoprotein, Analysis of Oil and Fat (Acid, Saponification and iodine values).

Xanthine derivatives: Caffeine, theophylline,

Flavones & isoflavones, coumarines, porphyrines, lipids, fats, oils and waxes, Fatty acids: Characterization and their physico-chemical properties, phospholipids, lecithins, cephalines, sphingomyeline, glycolipids, lipoproteins.

Terpenes: citral, carvone, thymol, menthol and camphor. An elementary treatment of rubber.

Suggested Readings/ Books:

1. Finar, I.L. Organic Chemistry, Vol.-I and II, ELBS/Longman.
2. Acheson, “An introduction to heterocyclic compounds”
3. Indian Pharmacopoeia.
4. Hendrikson, Organic Chemistry

Course	B. Pharm	**Semester**	Third
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH305[P]	**Subject Name**	Pharmaceutical Chemistry-IV (Chemistry of Natural Product)

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

B. Pharm IV Semester Scheme									
Subject Code	**Name of Subject**	**Teaching scheme**		**Credits**		**Examination Scheme**			
		T	**P**	**T**	**P**	**T**		**P**	
						Ext	**Int**	**Ext**	**Int**
BPH401[T]	Microbiology	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH401[P]	Microbiology	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH402[T]	Pharmacognosy - II	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
BPH402[P]	Pharmacognosy - II	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH403[T]	Value education and Spirituality	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH404[T]	Dosage form design	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH404[P]	Dosage form design	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH405[T]	Biochemistry	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH405[P]	Biochemistry	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
		20	**12**	**20**	**8**	**500**		**400**	
Total		**32 hrs/week**		**28**		**900**			

T- Theory, P- Practical

Course	B. Pharm	Semester	Fourth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH401[T]	Subject Name	Pharmaceutical Microbiology

Syllabus

Introduction: Historical development and scope of pharmaceutical microbiology, Structure of Bacterial Cell.

Microbiology Taxonomy- Classification of bacteria, fungi and virus.

Identification of microbes: Working of different types of microscopes, electron microscopy, stains and types of staining techniques, structure and Morphology of bacteria, fungi and virus. Nutritional requirements, Cultivation and isolation of bacteria, fungi and virus

Microbial genetics and variation: Structure of gene, genetic code, transcription, translation, mutation and regulation of gene expresion.

Control of microbes by physical and chemical methods:

Disinfectants: Dynamics of disinfection, factors affecting the process of disinfection, Evaluation of liquid disinfectants & methods of measuring growth inhibition (MIC). Types of chemical agents employed for disinfection, antisepsis and preservation with their full description & use.

Principles and practice of sterilization methods : Introduction, sensitivity of microorganisms, typical survival curves for bacterial spores exposed to moist heat or gamma radiations, expression of resistance in terms of D value and Z value & sterility assurance. Sterilization methods, with emphasis on sterilization of items used in hospital, thermolabile drugs and injectables, monitoring of sterilization processes, laminar aseptic hoods and aseptic processing.

Sterlity testing: Methods and media used with emphasis of the specific details of the sterility testing of parenterals and ophthalmics and other non injectable preparations.

Microbial assays of antibiotics, vitamins and amino acids.

Immunity to infection: Infection and factors influencing infection, immunity, Primary and Secondary defensive mechanism of body, Microbial resistance, Interferon.

Food spoilage and Preservation of food.

Sewage and Sewage disposal: Industrial Sewage, Sewage treatment methods, BOD, COD etc.

Suggested Readings/ Books:

Hugo and Russel. "Pharmaceutical Microbiology", 6th edition, 1998, Balckwell Scientific Publication, Oxford.

Prescott LM, Harley GP, Klein DA." Microbiology". 5th Edition, V.C.Brown Publishers, Oxford.

Pelczar MJ, Chan ECS, Krieg NR. " Microbiology", 5th edition, 1993, Tata McGraw Hill Publishing company Ltd., New Delhi.

Ananthanarayan R, Panikar CKJ. "Textbook of Microbiology", 5th edition, 1999, Orient Longmann Ltd, Chennnai.

Gaud and Gupta, Practical Microbiology, 3rd edition reprint 2008, Nirali Prakashan, Pune.

Course	B. Pharm	**Semester**	Fourth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH401[P]	**Subject Name**	Pharmaceutical Microbiology

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Fourth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH402[T]	Subject Name	Pharmacognosy - II

Syllabus

Systematic Study of Crude Drugs: Including synonyms, biological / geographical sources, identification, chemical constituents, chemical tests, uses, adulteration and evaluation of glycosidal and alkaloidal drugs of following groups:

Glycosidal drugs:

Anthraquinone glycosidal drugs: Senna, Aloe, Rhubarb, Cascara etc.

Saponin glycosidal drugs: Dioscorea, Solanum, Licorice, Senega, Ginseng.

Cyanogenetic glycosidal drugs: Wild Cherry.

Coumarins and Furanocoumarin glycosidal drugs including Psoralea.

Miscellaneous glycosidal drugs: Gentian, Quassia, and Saffron etc.

Alkaloidal drugs:

Indole alkaloidal drugs: especially Ergot, Nux-vomica, Rauwolfia, Catharanthus.

Isoquinoline alkaloidal drugs: including Ipecac, Opium, Curare.

Tropane alkaloidal drugs: Stramonium, Hyoscyamus, Datura, Belladonna, Duboisia etc.

Quinoline alkaloidal drugs: including Cinchona.

Pyridine alkaloidal drugs: especially Areca, Lobelia, Nicotiana.

Imidazole alkaloidal drugs: including Pilocarpus.

Quinazoline alkaloidal drugs: including Vasaka.

Steroidal alkaloidal drugs: especially Ashwagandha, Kurchi, Veratrum, Solanum.

Proto-alkaloidal drugs: Ephedra, Colchicum etc.

Terpenoid alkaloidal drugs: including Aconite.

Carbohydrate and related drugs: Agar, Isabgol, Starch, Honey, Bael, Pectin, Cellulose and Cellulose derivatives, Alginates , Gum Acacia, Gum Tragacanth and other gums and mucilages of pharmaceutical importance.

Lipids and other constituents of following: Castor, Sesame, Olive, Almond, corn Cotton seed, Linseed, Neem, Chaulmoogra, Fish products, Theobroma, Lard, Lanolin, Beeswax and Spermaceti.

Fibers: Study of fibers used in pharmacy such as cotton, silk, wool, nylon, glass-wool, polyester and asbestos. Pharmaceutical standards of fiber products.

Pharmaceutical aids: Study of pharmaceutical aids of category dispersing, emulsifying, suspending agents and viscosity builders, e.g., like talc, diatomite, kaolin, bentonite, gelatin and natural colors.

Suggested Readings/ Books:

1. Pharmacognosy: Trease and Evans
2. Pharmacognosy: Tyler and Brady
3. Pharmacognosy – C. K. Kokate, A.P. Purohit and S.B. Gokhale
4. A Text Book of Pharmacognosy – C.S. Shah & J. S. Quadry
5. A Text Book of Pharmacognosy – T. E. Wallis
6. Text Book of Pharmacognosy – V. K. Kapoor & S.S. Handa
7. Pharmacopoeia of India

Course	B. Pharm	**Semester**	Fourth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH402[P]	**Subject Name**	Pharmacognosy - II

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Fourth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH403[T]	Subject Name	Value Education and Spirituality

Syllabus

Value Education: Concepts of values-definition and types of values –The need for education in values-challenges for value adoption-character development-Vision of a better world

Inculcation of values: Classification of values- Personal Values-Family Values-Social Values-Spiritual values-Benefits of value adoption

Major religions of the world: Hinduism-Jainism-Buddhism-Christianity-Islam-Sikhism

Values in Health care: Inner values- Peace-Positivity-Compassion-co-operation-Valuing yourself

Understanding the self: True Identity-Anatomy of the self-The cyclic processes within the self-States of the awareness-Innate and Acquired qualities-Empowering the self

Exploring Spirituality: Process of thinking-Powers of the self-Self Image & Self motivation - All about the Supreme -Cosmic laws and spiritual laws-The timeless dimension

Spiritual Life style: Early morning meditation-Regular spiritual study-Authentic life style-Satwic Diet-Selfless service-Review of Personal Progress

Principles of living: Be introspective-Be an observer-Being optimistic-Appreciate differences-Don't compare yourself with others-Live at present

Practical Meditation: Methods of Meditation-Rajyoga meditation with a difference-Five fold impact of Rajyoga meditation-Stages of Rajyoga meditation-Attainments of Meditation-Research studies on meditation

Exercises for Practice: Quiet reflection- Practice introversion-Being an observer-Stand back and observe -Self awareness (Soul consciousness)-Experiencing Body free stage-Reflect on original qualities-Visualize the Divine-Think attributes of the Supreme-Developing a living relationship-Surrender to God-Create Good wishes for all-Visualization in Meditation: Orbs of Light- The forest-The Balloon

Course	B. Pharm	Semester	Fourth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH404[T]	Subject Name	Dosage Form Design

Syllabus

Preformulation studies: Study of physical properties of drugs like physical form, particle size, shape, density, wetting, dielectric constant. Solubility, dissolution and organoleptic property and their effect on formulation, stability and bioavailability. Study of chemical properties of drugs like hydrolysis, oxidation, reduction, racemization, polymerization etc., and their influence on formulation and stability of products. Study of pro-drugs in solving problems related to stability, bioavailability and elegancy of formulation.

Study of different types of formulation additives: Diluents, binders, disintegrating agents, lubricants, solvents, co-solvents, vehicles, preservatives, suspending agents, emulsifying agents, antioxidants, coloring, flavoring and sweetening agents, viscosity enhancers, ointment and suppositories bases.

Polymers and biodegradable polymers: Classification, methods of synthesis, properties, characterization and evaluation of polymer. Brief introduction of biodegradable polymers, pharmaceutical applications of polymers.

Drug product design: Stages of drug discovery and development process, Importance of product design, considerations.

Dissolution technology: Theories of dissolution, factors affecting dissolution, design of various dissolution apparatus, dissolution media, dissolution testing of different types of dosage formulations, data interpretation, and mathematical models for predication of dissolution of profile.

Stability and degradation study: Chemical stability, pathways of degradation, physical and phase transformation, stability testing protocols for various pharmaceutical dosage forms, accelerated stability, half-life determination, determination of expiry date (shelf life) and overage calculations, influence of temperature, light, solvent, catalytic species and other factors, stabilization of pharmaceutical formulations.

Suggested Readings/ Books:

Aulton ME. “Pharmaceutics- The Science of Dosage Form Design”, 1st edition, 1998, ELBS/Churchill Livingstone, New York.

Lachman L, Lieberman HA, Kanig JL.” The Theory & Practice of Industrial Pharmacy”, 3rd edition, 1991, Varghese Publishing House, Bombay.

Banker GS, Rhode CT. “Modern Pharmaceutics”, 4th edition, Informa Healthcare, New York.

Lieberman HA, Lachman L, Sachwartz JB.” Pharmaceutical Dosage Forms: Tablets”, 2nd edition , 2005, Vols 1-3 Marcel Dekker, N.Y.

Course	B. Pharm	**Semester**	Fourth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH404[P]	**Subject Name**	Dosage Form Design

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Fourth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH405[T]	Subject Name	Biochemistry

Syllabus

Biochemistry and its importance in Pharmaceutical sciences, biochemical organization of the cell, production of cell energy, ATP and its biological significance, biochemical importance of colloidal systems, Donnan effect.

Enzymes: Classification, nomenclature, factors affecting enzyme action, enzyme kinetics, mode and mechanism of enzyme action and inhibition, isozymes and their importance in diagnosis, vitamins as co-enzymes and their significance, metals as co-factors and there significance.

Carbohydrate Metabolism: Classification, glycolysis, citric acid cycle, glycogenesis and glycogenolysis, hexose monophosphate shunt, uronic acid pathway, blood sugar and its regulation, role of sugar nucleotide in biosynthesis.

Lipid Metabolism: Oxidation of fatty acids, biosynthesis of fats, ketogenesis and ketosis, metabolism of cholesterol, essential fatty acids and eicosanoids phospholipids, sphingolipids, biological oxidation and reduction, respiratory chain, oxidative phosphorylation, enzymes and co-enzymes of Bioredox system.

Metabolism of Amino Acids and Proteins: General biochemical reaction of amino acids like transamination, deamination and decarboxylation, metabolism of sulphur containing amino acids, urea cycle, nitrogen balance, biosynthesis of bile salts and bile pigments.

Metabolism of Nucleic Acids: Biosynthesis and catabolism of purines and pyrimidines containing nucleotides, biosynthesis of DNA and its replication, mutation and repair mechanism, biosynthesis of RNA, genetic code and protein synthesis, brief account of genetic engineering, polymerase chain reactions and regulation of gene expression.

Liver and kidney function tests of biochemical importance.

Detoxification mechanisms like oxidation, hydrolysis, reduction & conjugation.

Suggested Readings/ Books:

D.W. Martin, P.A. Mays and V.M. Redwell, Harpers Review of Biochemistry, Lunge Medical Publication.

Harpers Review of Biochemistry, Langue Medical Publication.

A.L.Lehninger, Biochemistry, Worth Publisher Inc.

A.L.Lehninger, Principle of Biochemistry, CBS publishers and Distributors.

L. Striae, Biochemistry, W.H. Freeman & Co. San Francisco.

B.Harrow and A.Mazur, Text Book of Biochemistry,W.B.Saunders Co.Philadelphia.

Text book of Biochemistry - West and Todd.

Elements of Biochemistry-O.P.Agrawal, Goel Publishing,House, Meerut

Course	B. Pharm	**Semester**	Fourth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH405[P]	**Subject Name**	Biochemistry

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

B. Pharm V Semester Scheme									
Subject Code	**Name of Subject**	**Teaching scheme**		**Credits**		**Examination Scheme**			
		T	**P**	**T**	**P**	**T**		**P**	
						Ext	**Int**	**Ext**	**Int**
BPH501[T]	Pharmaceutical Analysis-I	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH501[P]	Pharmaceutical Analysis-I	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH502[T]	Medicinal Chemistry I	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
BPH502[P]	Medicinal Chemistry I	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH503[T]	Pharmacology-I	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
BPH503[P]	Pharmacology-I	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH504[T]	Dispensing Pharmacy	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH504[P]	Dispensing Pharmacy	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH505[T]	Pharmaceutical Industrial Management	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
		20	**12**	**20**	**8**	**500**		**400**	
Total		**32 hrs/week**		**28**		**900**			

T- Theory, P- Practical

Course	B. Pharm	**Semester**	Fifth
Branch	Pharmacy	**Duration**	60 Hrs [Theory]
Subject Code	BPH501[T]	**Subject Name**	Pharmaceutical Analysis-I

Syllabus

Introduction: Introduction to pharmaceutical analysis, minimization of errors, Propagation of errors in addition and subtraction, multiplication and division, exponents, logarithms, precision and accuracy, selection of sample. Calibration of analytical equipments. Fundamentals of volumetric analysis, method of expressing concentrations, primary and secondary standards. Electrochemistry.

Acid Base Titrations: Acid base concept, role of the solvent, Relative strengths of acids and bases; Law of mass action; common ion effect, ionic product of water, pH, Hydrolysis of salts, Handerson – Hasselbach equation; Buffer and buffer capacity: Acid base indicators, Theory of indicators, choice of indicators, mixed indicators, polyprotic systems, amino acid titration, differential titration, Neutralization curves.

Redox Titrations: Concepts of oxidation and reduction, redox reactions, equivalent weights of oxidizing and reducing agents, electrochemical cells, reduction potential, standard reduction potential, Nernst equation, cell representations, measurement of electrode potential and its application in determining the equilibrium constant of a reaction. Concept of formal potential, oxidation reduction curves, redox indicators. pharmaceutical applications.

Non- aqueous Titrations: Theoretical consideration, scope and limitations, acid base equilibria in non-aqueous media, titration of weak bases, titration of weak acids, indicators, and pharmaceutical products should be selected for illustration.

Complexometric Titrations: Concept of complexation and chelation, Werner's Coordination number and electronic structure of c]mplexions, stability constants, titration curves, masking and demasking agents, types of Complexometric titrations, metal ion indicators, factors influencing the stability of complexes, applications.

Precipitation Titrations: Precipitation reactions, solubility product, effects of common ion, acids, temperature and solvent upon the solubility of a precipitate, conditional solubility product, fractional precipitation. Argentometric titrations, indicators, Gay-Lussac method, Mohr's method, Volhard's method, Fajan's method, Pharmaceutical applications.

Gravimetric Analysis: Precipitation techniques, the colloidal state, gravimetric factor, supersaturation, co-precipitation and its types, Post precipitation, digestion, washing of the

precipitate, filtration, filter papers and crucibles, ignition, thermogravimetric curves of copper sulphate, specific examples like barium as barium sulphate, aluminium as aluminium oxide, calcium as calcium oxalate and magnesium as magnesium pyrophosphate, organic precipitants**.**

Polarography and its application- Theory, mass transport processes, current potential relationship, polarization, choice of electrodes, instrumentation, effect of oxygen, calculation of concentration, laboratory design and safety

Amperometric titration and its application.

Potentiometry Theoretical consideration, ion-selective electrodes, measurement of potential, location of the end point, equipment, analytical applications, direct measurement of a metal concentration, differential curves, determination of Ksp, pH measurements, dead-stop titrations; pH meter, pH definition, relation of pH to potential, equipment, applications.

Conductometric and High Frequency Titrations and their Applications.

Miscellaneous Methods of Analysis: Diazotisation titration, Kjeldahl nitrogen determination, Karl- Fischer titration, Oxygen flask combustion**.**

Suggested Readings/ Books:

Becket & Stenlake. Practical Pharmaceutical Chemistry. Vol. 1& 2. 4th edition, 2005. CBS Publishers, New Delhi.

Jeffery, Bassett & Mendham. Vogel's text book of Quantitative chemical analysis. 5th edition, 1996. Addison Wesley Longman Ltd England.

Danzer K, Analytical Chemistry, 2007, Springer.

R.M. Verma. Analytical Chemistry. IIIrd edition, 2007. CBS Publishers, New Delhi.

Alexeyev. Qualitative Analysis. 2nd edition, 2005. CBS Publishers, New Delhi.

L. M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry, Oxford University Press, Delhi (Latest Edition).

Course	B. Pharm	**Semester**	Fifth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH501[P]	**Subject Name**	Pharmaceutical Analysis-I

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Fifth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH502[T]	Subject Name	Medicinal Chemistry I

Syllabus

Introduction: General pathways of drug metabolism phase I and phase II reaction, factor affecting drug metabolism.

The following topics shall be treated covering chemical naming, structure activity relationship, Synthesis, physicochemical and steric aspects, mode of action and uses. The emphasis would be mainly on BP and IP drugs, synthesis of only those drugs given in parenthesis under each topic would be covered.

- **Adrenergic hormones and drugs** including biosynthesis, storage, release and metabolism of catecholamines (Adrenaline, isoprenaline, salbutamol, amphetamine and naphazoline)
- **Cholinergics and anticholinesterases** including biosynthesis, storage, release and metabolism of Ach (methacholine chloride, neostigmine bromide, Pyridostigmine Bromide)
- **Antiparkinsonism drugs** (apomorphine)
- **Neuromuscular blocking agents** (gallamine triethiodide, succinylcholine chloride)
- **Local anaesthetic agents**: benzocaine, procaine hydrochloride, mepivacaine, lidocaine, cinchocaine hydrochloride.
- **General anaesthetic agents:** Divinyl ether, ethyl chloride, cyclopropane, thiopentone sodium, ketamine
- **Sedatives hypnotics:** barbiturates, amides and imides, alcohols, and their carbamate derivatives, aldehydes and their derivatives. barbitone, phenobarbitone, cyclobarbitone, pentobarbitone sodium, thiopentone sodium non barbiturates (official drugs).
- **Anticonvulsants:** Barbiturates (official drugs), hydantoins, oxazolidinediones, succinamides, miscellaneous dregs, phenytoin sodium, troxidone.
- **Opioid analgesics:** Morphine and related drugs, synthetic modifications of morphine, codeine, thebaine. Totally synthetic analgesics, morphinans(N methylmorphinan and 3 hydroxy Nmethylmorphinan), 6,7-benzomorphans, 4 phenylpiperidines (pethidine, methadone and isomethadone), endogenous opioid peptides, opioid antagonists(nalorphine)

- **CNS stimulants:** nikethamide, methylxanthines and modified methylxanthines (theophylline).
- **Psychopharmacological agents:** Antipsychotics, phenothiazines (chlorpromazine, trifluperazine, butyrophenones, miscellaneous), antidepressants- TCA (amitriptyline), MAO inhibitors, atypical antidepressants, antianxiety drugs- meprobamate and related drugs, benzodianepines (diazepam)
- **Hallucinogens-hallucinogenic agents** related to indoles, phenethylamines, cannabinoids.

Suggested Readings/ Books:

Foye, W.C. "Principles of Medicinal Chemistry" Lea and Febiger, Philadelphia

Wilson and Giswold's "Textbook of Organic, Medicinal and Pharmaceutical Chemistry" J. Lippincott Co., Philadelphia.

Burger's Medicinal Chemistry, John Wiley and Sons, Newyark

Singh and Kapoor "A Text Book of Pharmaceutical and Medicinal Chemistry" Vallabh Prakashan, New Delhi.

Course	B. Pharm	**Semester**	Fifth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH502[P]	**Subject Name**	Medicinal Chemistry I

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Fifth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH503[T]	Subject Name	Pharmacology-I

Syllabus

General Pharmacology: Introduction to pharmacology, sources of drugs, dosage forms and different routes of administration, factors modifying drug action and dosage forms, **Pharmacodynamics:** different types of drug actions, Receptor theory and its mechanisms, Pharmacokinetics: Absorption, distribution, metabolism and excretion of drugs, Principles of basic and clinical pharmacokinetics, ADME drug interactions. tolerance and dependence, pharmacogenetics, Adverse drug reactions, Combined effect of drugs, Drug Addition & Drug abuse, Bioassays of drugs and biological standardization, Discovery and development of new drug (clinical and pre-clinical studies).

Pharmacology of ANS: Neurohumoral transmission- autonomic and somatic, parasympathomimetic, parasympatholytics, sympathomimetics, adrenergic receptors and neuron blocking agents, ganglion stimulants and blocking agents, local anaesthetics.

Pharmacology of CNS: Neurohumoral transmission in CNS, general anesthetics, alcohol and disulfuram, sedative and hypnotics, antianxiety agents and centrally acting muscle agents, CNS stimulants, psychopharmacological agents (antipsychotics), antidepressants, antimaniacs and hallucinogens, antiepileptic drugs, antiparkinsonians. Narcotic analgesics and its antagonists, Non steroidal anti-inflammatory drugs: Analgesics, Antipyretics, Anti-inflammatory and Anti-gout drugs, Drugs for neurodegenerative disorders.

Suggested Readings/ Books:

Barar F S K, Text Book of Pharmacology, Interprint, New Delhi.

Best and Taylor's Physiological Basis of Medical Practice, William & Wilkins, Baltimore.

Crossland J and Thomson J H., Essentials of Pharmacology, Harper and Row Publishers NY

Craig C R and Stitzel R R, Modern Pharmacology, Little Brown and Company, 1994.

Davidson's Principles and Practice of Medicine, ELBS/Churchill Living Stone.

DiFore Lea SHand Febiger, Atlas of Normal Histology, Philadelphia.

Ghosh M N., Fundamentals of Experimental Pharmacology, Scientific Book Agency, Calcutta.

Goodman and Gilman's, The Pharmacological basis of Therapeutics; Editors: J G Hardman, LE

Guyton A C, Hall JE., Textbook of Medical Physiology,WB Sannders Company.

Human Physiology, C C Chatterjee, Medical Allied Agency, Calcutta.

Human Physiology, Subhash Shalya, CBS Publishers & Distributors.

Kulkarni S.K., Handbook of Experimentals Pharmacology, Vallabh Prakashan Delhi.

Mycek M J, Gertner S Band Perper M M, Pharmacology Lippincott's Illustrated Reviews, Lippincott Company, Philadelphia.

Paul L., Principles of Pharmacology, Chapman and Hall.

Rang MP, Dale MM, Riter lM., Pharmacology, Churchill Livingstone.

Tortora G J, and Anagnodokos N P, Principles of Anatomy and Physiology Harper & Row Publishers N. Y.

Course	B. Pharm	**Semester**	Fifth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH503[P]	**Subject Name**	Pharmacology-I

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Fifth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH504[T]	Subject Name	Dispensing pharmacy

Syllabus

Posology: Factor affecting dose and action of drugs, dosage route of administration, application of some common drugs and calculation of doses for infants, adults and elderly patients.

Prescription: Definition, various part of prescription, Handling of prescription, source of errors in prescription, General dispensing procedures including labelling of dispensing products.

Pharmaceutical Calculations: Weight & measures, house hold measures and use of equivalents imperial system to metric system, Enlarging and reducing recipes percentage solutions, allegation, proof spirit, isotonic solutions and displacement value.

Principle involved and procedures adopted in dispensing: Typical prescriptions like mixtures, solutions, emulsions, creams, ointments, powders, granules, capsules, pastes, jellies, suppositories, ophthalmic, pastilles, lozenges, pills, lotions, liniments, inhalations, paints, sprays, tablet triturates etc.

Incompatibility: Physical, chemical and therapeutic incompatibilities and their corrections.

Pharmaceutical care: Definition and principles of pharmaceutical care. Emergency treatment in shock, snake-bite, burns, poisoning, heart diseases, fractures, resuscitation methods. Elements of minor surgery and dressings.

Community pharmacy: Organization and structure of retail and whole sale drug store, legal requirement for establishment and maintenance, dispensing of proprietary products, maintenance of records, patient counseling, role of pharmacist in community health, hazards of medication.

Suggested Readings/ Books:

Carter SJ. “Cooper & Gunns Tutorial Pharmacy”, 6th edition, CBS Publishers & Distributors, New Delhi.

Indian Pharmacopoeia 2007, Vol I-III, 2008, Indian Pharmacopoeia Commission, Ghaziabad.

British Pharmacopoeia 2009, British Pharmacopoeia Commission, UK.

Remingtons The Science & Practice of Pharmacy Mack Publishing Co. Easton, PA

Jain NK & Gupta GD. Modern Dispensing Pharmacy, II edition, 2009, Pharma Book Syndicate, Hyderabad

Gaud RS & Gupta GD. Practical Pharmaceutics, 1st edition, Reprint 2008, , CBS Publishers & Distributors, New Delhi.

Course	B. Pharm	**Semester**	Fifth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH504[P]	**Subject Name**	Dispensing pharmacy

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Fifth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH505[T]	Subject Name	Pharmaceutical Industrial Management

Syllabus

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). Identification of key points to give maximum thrust for development and perfection.

Accountancy: Principles of Account, ledger posting and journal entries, preparation of trial balance, columns of a cash book. Bank reconciliation statement, rectification of errors, profit and loss account, balance sheet, purchase, keeping and pricing of stocks. Treatment of cheques, bills of exchange, promissory notes and hundies, documentary bills.

Economics: Principles of economics with special reference to the laws of demand and supply, demand schedule, demand curves, labor welfare, general principles of insurance and inland and foreign trade, procedure of exporting and importing goods.

Planning and Decision making: Definition, importance of planning, steps involved in decision making, objectives, strategies, policies and program.

Production planning and control scientific purchasing, quality control, problems of productivity, stores organization, location of store, receiving, inspection and issue of materials; control of stores and stocks, stores accounting and records.

Personnel Management Selection, appointment, training, transfer, promotion and demotion, remuneration, job evaluation, human relations.

Pharmaceutical Marketing: Functions, buying, selling, transportation, storage, finance, feedback, information, channels of distribution, wholesale, retail, departmental store, multiple shop and mail order business.

Market Research: a) Measuring & Forecasting Market Demands- Major concept in demand measurement, estimating current demand, Geodemographic analysis, estimating industry sales, market share & future demand.

b) Market Segmentation & Market Targeting.

Materials Management: A brief exposure or basic principles of materials management, major areas, scope, purchase, stores, inventory control and evaluation of materials management.

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.

Salesmanship: Principles of sales promotion, advertising, Ethics of sales, merchandising, literature, detailing. Recruitment, training, evaluation, compensation to the pharmacist.

Sales forecasting: Various methods, analysis, limitations and advantages.

Suggested Readings/ Books:

Principles of Marketing, by Philips Kottler.

Personnel management and Industrial Relations, by R.S. Davar.

Personnel management, by Mamoria.

Materials management, by Gopalkrisnan,and R.K. Rajput.

Purchasing and Store Keeping, by D.R. Gupta, R.K. Rajput.

Principles and Practice of Management - Peter Drucker.

Principles of Management - Koontz O'Donnel.

Business Organization and Management - Shukla.

Business Organization - Ghosh.

Principles of Industrial Organization - Kimball and Kimball.

Double Entry Book Keeping - Batliboi.

Professional Pharmacy - Jain and Sharma.

D.A. Whetton and K.S. Cameron, Developing Management Skills, New York: Harper Collins, 1995, 72-73.

B. Pharm VI Semester Scheme									
Subject Code	**Name of Subject**	**Teaching scheme**		**Credits**		**Examination Scheme**			
		T	**P**	**T**	**P**	**T**		**P**	
						Ext	**Int**	**Ext**	**Int**
BPH601[T]	Hospital and Clinical Pharmacy	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH601[P]	Hospital and Clinical Pharmacy	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH602[T]	Medicinal Chemistry II	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
BPH602[P]	Medicinal Chemistry II	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH603[T]	Pharmacology - II	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
BPH603[P]	Pharmacology - II	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH604[T]	Pharmaceutical Technology – I	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH604[P]	Pharmaceutical Technology – I	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH605[T]	Pharmacognosy - III	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH605[P]	Pharmacognosy - III	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH606[P]	Educational Tour	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**50**
		20	**15**	**20**	**12**	**500**		**550**	
Total		**35 hrs/week**		**32**		**1050**			

T- Theory, P- Practical

Course	B. Pharm	**Semester**	Sixth
Branch	Pharmacy	**Duration**	60 Hrs [Theory]
Subject Code	BPH601[T]	**Subject Name**	Hospital and Clinical Pharmacy

Syllabus

Organization & Structure: Organization of a hospital and hospital Pharmacy, Responsibilities of hospital pharmacist, Pharmacy and therapeutic committee, Budget preparation and Implementation.

Hospital Formulary: Contents, preparation and revision of hospital formulary.

Drug Store Management and Inventory Control: Organization of drug store, Types of materials stocked, storage conditions, Purchase and Inventory Control-principles, purchase procedures, Purchase order, Procurement and stocking.

Drug distribution System in Hospitals: Outpatient dispensing, methods adopted. Dispensing of drugs to in-patients. Types of drug distribution system. Charging policy, labeling; Dispensing of drugs to ambulatory patients; Dispensing of controlled drugs.

Central Sterile Supply Unit and their Management: Types of materials for sterilization, Packing of materials prior to sterilization, sterilization equipments, Supply of sterile materials. Manufacture of Sterile and Non-sterile Products: Policy making of manufacturable items, demand and costing, personnel requirements, manufacturing practice, Master formula Card, production control, manufacturing records.

Drug Information Services: Sources of Information on drugs, disease, treatment schedules, procurement of information, computerized services (e.g., MEDLINE), Retrieval of information, Medication error.

Records and Reports: Prescription filling, drug profile, patient medication profile, cases on drug interaction and adverse reactions, idiosyncratic cases. Pharmacoeconomics: Introduction to pharmacoeconomics, different methods of pharmacoeconomics, application of pharmacoeconomics. Pharmacoepidemiology: Definition and scope, method to conduct pharmacoepidemiological studies, advantages & disadvantages of pharmacoepidemiological studies.

General Principles, preparation, maintenance, analysis of observational records in clinical Pharmacy.

Clinical trials, type and phases of clinical trials, placebo, ethical and regulatory issues including Good clinical practice in clinical trials.

Therapeutic drug monitoring, adverse drug reaction (ADR), types of ADR, Mechanism of ADR. Drug interaction, Monitoring and reporting of ADR and its significance. Drug information services, Drug interactions.

Pharmacovigilance, Therapeutic drug monitoring, Neutraceuticals, essential drugs and rational drug usage.

Suggested Readings/ Books

Owunwonne Handbook of Radio pharmaceuticals. Narosa Publishing House, New Delhi.

Hassan, William E. Hospital Pharmacy. Lea & Febiger, Philadelphia.

Remington□s The Science & Practice of Pharmacy Mack Publishing Co. Easton, PA

Turco. S, and King, R.E. Sterile Dosage Forms. Lea & Febiger, Philadelphia.

Laurence, D R and Bennet P. N., Clinical Pharmacology, Churchill Livingstone.

Herfindal E T and Hirschman J L., Clinical Pharmacy and Therapeutics. Williams and Wilkins.

Heifindal et al: Clinical Pharmacy & Therapeutics.

Allwood and Fell: Hospital Pharmacy.

Pratibha Nand and R.K. Khar: Hospital & Clinical Pharmacy.

Course	B. Pharm	**Semester**	Sixth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH601[P]	**Subject Name**	Hospital and Clinical Pharmacy

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Sixth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH602[T]	Subject Name	Medicinal Chemistry II

Syllabus

Steroids: Introduction, Nomenclature, stereochemistry, Biosynthesis, simple reactions and SAR of Cholesterol; Estrogens, progesterone, Testosterone Antiestrogens and progesterone. Oral contraceptives, anabolic agents and adrenocorticoids

The following topics shall be treated covering Introduction, chemical naming, classification, structure activity relationship, Synthesis, physicochemical and steric aspects, and mode of action and uses of the following category of drugs. (Synthesis of only those drugs given in parenthesis under each topic would be covered.)

- **CVS agents:** Antihypertensive agents, etiology, 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, (nitroglycerine), antiarryhthmic and antifibrillytic drugs, antilipidemic drugs.
- **Anticoagulants and haemostatic agents** (warfarin, phenindione)
- **Diuretics:** Carbonic anhydrase inhibitors (acetazolamide and dichlorphenamide), Thiazides and related drugs (bendrofluazide), High ceiling diuretics (Frusemide), aldosterone antagonists (spironolactone), other potassium sparing diuretics, osmotic diuretics.
- **Prostaglandins and other Eicosanoids:** Nomenclature, biosynthesis and biological activity
- **NSAIDS:** includes anti-gout drugs also (Indomethacin, phenylbutazone, allopurinol, probenecid).
- **Antihistamines:** including discussion on sodium cromoglycate (mepyramine, diphenhydramine, chlorpheniramine, promethazine)
- **Antitussives:** Centrally acting antitussives, opium alkaloids and their modifications, synthetic antitussives, peripherally acting antitussives, expectorants.
- **Vitamins** excluding detailed study of constitution.

Suggested Readings/ Books:

Foye, W.C. “Principles of Medicinal Chemistry” Lea and Febiger, Philadelphia

Wilson and Giswold’s “Textbook of Organic, Medicinal and Pharmaceutical Chemistry” J.

Lippincott Co., Philadelphia.

Burger's Medicinal Chemistry, John Wiley and Sons, Newyark

Singh and Kapoor "A Text Book of Pharmaceutical and Medicinal Chemistry" Vallabh Prakashan, New Delhi.

Course	B. Pharm	**Semester**	Sixth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH602[P]	**Subject Name**	Medicinal Chemistry II

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Sixth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH603[T]	Subject Name	Pharmacology-II

Syllabus

Pharmacology of cardiovascular systems: Digitalis and cardiac glycosides, Antihypertensive drugs, Antianginal and vasodilator drugs, including calcium channel blockers and beta adrenergic antagonists, Antiarrythmic drugs, Antihyperlipidimic drugs, Drugs used in therapy of shock.

Drugs acting on haemopoetic systems: Hematinics, Anticoagulants, vitamin K, haemostatic agents, Fibrinolytics, antiplatelet drugs, Blood and plasma volume expanders.

Drugs acting on urinary system: Fluid and electrolyte balance, Diuretics, Anti-diuretics.

Autacoids: Histamine, 5-HT and their antagonists, Prostaglandins, thromboxanes and leukotrienes, Pentagastrins, cholecystokinin, angiotensin, bradykinin and substance P.

Drugs acting on respiratory system: Antiasthamatic drugs including bronchodilators, antitussive, expectorant and respiratory stimulants.

Peptides and proteins as mediators: General Principal of peptide pharmacology Biosynthesis and regulation of peptides, Peptide antagonists. Protein and peptide as drugs.

Nitric oxide: Biosynthesis of nitric oxide and its physiological role, Therapeutic use of nitric oxide and nitric oxide donors. Clinical condition in which nitric oxide may play a part.

Vitamins & Minerals: Vitamin deficiency diseases and their management, Role of minerals in health & diseases.

Chronopharmacology: Definition of rhythm and cycles. Biological clock and their significance leading to chronotherapy.

Suggested Readings/ Books:

Barar F S K, Text Book of Pharmacology, Interprint, New Delhi.

Best and Taylor's Physiological Basis of Medical Practice, William & Wilkins, Baltimore.

Crossland J and Thomson J H, Essentials of Pharmacology, Harper and Row Publishers NY

Craig C R and Stitzel R R, Modern Pharmacology, Little Brown and Company, 1994.

Davidson's Principles and Practice of Medicine, ELBS/Churchill Living Stone.

Di Fore Lea SH and Febiger, Atlas of Normal Histology, Philadelphia.

Ghosh MN, Fundamentals of Experimental Pharmacology, Scientific Book Agency, Calcutta.

Goodman and Gilman's, The Pharmacological basis of Therapeutics; Editors: J G Hardman,

Guyton A C, Hall JE, Textbook of Medical Physiology,WB Sannders Company.

Chatterjee C C, Human Physiology, Medical Allied Agency, Calcutta.

Shalya S, Human Physiology, CBS Publishers & Distributors.

Kulkarni SK, Handbook of Experimentals Pharmacology, Vallabh Prakashan Delhi.

Mycek MJ, Gertner SB and Perper MM, Pharmacology Lippincott's Illustrated Reviews, Lippincott Company, Philadelphia.

Paul L, Principles of Pharmacology, Chapman and Hall.

Rang MP, Dale MM and Riter lM, Pharmacology, Churchill Livingstone.

Tortora GJ, and Anagnodokos NP, Principles of Anatomy and Physiology Harper & Row Publishers. NewYork

Course	B. Pharm	**Semester**	Sixth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH603[P]	**Subject Name**	Pharmacology-II

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Sixth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH604[T]	Subject Name	Pharmaceutical Technology-I

Syllabus

Tablets: Formulation of different types of tablets, granulation technology or large scale by various techniques, physics of tablets making, different types of tablet compression machinery and the equipment employed, evaluation of tablets.

Coating of Tablets: Types of coating, film forming materials, formulation of coating solution, equipments for coating, coating process evaluation of coated tablets.

Capsules: Introduction, types, advantages and disadvantages, material and method of preparation hard gelatin capsules, size of capsules, method of capsule filling, soft gelatin, capsule shell and capsule content, importance of base absorption and minimum/gm factors in soft capsules, evaluation, quality control, stability testing and storage of capsule dosage forms.

Liquid dosages forms: Solutions, syrups, elixirs, spirits, aromatic water, liquid for external uses), Definition, types, general formulation, manufacturing procedure, evaluation methods.

Suspensions: Formulation of deflocculated and flocculated suspension, manufacturing procedure, evaluation methods.

Emulsions: Types, emulsifying agents, general formulation, manufacturing procedure, evaluation methods.

Semisolid dosage forms: Definitions, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection. General formulation of semisolids, clear gels manufacturing procedure, evaluation and packaging.

Suppositories: Classification, ideal requirements, bases, manufacturing procedure, packaging and evaluation.

Pharmaceutical aerosols: Definition, propellants, general formulation, manufacturing and packaging methods. Evaluation and pharmaceutical applications of aerosol.

GMP and validation: Concept and need of good manufacturing practice guidelines.

Elements of GMP covering controls of area and processes and product. Regulations related to GMP. Introduction of validation process. Types of validation. Brief methodology of process, equipments and instrument validation.

Suggested Readings/ Books:

Aulton ME. "Pharmaceutics- The Science of Dosage Form Design", 1st edition, 1998, ELBS/Churchill Livingstone, New York.

Lachman L, Lieberman HA, Kanig JL." The Theory & Practice of Industrial Pharmacy", 3rd edition, 1991, Varghese Publishing House, Bombay.

Banker GS, Rhode CT. "Modern Pharmaceutics", 4th edition, Informa Healthcare, New York.

Allen LV, Popovich NG, Ansel HC", Ansel's pharmaceutical Dosage Forms & Drug Delivery Systems", 8th edition, 2005.

Sagarin, Balsam MS." Cosmetic Science & Technology", Vol. 1-3 2nd ed. John Wiley.

Butter H., Poucher's Perfumes Cosmetics and Soaps, 10th edition, 2007, Springer.

Course	B. Pharm	**Semester**	Sixth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH604[P]	**Subject Name**	Pharmaceutical Technology-I

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Sixth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH605[T]	Subject Name	Pharmacognosy - III

Syllabus

Volatile Oils: Chemistry and biogenesis of medicinally important monoterpenes, sesquiterpenes, diterpenes and triterpenes.

Study of important drugs yielding essential oils like Mentha, Coriander, Cinnamon, Cassia, Lemon peel, Orange peel, Lemon grass, Citronella, Caraway, Dill, Spearmint, Clove, Fennel, Nutmeg, Eucalyptus, Chenopodium, Cardamam, Valerian, Musk, Palamarosa, Gaultheria, Sandalwood.

Resins: classification and medicinal importance. Study of some important resin containing drugs Colophony, Podophyllum, Jalap, Canabis, Capsicum, Myrrh, Asafoetida, Balsam of Tolu, Balsam of Peru, Benzoin, Turmeric, Ginger etc.

Tannins: Classification, chemistry, uses and medicinal significance. Important drugs of this category like Gambir, Black Catechu, Pale Catechu, Myrobalan etc.

Proteins and enzymes: Sources, Preparation, Identification test, Chemical nature, and uses of papain, pepsin, pancreatin, urokinase, diastase, trypsin, penicillinase, hyaluronidase.

Quality Control and Standardization: Introduction, classification, and study of different chromatography methods and their methods and their applications in evaluation of herbal drugs. Extractive values, Ash values, Concept of marker compounds

Introduction, classification and study of different chromatographic methods -TLC, Paper chromatography, Column chromatography, HPTLC, HPLC, GC, Ion exchange chromatography, Size exclusion chromatography, Droplet counter current chromatography and their applications in evaluation of herbal drugs.

WHO Guidelines for rational use of herbal drugs

Utilization and production of phyto-constituents from aromatic and medicinal plants: Isolation of the following phyto-constituents (including industrial methods): Morphine, Quinine, Reserpine, Sennosides, Digitalis glycosides, Diosgenin, Menthol, Thymol, Rutin, Psoralen.

Marine Pharmacognosy: Study of novel agents from marine sources

Herbal constituents as health foods and cosmetic ingredients, Natural allergens, photosensitizing agents, Fungal and mushroom toxins, poisonous plants

Chemistry and biogenesis of medicinally important alkaloids, glycosides, terpenoids, lignans, quassinoids, carotenoids and flavonoids.

Concept of synergy in herbs.

Suggested Readings/ Books:

1. Pharmacognosy: Trease and Evans
2. Pharmacognosy: Tyler and Brady
3. Pharmacognosy – C. K. Kokate, A.P. Purohit and S.B. Gokhale
4. A Text Book of Pharmacognosy – C.S. Shah & J. S. Quadry
5. A Text Book of Pharmacognosy – T. E. Wallis
6. Text Book of Pharmacognosy – V. K. Kapoor & S.S. Handa
7. Pharmacopoeia of India.

Course	B. Pharm	**Semester**	Sixth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH605[P]	**Subject Name**	Pharmacognosy - III

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

B. Pharm VII Semester Scheme									
Subject Code	**Name of Subject**	**Teaching scheme**		**Credits**		**Examination Scheme**			
		T	**P**	**T**	**P**	**T**		**P**	
						Ext	**Int**	**Ext**	**Int**
BPH701[T]	Pharmaceutical Analysis-II	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH701[P]	Pharmaceutical Analysis-II	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH702[T]	Medicinal Chemistry III	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
BPH703[T]	Pharmacology-III	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
BPH703[P]	Pharmacology-III	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH704[T]	Cosmeticology	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH704[P]	Cosmeticology	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH705[T]	Pharmaceutical Jurisprudence	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH706[P]	Project Work	**-**	**3**	**-**	**2**	**-**	**-**	**50**	**-**
		20	**12**	**20**	**8**	**500**		**350**	
Total		**32 hrs/week**		**28**		**850**			

T- Theory, P- Practical

Course	B. Pharm	Semester	Seventh
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH701[T]	Subject Name	Pharmaceutical Analysis-II

Syllabus

Quantitative Analysis and Data Handling: Introduction to concept of Quality Control and Assurance in Pharmaceutical Industry and role of Statistics in pharmaceutical analysis. Significance of quantitative analysis in quality control, different techniques of analysis, preliminaries and definitions, significant figures. Rules for retaining significant figures, Types of errors (Determinate and Indeterminate).

Electromagnetic Radiations: Nature of Electromagnetic Radiations, the interaction between energy and matter.

Ultraviolet and Visible Spectrophotometry: Beer-lambart law, electronic transitions, instrumentation, methods, chemical derivatisation, structural analysis, applications..

Fluorometric Analysis: Theory, quantitative description, experimental factors affecting fluorescence intensity, factors affecting Io and F directly, relationship of fluorescence to molecular structure, instrumentation (cells, light sources, wavelength selection, detectors), correction of spectra, pharmaceutical applications.

Chromatography: The theoretical aspects, basic instrumentation, and pharmaceutical application of the following chromatographic techniques

Paper Chromatography TLC, GLC, HPTLC and HPLC.

Infrared Spectrophotometry: Theory, instrumentation, qualitative and quantitative applications in pharmaceutical analysis,

X-Ray Spectroscopy: Introduction and theory of x-ray spectroscopy. Diffraction of x-ray by crystals, Bragg's equation, powder method, x-ray diffraction pattern of cubic system, applications in pharmaceutical analysis.

Nuclear Magnetic Resonance Spectroscopy: An introduction to the theory of NMR, magnetic properties of the nuclei, nuclear magnetic moments, absorption of energy, chemical shift, shielding and deshielding, spin-spin coupling, NMR instrumentation, typical spectra, analytical application in pharmaceutical analysis.

Mass Spectrometry: Instrumentation, Basic principle determination of the molecular formula, recognition of the molecular ion peak, fragmentation and analytical application in pharmaceutical analysis.

Flame Photometry: Origin of spectra, atomization and ionization, instrumentation qualitative & quantitative applications in pharmaceutical analysis).

Atomic Absorption Spectroscopy: Theory of absorption of radiant energy by atoms, equipment, analytical applications.

Polarimetry: Theory, principles and Applications.

Electrophoresis

Suggested Readings / Books:

L.G. Chatten, Pharmaceutical Chemistry, V 01. 1 and 2, Marcel Dekker, NY (Latest Edition).

A. H. Beckett and J. B. Stenlake, Practical Pharmaceutical Chemistry,Vol. 1 and 2, Athlone Press of the University of London (Latest Edition). Punjab Technical University/B.Pharmacy/Batch 2011-12 93

H. Willard, L.L., Marriott; Jr., J. A. Dean, Instrumental Methods of Analysis, Van Nostrand Reinhold, N.Y. (Latest Edition).

J. W. Robinson, Undergraduate Instrumental Analysis, Marcel and Dekker Inc., NY, 1970 (Latest Edition).

V. M. Parikh, Absorption Spectroscopy of Organic Molecules, Addison-Wesley Publishing Co., London, 1974 (Latest Edition).

Course	B. Pharm	**Semester**	Seventh
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH701[P]	**Subject Name**	Pharmaceutical Analysis-II

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Seventh
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH702[T]	Subject Name	Medicinal Chemistry-III

Syllabus

Principles of drug design: Traditional analogue, Introduction to quantitative structure activity relationship (QSAR), computer aided drug designing (CADD), Prodrug design and its mechanism based approaches. Application of quantum mechanics, and molecular modelling.

Enzymes: Metabolite antagonism-basic concepts, active site directed irreversible enzyme inhibitors, mechanism based enzyme inhibitors, dihydrofolate synthetase inhibitors, dihydrofolate reductase inhibitors, amino acid antagonists, antagonists directed against nucleic acids, _-lactamase inhibitors.

The following topics shall be treated covering Introduction, chemical naming, classification, structure activity relationship, Synthesis, physicochemical and steric aspects, mode of action and uses of the following category of drugs. (Synthesis of only those drugs given in parenthesis under each topic would be covered.)

- **Antispasmodic & antiulcer drugs** (cyclopentolate, propantheline bromide, benzhexol, Dicyclomine hydrochloride)
- **Hypoglycaemic drugs** (tolbutamide),Thyroid hormones and antithyriod drugs
- (L-thyroxine, propylthiouracil)
- **Sulphonamides:** sulphanilamide, sulphacetamide, sulphadiazine, sulphadimethoxine, sulphamethazole and sulphamethoxazole
- **Antibiotics-** cycloserine, chloramphenicol, penicillins, cephalosporins, aminoglycosides, tetracyclines, polypeptides (chloramphenicol)
- **Anti mycobacterial agents-** dapsone, sulfoxone sodium, solapsone, isonicotinic acid hydrazide, para aminosalicylic acid, pyrazinamide and ethionamide.
- **Antimalarials:** Quinoline and analogues, 8-amino quinolines, 9- amino acridines, 4-amino quinolines, diamino pyrimidine, biguanides (primaquin, mepacrine, chloroquin , pyrimethamine)
- **Antiamoebic agents:** Emetine hydrochloride, quinoline derivatives, metal free substances, diloxanide furoate, metronidazole, organometallic compounds, acetarsol (diodohydroxyquinoline, diloxanide)
- **Anthelmintics drugs:** niclosamide, hexylresorcinol, diethylcarbamazine citrate, thiabendazole. Drug used in cestide infections, drugs used in trematode infections, drugs for intestinal nematode infections.

- **Antifungal agents**: antibiotics, griseofulvin, amphotericin, candicidine, nystatin, synthetic antifungal agents, salicyclic acid, miconazole elcomazole, tolanflate, flucotosine, dithranol and chlorphenesin
- **Antineoplastic agent**- antimetabolites, 6-thioguanine, methotrexate, 6-mercaptopurine, cytarabine, 5-flurouracil and dacarbazine, alkylating agents, mechlorethamine, melphalan, busulphan, mitomycin, cisplatin, thiotepa, chlorambucil, carmustine, lomustine, cyclophosphamide, DNA intercalating agents, doxorubicin, daunorubicin, mitoxantrine, antibiotics, dactinomycin, bleomycin, mithramycin, anthramycin, antimitotic agents, vincristine, vinblastine, miscellaneous agents, procarbazine, asparaginase, interferones, hydroxyurea.
- **Antiviral agents**- Retroviruses, viral replication, amantidine hydrochloride, interferones, acyclovir, idoxuridine, trifluorothymidine, vidarabine, cytarabine, ribavirin, methisazone, zidovudine.
- **Diagnostic agents**
- **Drugs used for trypanosomiasis** and other protozoal diseases
- **Urinary antiseptics** quinolones, nalidixic acid, nitrofurantion
- **Disinfictants and antiseptics**
- **Oxytocics** (including discussion on ergot alkaloids also) (ergometrine).

Suggested Readings/ Books:

Foye, W.C., Principles of Medicinal Chemistry, Lea and Febiger, Philadelphia.

Wolff , M.E. Ed., Burger's Medicinal Chemistry, John Wiley and Sons, New York.

Hansch, C., Comprehensive Medicinal Chemistry, Pergarnon Press, Oxford.

Delagado, J.N. and Remers, W.A.R, Wilson and Giswold's Text Book of Organic,Medicinal and Pharmaceutical Chemistry, J.Lippincott Co., Philadelphia.

Kar, A., Medicinal Chemistry, Willey Eastern Ltd., New Delhi.

Patrick, G., An Introduction to Medicinal Chemistry, Scientific Distributors, Mumbai.

Malone, Dyson and Purey, May's Chemistry of Synthetic Drugs.

Singh H.K., Kapoor, V. K., Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, New Delhi

Thomas, G., Introduction to Medicinal Chemistry, CBS Publishers and Distributors, New Delhi

Course	B. Pharm	Semester	Seventh
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH703[T]	Subject Name	Pharmacology-III

Syllabus

Drugs acting on the Gastrointestinal Tract: Antacids, antisecretory, anti-ulcers, Laxatives, antidiarrhoeal, Appetite stimulants and suppressants, Emetics and anti-emetics, Miscellaneous- Carminatives, demulcents, protectives, adsorbents, Astrigents, digestants, enzymes and mucolytics.

Pharmacolgy of Endocrine system: Hypothalamic and pituitary hormones,Thyroid hormones and anti thyroid drugs, parathormone, calcitonin and vitamin D, Insulin, oral hypoglycaemic agents and glucagons, ACTH and corticosteroids, Androgens and anabolic steroids, Estrogen, progesterone and oral contraceptive, Drugs acting on the uterus.

Chemotherapy:

- General principles of chemotherapy.
- Sulfonamides and cotrimoxazole.
- Antibiotics – Penicillins, cephalosporins, chloramphenicol, Macrolides, quinolines and fluoroquinolins, quinolones. Tetracyclines. Aminoglycosides and miscellaneous antibiotics.
- Chemotherapy of tuberculosis, leprosy, fungal diseases, viral, AIDS, protozoal diseases, worm infections, urinary tract infections and sexually transmitted diseases.
- Chemotherapy of malignancy
- Immunostimulants and immunosuppressive agents.

Basic Concepts of Pharmacotherapy: Clinical Pharmacokinetics Individualization of Drug Therapy, Drug Use During Infancy and in the Elderly (Pediatrics and Geriatrics), Drug use during Pregnancy, General principles of clinical laboratory tests.

Principles of toxicology: Definition of poison. General principles of treatment of Poisoning. Treatment of poisoning due to Heavy metals, insecticides, opiods barbiturates, Atropine and other addict forming drugs. Study of acute, sub acute and chronic toxicity as per OECD guidelines. Genotoxicity, Carcinogenicity, teratogenicity and mutagenicity studies

Suggested Readings/ Books:

Barar F S K, Text Book of Pharmacology, Interprint, New Delhi.

Best and Taylor's Physiological Basis of Medical Practice, William & Wilkins, Baltimore.

Crossland J and Thomson J H., Essentials of Pharmacology, Harper and Row Publishers, NewYork

Craig C R and Stitzel R R, Modern Pharmacology, Little Brown and Company, 1994.

Goodman and Gilman's, The Pharmacological basis of Therapeutics; Editors: J G Hardman, LE

Guyton A C, Hall JE., Textbook of Medical Physiology,WB Sannders Company.

Mycek M J, Gertner S Band Perper M M, Pharmacology Lippincott's Illustrated Reviews, Lippincott Company, Philadelphia.

Paul L., Principles of Pharmacology, Chapman and Hall.

Rang MP, Dale MM, Riter lM., Pharmacology, Churchill Livingstone.

Tortora G J, and Anagnodokos N P, Principles of Anatomy and Physiology Harper & Row Publishers N. Y.

Course	B. Pharm	**Semester**	Seventh
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH703[P]	**Subject Name**	Pharmacology-III

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Seventh
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH704[T]	Subject Name	Cosmeticology

Syllabus

Introduction to cosmetics, Applications, origin and development of cosmetic sciences. Basic knowledge of skin and hair, role of hormones and vitamins in skin nutrition. Dermatitis and allergy, primary irritants, photosensitization, allergy and antihistaminics in cosmetics.

Cosmetic colours: Natural and synthetic colours including plant and animal origin colours, lakes, pigments and inorganic colours.

Perfumes in cosmetics: Synthetic, natural and artificial perfumes, classification of perfumes, manufacturing and blending of perfumes.

Formulation, manufacturing and equipments used for the following types of cosmetic preparations.

(a) Skin creams and lotions, classification of skin creams, cold, vanishing, all purpose and emollient creams, cleansing creams, foundation creams, hand creams, protective and barrier creams Sun-screen, Suntan, and anti-sun burn preparation.

(b) Shaving Preparation: Lather shaving stick, Lather shaving creams, Shaving foams, Shaving gels, pre-and after shave lotions.

(c) Hair preparations: Shampoos, hair setting lotions, conditioners, hair tonics, hair bleaches, hair colouring dyes, permanent waving, hair straightners, antidandruff preparations.

(d) Face powders and makeup: Face powders, compact powder, cake make up, make up cream, Liquid make up, stick make up and liquid powder, beauty masks.

(e) Coloured make up: Lipsticks, rouges and eye make up.

(f) Manicure preparations: Cuticle remover, nail bleach, nail whites, nail creams, nail lacquer and enamel remover.

(g) Dental Products: Dentifrices and mouth washes.

(h) Astringents and skin tonics.

Herbal Cosmetics: Cosmetics containing aloe, babul, brahmi, chandan, cucumber, haldi, jatamansi, khus, mehandi, neem, reetha, shikakai, tulsi, arnica, bhringraj and volatile oils.

Suggested Readings/ Books:

J.C. Mac Chesney "Packaging of Cosmetics and Toiletries" Newness-Butterworth, London, 1974.

M.S. Balsam & E. Sagarin "Cosmetics and Toiletries' 2nd ed. vol. 1-3, John Wiley and Sons, New York, 1974.

E. Sagarin- Cosmetic Science and Technology, vol. 1-3, 2nd ed., 1974.

J.S. Jellinek - Formulation and Function of Cosmetics, 1970.

G. S. Banker and C. T. Rhodes: Modern Pharmaceutics, Second Edition, Volume 40, Marcel Dekker, Inc., New York, 1990.

L. Lachman, H. A. Lieberman and J. L. Kaing: The Theory and practice of Industrial Pharmacy, Vargheese Publishing House, Mumbai, 1987.

M. E. Aulton: Pharmaceutics, Science of Dosage Form Design.

E.A. Rawlins: Bentley's Textbook of Pharmaceutics, University Printing House, Oxford, 1988.

D.F. Williams and W.H. Schmitt: Chemistry and Technology of the cosmetics and Toileteries Industry.

W.A. Poucher: Perfumes, Cosmetics and Soaps Vol. I, II and III Chapman and Hall London.

Course	B. Pharm	**Semester**	Seventh
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH704[P]	**Subject Name**	Cosmeticology

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Seventh
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH705[T]	Subject Name	Pharmaceutical Jurisprudence

Syllabus

Pharmaceutical Legislations- A brief review

Drugs & Pharmaceutical Industry- A brief review.

Pharmaceutical Education- A brief review.

Brief study of the following with special reference to the main provisions.

Code of Pharmaceutical Ethics. Pharmacy Act 1948. Drugs Price Control Order. Drugs and Cosmetics Act 1940 and Rules 1945.

Medicinal & Toilet Preparations (Excise Duties) Act 1955.

Narcotic Drugs & Psychotropic Substances Act 1985 & Rules. Poisons Act 1919. Drugs and Magic Remedies (Objectionable Advertisements) Act 1954.

Medical Termination of Pregnancy Act 1970 & Rules 1975. Prevention of Cruelty to Animals Act 1960.

States Shops & Establishments Act & Rules. Insecticides Act 1968. AICTE Act 1987. Factories Act 1948, Minimum Wages Act 1948. Industrial Development and Regulation act 1951.

Patents Act 1970. Designs Act. Trade and Merchandise Marks Act. Monopolies and Restrictive Trade Practices Act.

Prevention of Food Adulteration Act 1954 and Rules 1955.

An Introduction to Standard Institutions and Regulatory Authorities such as BIS, ASTM, ISO, TGA, USFDA, MHRA, ICH, WHO.

A brief study of the Various Prescription/Non-prescription Products, Medical / Surgical accessories, Diagnostic aids, appliances available in the market.

Suggested Readings/ Books:

Jain, N.K.A Textbook of Forensic Pharmacy. Vallabh Prakashan, New Delhi.

Mithal, B.M. A Textbook of Forensic Pharmacy. National Book Depot, Kolkatta.

Kokate and Gokhale, Textbook of Forensic Pharmacy, 2006, Pharma Book Syndicate, Hyderabad

B. Pharm VIII Semester Scheme									
Subject Code	**Name of Subject**	**Teaching scheme**		**Credits**		**Examination Scheme**			
		T	**P**	**T**	**P**	**T**		**P**	
						Ext	**Int**	**Ext**	**Int**
BPH801[T]	Pharmaceutical Biotechnology	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
BPH801[P]	Pharmaceutical Biotechnology	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH802[T]	Pharmacognosy - IV	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH802[P]	Pharmacognosy - IV	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH803[T]	Biopharmaceutics & Pharmacokinetics	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
BPH803[P]	Biopharmaceutics & Pharmacokinetics	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH804[T]	Pharmaceutical Technology – II	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH804[P]	Pharmaceutical Technology – II	**-**	**3**	**-**	**2**	**-**	**-**	**60**	**40**
BPH805[T]	Intellectual Property Rights	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
BPH806[P]	Professional Training	**-**	**-**	**-**	**2**	**-**	**-**	**25**	**25**
		20	**12**	**20**	**10**	**500**		**450**	
Total		**32 hrs/week**		**30**		**950**			

T- Theory, P- Practical

Course	B. Pharm	Semester	Eighth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH801[T]	Subject Name	Pharmaceutical Biotechnology

Syllabus

Introduction: Definition and application of biotechnology in pharmaceutical sciences. **Immunology and Immunological preparations**: Principles, Antigens and antibodies, Antigen-antibody reactions and their applications, immune system. Cellular humoral immunity, Immunological tolerance, Hypersensitivity, Immunological and diagnostic preparations: Methods of their preparation, standardization and storage.

Plant tissue culture: Historical development, types of tissue cultures, their nutritional requirements, growth and main features, applications of plant tissue culture in pharmacy.

Genetic recombination: Transformation, Conjugation, Transduction, Protoplast fusion, Gene cloning and their applications, Monoclonal antibodies and hybridoma technology, Recombinant DNA technology: Concepts, Methodology and Pharmaceutical applications. Study of drugs produced by biotechnology such as Activase, Humulin, Humatrope, Introne A, Monoclate, Orthoclone OKT3, Referon-A, Recombivax HB etc.Drug delivery systems in Gene therapy.

Microbial transformation: Introduction, types of reactions mediated by microorganisms, design of biotransformation processes, selection of organisms, biotransformation process and its improvements with special reference to steroids.

Enzyme immobilization: Techniques of immobilization of enzymes, factors affecting enzyme kinetics. Study of enzymes such as hyaluronidase, penicillinase, streptokinase and streptodornase, amylases and proteases etc. immobilization of bacteria and plant cells.

Industrial biotechnology: Historical development, fermenter and its design, control of different parameters in fermentation process, isolation of mutants, use of mutagenic agents, factors in influencing rate of mutation, design of fermentation process, fermentative, production of alcohol, acetic acid, penicillin, streptomycin, riboflavin, vitamin B12.

Suggested Readings/ Books:

Trevan, Boffey, Goulding and Stanbury, Biotechnology the Biological Prianciples, Tata McGraw Hill.

Hugo and Russel. “Pharmaceutical Microbiology”, 6th edition, 1998, Balckwell Scientific Publication, Oxford.

Trevan MD, Boffey S, Goulding KH, Stanbury P.” Biotechnology- The Biological Principles “, 1st edition, 1998, Tata McGraw Hill , New Delhi.

Crueger W, Crueger A.” Biotechnology”, 2nd edition, 20000, Panima Publishing Corporation, New Delhi.

Vyas SP, Dixit VK.”Pharmaceutical Biotechnology”, 1st edition ,2007, CBS Publishers & Distributors, New Delhi

Course	B. Pharm	**Semester**	Eighth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH801[T]	**Subject Name**	Pharmaceutical Biotechnology

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Eighth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH802[T]	Subject Name	Pharmacognosy - IV

Syllabus

Study of indigenous traditional and emerging drugs with their source (including alternative/ controversial) medicinal uses, pharmacological action/activity, chemical profile and authentication of following:

Amla (*Phyllanthus emblica*), Harad (*Myroblan-Treminalia chebula*), Baheda (*Terminalia belerca*), Guduchi (*Tinospora cardifolia*), Kalmegh (Andrographis *paniculata*), Guggal (*Commiphora weightii*), Salai (*boswellia serrata*), Brahmi (*Centell asiatica*), Shankhpuspi (*Convolvulus microphyllus*), Bach (*Acorus calamus*), Kantkari (*Solanum xanthocarpum*), Tulsi (*Ocimum sanctum*), Valerian (*Valerian wallchi*), Jatamansi (*Nardostacys jatamansi*), Gokhru (*Tribulus terrestris*), Arjuna (*Terminalia arjuna*), Ashok – (*Saraca indica*), Vidang (*Embelia ribes*), Lahsun (*Garlic-Allium sativum*), Malkangni (*Celastrus paniculata*), Bhilwa (*Semecarpus anacadium*), Chirayata (*Swertia chirata*), Neem (*Azadirachta indica*), satavar (*Aspargus racemosus*), Safed Musli (*Chlorophytum borivalianum*), Artemisia (*Artemica spp*), Thylophora (*Thylophora indica*), Morinda (*Morinda citrifolia*), Chitrak (*Plumbago zeylanicum*), Haldi (*Curcuma domestica*), Tephrosia (*Tephrosia purpurea*), Bhui Amla (*Phyllanthus amarus*), Shilajeet

Introduction to dosage forms in Indian system of medicine with preparation and standardization of some important dosage forms such as Asavas, Arishtas, Avalehas, ghutika, tailia, ghrita, bhasmas, Lehyas and Churnas. Determination of alcohol contents in arishtas and bhasmsa. Preparation of Unani formulations like majooms, Safoofs.

General method of extraction, isolation, identification and characterization of Phytoconstitutents of Carbohydrates, Alkaloids Glycosides and Phenolic and Steroidal groups.

Isolation, identification and estimation of: caffeine, eugenol, digoxin, piperine, tannic acid, diosgenin, hesperidine, berberine, calcium sennosides, rutin, glycyrrhizin, menthol, ephedrine, quinine, andrographolides and guggul lipids.

An introduction to Tissue culture techniques with their scope as alternative source of Phyto-Pharmaceuticals.

An overview of plants as source of Bitters, Sweeteners, Colors, Flavors, Carotinoids, Photosensitizing agents and Vaccines

Suggested Readings/ Books:

1. Trease, G.E. and Evans, W.C., Pharmacognosy, Bailliere Tindall, Eastbourne, U.K.

2. Tayler, V.C., Brady, L.R. and Robers, J.E., Pharmacognosy, Lea and Febiger, Philadelphia.

3. Shah, C.S. and Quadry, J.S., A text book of Pharmacognosy, B.S. Shah Publishers, Ahmedabad.

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

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

6. Wallis, T.E., Text Book of Pharmacognosy, Jand A Churchill Limited, London

Course	B. Pharm	**Semester**	Eighth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH802[P]	**Subject Name**	Pharmacognosy - IV

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Eighth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH803[T]	Subject Name	Biopharmaceutics and Pharmacokinetics

Syllabus

Introduction to biopharmaceutics and pharmacokinetics: Role in formulation development and clinical setting. Absorption, distribution, metabolism and elimination of drugs, Biopharmaceutical study of drugs, blood level concentration, biological half life and elimination rate constant. Volume of distribution and distribution coefficient.

Passage of drug across GIT membrane: Mechanism, physico-chemical, biological and pharmaceutical factors affecting drug absorption through GIT- Physicochemical, biological and dosage from related factors. Techniques for the GIT absorption assessment.

Drug disposition: Distribution in blood, plasma -protein binding, application of drug protein binding. Clearance concept, Mechanism of renal clearance, clearance ratio, Determination of renal clearance.

Bioavailability and bioequivalence: Definitions, federal requirements, methods of determination of bioavailability using blood and urinary excretion data. Protocol designs for bioavailability assessment. Methods for bioequivalence determination. Review of regulatory requirements for conduct of bioequivalent studies.

Compartment Models: Definition, basis of classification, model selection criteria.

One-compartment open model with first order elimination kinetics, pharmacokinetics of single dose administration as applied to intravenous (rapid/bolus) and oral administration, Intravenous transfusion, superposition principle and multiple intravenous and oral administration, pharmacokinetic basis of sustained release formulations.

Two compartment open model with first order elimination kinetics, pharmacokinetics of single and multiple dose administration, as applied to intravenous (rapid/bolus) and oral administration intravenous infusion, pharmacokinetic basis of sustained release formulations.

Absorption kinetics: Curve Fitting, Wagner-Nelson, Loo Riegelman methods and Deconvolution methods for estimation of absorption rate constants.

Dosage regimen: Dosage regimen adjustment in patients with and without renal failure.

Non-Compartmental Analysis: Statistical moments, Application, bioavailability determination.

Non-Linear Pharmacokinetics: Michaelis-Menten's kinetics, pharmacokinetic characteristics, In-vivo estimation of Km and Vm, Unit impulse response. Application in bioavailability determination.

Suggested Readings/ Books:

Handbook of Basic Pharmacokinetics-Ritschel, W.A.,Drug Intelligence Publication, M Hamilton, 1977.

Fundamentals of Clinical Pharmacokinetics-Wagner,J.C.,Drug Intelligence Publication, M.Hamilton, 1975.

Remington's Pharmaceutical Sciences - Gennaro A.R., ed., 19th Edition, Mack Publishing Co., Easton, PA. 1995.

Clinical Pharmacokinetics - Rowland, M. & Tozer,N., 2nd,edition, Lea and Febiger, Philadelphia, 1989.

Pharmacokinetics-Gibaldi M. & Perrier, D., 2nd ed., Marcel Dekker, New York, 1982.

Pharmacokinetics for the Pharmaceutical Scientist-Wagner, J.C., Technomic Publishing AG, Switzerland, 1993.

Biopharmaceutics and Pharmacokinetics-Notari, R.E., 2nd ed., Marcel Dekker, New York, 1975.

Course	B. Pharm	**Semester**	Eighth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH803[P]	**Subject Name**	Biopharmaceutics and Pharmacokinetics

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Eighth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH804[T]	Subject Name	Pharmaceutical Technology - II

Syllabus

Microencapsulation: Types of microcapsules, importance on microencapsulation in pharmacy, microencapsulation by phase separation, coacervation, multi orifice, spray drying, spray congealing, polymerization complex emulsion, air suspension technique, coating pan and other techniques, evaluation of micro capsules.

Parenteral Products: Preformulation factors, routes of administration, water for injection, pyrogenicity, non-aqueous vehicles, isotonicity and methods of its adjustment. Formulation details, containers and closures and selection. Prefilling treatment, washing of containers and closures, preparation of solution and suspensions, filling and closing of ampoules, vials, infusion fluids, lyophilization & preparation of sterile powders, equipment for large scale manufacture and evaluation of parenteral products. Aseptic Techniques:- source of contamination and methods of prevention, design of aseptic area, laminar flow bench services and maintenance. Sterility testing of Pharmaceuticals.

Ophthalmic preparations: Requirements, formulation, methods of preparation, containers, evaluation.

Blood products and plasma substitutes: 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, PVP, dextran etc. for control of blood.

Surgical products: Definition, primary wound dressing, absorbents, surgical cotton, surgical gauzes etc. bandages, adhesive tape, protective cellulosic hemostastics, official dressings, absorbable and non absorbable sutures, ligatures and catguts. Medical prosthetics and organ replacement materials.

Biological products: Absorbable and non-absorbable material types, sutures and ligatures, processing. manufacturing, sterilization, packing, QC tests of materials like catgut and nylon

Packaging of Pharmaceutical Products: Packaging components, types, specifications and methods of evaluation, stability aspects of packaging. Packaging equipments, factors influencing choice of containers, legal and other official requirements for containers, package testing.

Controlled release (CR) delivery systems: Principle, Advantages and Disadvantages, Classification and types of oral drug delivery system, osmotic pumps, Liposomes, Implants, transdermal and parenteral CR drug delivery systems.

Pilot plant scale up techniques: Need, organization and layout, scale up techniques for solid and liquid dosage forms. Technology transfer.

Suggested Readings/ Books:

Aulton ME. "Pharmaceutics- The Science of Dosage Form Design", 1st edition, 1998, ELBS/Churchill Livingstone, New York.

Lachman L, Lieberman HA, Kanig JL." The Theory & Practice of Industrial Pharmacy", 3rd edition, 1991, Varghese Publishing House, Bombay.

Banker GS, Rhode CT. "Modern Pharmaceutics", 4th edition, Informa Healthcare, New York.

Allen LV, Popovich NG, Ansel HC", Ansel's pharmaceutical Dosage Forms & Drug Delivery Systems", 8th edition, 2005.

Lieberman HA, Lachman L, Sachwartz JB." Pharmaceutical Dosage Forms: Tablets", 2nd edition , 2005, Vols 1-3 Marcel Dekker, N.Y.

Bentia Simson, Microencapsulation, 2nd edition, 2007, Tylor's and Fransis

Course	B. Pharm	**Semester**	Eighth
Branch	Pharmacy	**Duration**	60 Hrs [Practical]
Subject Code	BPH804[P]	**Subject Name**	Pharmaceutical Technology – II

Practicals:

Practical exercises based on the topics mentioned in theory syllabus.

Course	B. Pharm	Semester	Eighth
Branch	Pharmacy	Duration	60 Hrs [Theory]
Subject Code	BPH805[T]	Subject Name	Intellectual Property Rights

Syllabus

Introduction to Intellectual Property: Introduction, definition, Basic Principles and Acquisition of Intellectual Property Rights, Kinds of Intellectual Property and Economic importance of Intellectual Property.

Patents: Overview, Historical development (Patent Act 1970 – amendments of 1999, 2000, 2002 and 2005), Concepts, Novelty, Utility, Inventiveness/Non-obviousness, Contents of a Patent Application, Specification, Provisional, Complete, Disclosure aspects and Claims.

Infringement: Definition, methods of Infringement Determined, Direct, contributory, and Induced, Defences to Infringement.

Trade Mark : Introduction, Historical development, concept, law of National trade mark, Need for Protection of Trademarks, Kinds of Trademarks, International Legal Instruments on Trademarks, Well known Trademark, Procedure for registration of Trademarks Registration of Trademarks, Infringement of Trademarks, Passing Off, Defences and Remedies.

Copyright: introduction, Concepts, Idea- Expression dichotomy, Works protected under Copyright law, Authorship and ownership, Rights conferred on copyright owners plagiarism and related right.

Industrial Design: Introduction, Need for Protection of Industrial Designs, Subject Matter of Protection and Requirements, The Designs Act, 2000, Procedure for obtaining Design Protection, Revocation, Infringement and Remedies.

Cyber Crimes: Introduction, Essential Ingredients of Crime, Types of Internet Crimes and Infringement and remedies.

International Scenario: Introduction to the leading international instruments concerning intellectual property rights: GATT, GATS, the Berne Convention, Universal Copyright Convention, the Paris Convention, TRIPS, the World Intellectual Property Rights Organization (WIPO) and the UNESCO.

Suggested Readings/ Books:

Akehust's Modern Introduction to International Law, Ed. By Peter Malanczuk, 7th Edition, (Revised)

W.R. Cornish, Intellectual Property, Sweet & Maxwell, London (2000)

Kerly's Law of Trade Marks and Trade Names, 14th Edition, Thomson, Sweet & Maxweel.

A. K. BanSal, Law of Trade Marks in India (2009 Edition) Institution of Constitutional and Parliamentary Studies and Centre for Law, Intellectual Property and Trade, New Delhi.

N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property (2009), Eastern Book Company, Lucknow.

W.R. Cornish, Intellectual Property, Sweet & Maxwell, London (2000)

Prof. Bernt Hugenholtz & Dr. Lucie Guibault (Edited), Kluwer Copyrights Cases, Wolters Kluwer.

N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property (2009), Eastern Book Company, Lucknow.