

**SYLLABUS FOR B. PHARMACY
(A EIGHT SEMESTERS COURSE)**

Choice Based Credit System Syllabus: Effective from July 2016

COURSE STRUCTURE AND SCHEME OF EXAMINATION

B Pharmacy shall have 8 semesters. The number of theory papers and practical courses, along with their credit system, are described in the next page. It is necessary to secure minimum 40% pass marks with Grade Point 5 separately in each theory paper and practical courses in each semester. It is also necessary to secure minimum 40% marks with Grade Point 5 in Continuous and Comprehensive Evaluation (CCE) in each semester to qualify to appear in subsequent full examination of the respective semester. The Course is governed by the **University Ordinance No. 222**.

Continuous Evaluation (Internal Assessment): Semesters I to IV.

(i) In each semester, each theory course will be assessed for 100 marks, out of which 60 marks will be for end semester examination and 40 marks will be for continuous evaluation. In case of laboratory/project work based courses, appropriate distribution of marks for practical record/Attendance/ Viva-Voce/ Project report are given at the appropriate place of the syllabus. The project may be undertaken in any of the national Laboratories/Institutes/Universities/ Govt. approved Companies/Industries/ in own Department .

(ii) During the semester, a teacher offering the course will do the continuous evaluation of the students at three points of time by conducting three tests of 20 marks each. Of these, two must be written tests and the third may be written test/quiz/ seminar/assignment for theoretical courses. Marks obtained in two best tests out of three will be awarded to the students. Each test will be of 1-hour duration based on unit or portion thereof taught in prescribed theory papers. A record of continuous evaluation should be maintained.

(iii) The teacher offering the course will be responsible for setting the question paper and evaluating the answer books of tests and end semester examination of that course. In case of guest faculty involved in teaching or in case of other unavoidable circumstances, Head of the Department will make an alternate arrangement for the conduction of end term examination.

(iv) Total of marks obtained in end semester examination and best of two tests under continuous evaluation will decide grade of the course.

(v) The grading will be made on 10 point scale as described below:

Letter Grade	Grade points	Description	Range of Marks
O	10	Outstanding	90-100
A ⁺	9	Excellent	80-89
A	8	Very good	70-79
B ⁺	7	Good	60-69
B	6	Above average	50-59
C	5	Average	40-49
F	0	Fail	0-39
Ab	0	Absent	Absent

(vi) If a student obtains **F or Ab grade** in any course, he/she will be treated to have failed in the course. He/ she has to appear in the examination of the course as and when conducted/arranged by the University Teaching Department (UTD). Marks obtained earlier in continuous assessment may be carried forward and added to the marks obtained in the repeat end-term examination to decide the grade of the repeat course.

(vii) The theoretical and practical courses can be repeated whenever offered or arrange by the Department but within maximum duration of the programme. **He/she can avail multiple repeat attempts to pass the course.**

(viii) The Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) will be calculated as weighted average of **valid and virtual** credit points secured by the student . The SGPA and CGPA shall be rounded off up to 2 decimal place and shall be reported in the grade sheet.

(ix) SGPA is measure of the performance of the student in a semester in a semester. It is a ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester, that is,

$$SGPA (S_i) = \frac{\sum(C_i \times G_i)}{\sum C_i} = \text{Total Credit points} / \text{Total credits}$$

where C_i is the number of credits of the i^{th} course in a semester and G_i is the grade point scored by the student in the i^{th} course,

(x) CGPA is a measure of overall cumulative performance of a student over all the semesters completed. The CGPA is the ratio of total credit points secured by a student in various courses in all the semesters completed and some of the total credits of all courses in all the semesters completed.

$$CGPA = \frac{\sum(C_i \times S_i)}{\sum C_i}$$

Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in the i^{th} semesters.

(x) The dissertation / major project / internship report of 9 credit will be assessed by one external examiner to be appointed by the vice chancellor from the panel of examiner suggested by Head /Director and the supervising teacher /the examiner appointed by the Head /Director of the UTD.

(xi) A comprehensive viva-voce of **4 virtual credits** will be conducted at the end of each semester of the programme by a board of four examiners, at least one of whom shall be external. The vice chancellor will appoint the external examiner in consultation with Head /Director of the UTD. Three will form a quorum. Head /director will coordinate the comprehensive viva-voce. The grade awarded in the viva-voce shall be shown separately in the grade sheet.

(xii) If a programme has large number of students then more number of boards may be constituted as per requirement. The board may include at least two experts including one internal and one external.

(xiii) On completing all requirements for award of the degree, the CGPA will be calculated and this value will be indicated on the degree along with division. The final degree will also indicate the division obtained as follows:

I Div. with distinction: The candidate has earned minimum number of credits for the award of the degree in first attempt with CGPA of 8.00 or above.

I Div.: The candidate has earned minimum number of credits for the award of the degree in first attempt with CGPA of 6.50 or above but less than 8.00.

II Div.: The candidate has earned minimum number of credits for the award of the degree in first attempt with CGPA of 5.00 or above but less than 6.50.

Pass Division: No passed division will be awarded.

(xiv) The student will be promoted to the next semester if he/ she secured at least 12 valid credits in a semester. In case the student secure less than 12 valid credits in any semester, then the student will be asked to repeat the entire semester and the semester will be treated as zero semesters.

In this programme the student will be promoted as per the following conditions:

- The student should not carry more than five courses (combining theory and practical) in Ist year, IInd year or IIIrd year to be promoted to the next year.
- The student cannot be promoted in to IIIrd year, if he /she carries any course of Ist year with F or AB grade.
- The student cannot be promoted in to IVth year, if he /she carries any course of IInd year with F or AB grade

(xv) Repetition of a theory practical course is allowed only to those candidates who get F or Ab in the course. The student has to pay the prescribed fee for repeating the course.

SEMESTER-I					
Course No.	Paper No.	Title of the Paper (duration of examination)	Teaching Hrs.	Credit	Max. Marks
THEORY COURSES					
Course PY-101	Paper I	Remedial Mathematics Or Remedial Biology	60	4	60+ 40 (CCE) = 100
Course PY-102	Paper II	Computer Application	60	4	60+ 40 (CCE) = 100
Course PY-103	Paper III	Pharmaceutics-I (ITP)	60	4	60+ 40 (CCE) = 100
Course PY-104	Paper IV	Pharmaceutical Chemistry-I (Physical)	60	4	60+ 40 (CCE) = 100
Course PY-105	Paper V	Pharmaceutical Chemistry-II (Inorganic)	60	4	60+ 40 (CCE) = 100
PRACTICAL COURSES					
Course PY-106		Remedial Biology	60	2	50
Course PY-107		Computer Application	60	2	50
Course PY-108		Pharmaceutics-I (ITP)	60	2	50
Course PY-109		Pharmaceutical Chemistry-I (Physical)	60	2	50
Course PY-110		Pharmaceutical Chemistry-II (Inorganic)	60	2	50
Total Marks, I SEM				30	750
Total Marks, I SEM				For Mathematics Students	700
				4*	50

SEMESTER II					
Course No.	Paper No.	Title of the Paper (duration of examination)	Teaching Hrs.	Credit	Max. Marks
THEORY COURSES					
Course PY-201	Paper I	Advance Mathematics (One elective from P-201A- P201B)	60	4	60+ 40(CCE) = 100
Course PY-202	Paper II	Pharmaceutics-II	60	4	60+ 40 (CCE) = 100
Course PY-203	Paper III	Ph. Chem. —III (Organic-I)	60	4	60+ 40 (CCE) = 100
Course PY-204	Paper IV	Pharmacognosy-I	60	4	60+ 40 (CCE) = 100
Course PY-205	Paper V	Anatomy,Physiology and Health Education (APHE-I)	60	4	60+ 40 (CCE) = 100
PRACTICAL COURSE					
Course PY-206		Pharmaceutics-II	60	2	50
Course PY-207		Ph. Chem. —III (Organic-I)	60	2	50
Course PY-208		Pharmacognosy-I	60	2	50
Course PY-209		Anatomy,Physiology and Health Education (APHE-I)	60	2	50
Total Marks II SEM				28	700
				4*	50

SEMESTER III					
Course No.	Paper No.	Title of the Paper (duration of examination)	Teaching Hrs.	Credit	Max. Marks
THEORY COURSES					
Course PY-301	Paper I	Pharmaceutics-III (Pharmaceutical Engineering-I)	60	4	60+ 40 (CCE) = 100
Course PY-302	Paper II	Anatomy,Physiology and Health Education-II	60	4	60+ 40 (CCE) = 100
Course PY-303	Paper III	Pharmaceutical Chem.-IV(Organic-II)	60	4	60+ 40 (CCE) = 100
Course PY-304	Paper IV	Pharmaceutical Microbiology	60	4	60+ 40 (CCE) = 100
Course PY-305	Paper V	Pharmacognosy-II	60	4	60+ 40 (CCE) = 100
PRACTICAL COURSE					
Course PY-306		Pharmaceutics-III (Pharmaceutical Engineering-I)	60	2	50
Course PY-307		Anatomy,Physiology and Health Education-II	60	2	50

Course PY-308		Ph. Chem. —IV (Organic-II)	60	2	50
Course PY-309		Pharmaceutical Microbiology	60	2	50
Course PY-310		Pharmacognosy-II	60	2	50
Total Marks III SEM				30	750
			Comprehensive Viva-Voce	4*	50

SEMESTER IV					
Course No.	Paper No.	Title of the Paper (duration of examination)	Teaching Hrs.	Credit	Max. Marks
THEORY COURSES					
Course PY-401	Paper I	Pharmaceutics-IV (Pharmaceutical Engineering-II)	60	4	60+ 40 (CCE) = 100
Course PY-402	Paper II	Pharmaceutical-V (Dosage form Design)	60	4	60+ 40 (CCE) = 100
Course PY-403	Paper III	Pharmaceutical Analysis-I	60	4	60+ 40 (CCE) = 100
Course PY-404	Paper IV	Pharmaceutical (Bio Chemistry) —V	60	4	60+ 40 (CCE) = 100
Course PY-405	Paper V	Pharmacology-I	60	4	60+ 40 (CCE) = 100
PRACTICAL COURSE					
Course PY-406		Pharmaceutics-IV (Pharmaceutical Engineering-II)	60	2	50
Course PY-407		Pharmaceutical-V (Dosage form Design)	60	2	50
Course PY-408		Pharmaceutical Analysis-I	60	2	50
Course PY-409		Pharmaceutical (Bio Chemistry)-V	60	2	50
Course PY-409		Pharmacology-I	60	2	50
Total Marks, IV SEM				30	750
			Comprehensive Viva-Voce	4*	50

SEMESTER V					
Course No.	Paper No.	Title of the Paper (duration of examination)	Teaching Hrs.	Credit	Max. Marks
THEORY COURSES					
Course PY-501	Paper I	Pharmaceutics-VI (Cosmetic Technology)	60	4	60+ 40 (CCE) = 100
Course PY-502	Paper II	Pharmaceutical-VII Dispensing Community & Clinical Pharmacy	60	4	60+ 40 (CCE) = 100
Course PY-503	Paper III	Pharmaceutical Chemistry –VI (Medicinal Chemistry-I)	60	4	60+ 40 (CCE) = 100
Course PY-504	Paper IV	Pharmacognosy-III	60	4	60+ 40 (CCE) = 100
Course PY-505	Paper V	Pharmacology-II	60	4	60+ 40 (CCE) = 100
PRACTICAL COURSE					
Course PY-506		Pharmaceutics-VI (Cosmetic Technology)	60	2	50
Course PY-507		Pharmaceutical-VII Dispensing Community & Clinical Pharmacy	60	2	50
Course PY-508		Pharmaceutical Chemistry –VI (Medicinal Chemistry-I)	60	2	50
Course PY-509		Pharmacognosy-III	60	2	50
Course PY-510		Pharmacology-II	60	2	50
Total Marks V SEM				30	750
			Comprehensive Viva-Voce	4*	50

SEMESTER VI					
Course No.	Paper No.	Title of the Paper (duration of examination)	Teaching Hrs.	Credit	Max. Marks
THEORY COURSES					
Course PY-601	Paper I	Pharmaceutical Industrial Management	60	4	60+ 40 (CCE) = 100
Course PY-602	Paper II	Pharmaceutical Analysis-II	60	4	60+ 40 (CCE) = 100

Course PY-603	Paper III	Pharmaceutical Chemistry –VII (Medicinal Chemistry-II)	60	4	60+ 40 (CCE) = 100
Course PY-604	Paper IV	Pharmacognosy-IV	60	4	60+ 40 (CCE) = 100
Course PY-605	Paper V	Pharmacology-III	60	4	60+ 40 (CCE) = 100
PRACTICAL COURSE					
Course PY-606		Pharmaceutical Analysis-II	60	2	50
Course PY-607		Pharmaceutical Chemistry –VII (Medicinal Chemistry-II)	60	2	50
Course PY-608		Pharmacognosy-IV	60	2	50
Course PY-609		Pharmacology-III	60	2	50
		Educational Study Tour		2	50
Total Marks VI SEM				30	750
				Comprehensive Viva-Voce	4* 50

SEMESTER VII					
Course No.	Paper No.	Title of the Paper (duration of examination)	Teaching Hrs.	Credit	Max. Marks
THEORY COURSES					
Course PY-701	Paper I	Pharmaceutics-VIII (Pharm. Technology-I)	60	4	60+ 40 (CCE) = 100
Course PY-702	Paper II	Pharmaceutics-IX (Biopharmaceutics and Pharmacokinetics)	60	4	60+ 40 (CCE) = 100
Course PY-703	Paper III	Pharmaceutical Chemistry –VIII (Medicinal Chemistry-III)	60	4	60+ 40 (CCE) = 100
Course PY-704	Paper IV	Pharmaceutical Biotechnology	60	4	60+ 40 (CCE) = 100
Course PY-705	Paper V	Pharmacology-IV (Clinical and Drug Interaction)	60	4	60+ 40 (CCE) = 100
PRACTICAL COURSE					
Course PY-706		Pharmaceutics-VIII (Pharm. Technology-I)	60	2	50
Course PY-707		Pharmaceutics-IX (Biopharmaceutics and Pharmacokinetics)	60	2	50
Course PY-708		Pharmaceutical Biotechnology	60	2	50
Course PY-709		Project work		4	50
Total Marks, VII SEM				30	700
				Comprehensive Viva-Voce	4* 50

SEMESTER VIII					
Course No.	Paper No.	Title of the Paper (duration of examination)	Teaching Hrs.	Credit	Max. Marks
THEORY COURSES					
Course PY-801	Paper I	Pharmaceutics-X (Pharm. Technology-II)	60	4	60+ 40 (CCE) = 100
Course PY-802	Paper II	Pharmaceutics-XI (Pharmaceutical Jurisprudence)	60	4	60+ 40 (CCE) = 100
Course PY-803	Paper III	Pharmaceutical Analysis-III)	60	4	60+ 40 (CCE) = 100
Course PY-804	Paper IV	Elective –I	60	4	60+ 40 (CCE) = 100
Course PY-805	Paper V	Elective –II	60	4	60+ 40 (CCE) = 100
PRACTICAL COURSE					
Course PY-806		Pharmaceutics-X (Pharm. Technology-II)	60	2	50
Course PY-807		Pharmaceutical Analysis-III)	60	2	50
Course PY-809		Professional Training (Four Weeks)	4 Week	4	100
Total Marks VIII SEM				28	700
				Comprehensive Viva-Voce	4* 50

BACHELOR OF PHARMACY I SEMESTER REMEDIAL MATHEMATICS – PY 101(A)

Hrs:60

Max.Marks:100

Credit :04

UNIT I

Algebra: Equation reducible to quadratics, Simultaneous equations (linear and quadratic), Determinations. Properties of solution of simultaneous equations by Cramer's rule, Matrices, definition of special kinds of matrices, arithmetic operations on matrices, inverse of a matrix. Solution of simultaneous equations by matrices, pharmaceutical applications of determinants and matrices, Evaluation on En1, En2 and En3.

UNIT II

Menstruation and its pharmaceutical applications. Measures of Central Value objectives and pre-requisites of an ideal measure, Mean, Mode and median.

UNIT III

Trigonometry: Measurement of angle, T-ratios, addition, subtraction and transformation formulae, T-ratios of multiple, sub multiple, allied and certain angles. Application of logarithms in pharmaceutical computations.

UNIT IV

Analytical plane Geometry: Certain Co-ordinates, Distance between two points, area of triangle, a locus of points, straight line, slope and intercept form, double-intercept form, normal (perpendicular form), slope-point and two point form, general equation of first degree.

UNIT V

Calculus:

Differential: Limits and functions, definition of differential coefficient, Differentiation of standard functions including function of a function (Chain rule). Differentiation of implicit functions, logarithmic differentiation, parametric differentiation, successive differentiation.

Integral: Integration as inverse of differentiation, indefinite integrals of standard forms, integration by parts, substitution and partial fractions, formal evaluation of definite integrals.

Books & References Recommended:

1. Loney S.L., Plane Trigonometry.
2. Ray M., Algebra.
3. Basu K.P., Intermediate Algebra.
4. Paria G., Differential Calculus, Scholar's Publications, Indore.
5. Paria G., Integral Calculus, Scholar's Publications, Indore.

B. Pharm. I Semester
Remedial Biology – PY 101(B)

Hrs: 60
Max.Marks:100
Credit :04

1. Plant Anatomy and Physiology :
 - i. Morphology and Anatomy of flowering plant and its parts like root, stem, bark, wood, leaf, flower, fruit and seed. Modification of root and stem.
Transportation, photosynthesis and respiration in plants, Plant growth and development.
 - ii. Structure of plant cell, Different types of plant tissues and their functions.
 - iii. Structure of plant cell, Different types of plant tissues and their functions.
2. Structure and functions :
 - i. Cell- the unit of life. Biomolecules – Lipids, polysaccharides, Proteins, and nucleic acids. Enzymes and cofactors, their classification, chemistry, mechanism of action and factors affecting enzyme activity.
 - ii. Cell cycle and cell division, stages of mitosis and meiosis, and their significance.
 - iii. Cell cycle and cell division, stages of mitosis and meiosis, and their significance.
3. Living systems
 - i. Biological classification – Five kingdoms Monera, Protista, Fungi, plantae and animalia. Viruses, viroids and lichens.
 - ii. Animal kingdom — Classification and its basis
 - iii. Plant kingdom – Algae, bryophytes, Pteridophytes, Gymnosperms, Angiosperms. Plant life cycles and alteration of generations.
4. Genetics and Evolution :
 - i. Principles of inheritance and variation – Mendel's laws, inheritance of one gene and two gene, sex determination, mutation and genetic disorders.
Molecular basis of inheritance – DNA, RNA, Replication, Transcription,
 - ii. Genetic code, Translation, regulation of gene expression, DNA fingerprinting, Human Genome Project.
 - iii. Evolution – Origin of life, theory of evolution of life forms, Evidences for evolution, Adaptive radiation, Biological evolution, Hardy-Weinberg principle.

BACHELOR OF PHARMACY I SEMESTER COMPUTER APPLICATIONS — PY102

Hrs: 60
Max. Marks: 100
Credit: 04

UNIT I

Introduction to Computer- Its Types and uses, Computer Generations, Hardware, software, Elements of computer system, Number Systems:- Decimal, Binary, Octal, hexadecimal, Storage Devices- primary memory, Secondary Memory, Input and output devices.
Operating system- Basic Concepts, Organization, functions, operations and types, Features of DOS, Windows and Unix operating systems. Dos Commands.

UNIT II

Data Transmission and Networks- Basic Concepts LAN, MAN, WAN. Network Topologies, TCP/IP, Worldwide web, URL, HTML. Transmission Media.

UNIT III

Programming – High Level languages, Machine languages, Syntax, semantics. Compiler, Interpreter Algorithms and Flowchart.

UNIT IV

Programming Language 'C' – Data types, Constants, variables, Operators, symbolic constants, input and output, increment and decrement operators. Control Structures: while, do-while, for, if, if-else, and switch statement. Functions, header files, recursion, pointers and arrays, structures.

UNIT V

Application software- Word processing, formatting, printing setups, mail merge, Table Handling, picture handling, spreadsheet programs, workbooks/ worksheets, formatting of sheets, formulae and functions, graphs, Import and export of files / data. Presentation Packages, Slide designing.

Book Recommended:

1. V. Rajaraman: Fundamentals of computer, 1st Edition, East Economy Edition.
2. E. Balaguruseamy: Programming In C, TMH Pub
3. D.S. Yadav: Fundamentals of Information Technology, New Age Publication.
4. P.K. Sinha: Fundamentals of Computer
5. Computer Architecture (Schaum's outline) CARTER, TMH

Bachelor of Pharmacy I Semester PHARMACEUTICS –I —PY 103

Hrs: 60
Max.Marks:100
Credit :04

Unit I

Introduction to pharmaceuticals History of pharmaceutical practice through ages. Various system of medicines. Significance of pharmacopoeias with special reference to Indian, British, United States, International and Extra pharmacopoeias.

Unit II

Routes of administration and classification of pharmaceutical dosage form.

Unit III

Definition, general formulation, principles and procedures adopted for dispensing and official products of the following- Aromatic waters, Solutions, Syrups, Mixtures, Spirits, Elixers,

Linctuses, lotions, liniments, Mixtures, Glycerites, Gargles, Mouth washes, Inhalations powders, Capsules, Tablet triturates, Ointments, Creams, pastes, Suppositories and ophthalmics, Emulsions, Suspension, Milk and Magmas, Mucilages, Jellies, Infusion, Decoctions, Tinctures and Extracts.

Unit IV

Pharmaceutical Calculation: Different systems of weights and measures, Dilution and conc. Of solutions, Percentage solution, Calculation by allegation, Proof Spirits, Calculation of doses, Displacement value.

Unit IV

Detailed methods employed in the preparation of plant extractives.

Books Recommended

1. Indian Pharmacopoeia.
2. British Pharmacopoeia.
3. United State Pharmacopoeia.
4. Lachmen, L. & Lieberman, H.A., "Theory and Practice of Industrial Pharmacy", Verghese publishing house, Bombay.
5. Gennaro, A.R., Remington's "The Science and practice of Pharmacy", Lippincot, Wiliams & Wilkins, Philadelphia.
6. Aulton, M.E., "Pharmaceutics- The science of doses form design", Churchill Livingstone, London.
7. Banker and Rhodes, Modern Pharmaceutics. Marcel Dekker Inc. NY.
8. Kibbe, " Hand book of Pharmaceutical Excipients., Pharmaceutical Press, London.
9. Martin, Physical Pharmacy.
10. N. K. Jain, Text Book of Professional Pharmacy, CBS Publishers & Distributors, New Delhi.
11. N.K. Jain, Pharmaceutical product development, CBS Publishers & Distributors, New Delhi.
12. B. M. Mithal, Text Book of Pharmaceutical Formulation.
13. Loyd. V.Allen, Jr.Nicholas, G.Popovich, Howad C. Ansel, Pharmaceutical Dosage Forms & Drug Delivery System.
14. Bentley, E.A. Rawlins, Textbook of Pharmaceutics.

Bachelor of Pharmacy I Semester **Course PY 104- Pharmaceutical Chemistry-I (Physical)**

Hrs: 60

Max.Marks:100

Credit : 04

Unit I

Physical-chemical properties of substances

Polarity of substances, dipole moment, dielectric constant, refractive index, optical rotation, density, specific gravity, viscosity, molar refraction, parachor relative inomial tio, Bonding and non-bonding interactions, roentgen diffraction, polymorphism, isomorphism, isotropy, anisotropy, liquid crystals.

Unit II

Thermodynamics

Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, types of processes. Spontaneity of chemical change; Free Energy. Equilibrium; Enthalpy and Entropy and spontaneous change

First law of thermodynamics: Concept of work, heat internal energy and enthalpy, standard state, thermochemistry, thermochemical laws, heat capacity, molar heat capacity, Hess's law of constant heat summation; Enthalpies of bond dissociation, combustion, formation, atomization, sublimation, phase transition, hydration, ioniz-ation and solution.

Second law of thermodynamics: Spontaneity of processes; ΔS of the universe and ΔG of the system as criteria for spontaneity, ΔG_o (Standard Gibbs energy change) and equilibrium constant.

Third Law of Thermodynamics: calculation of absolute entropies; specific heat; variation in enthalpy with temperature. Helmholtz and Gibbs energies, chemical potential, conception of absolute entropy. Calculations involving entropy and enthalpy; dealing with ions etc. Variation of $\square G$ and K with temperature: Ellingham Diagrams, Giauque Function.

Unit III

Surface Chemistry

Adsorption : Physisorption and inomial tions and their characteristics, factors affecting adsorption of gases on solids - -Freundlich and Langmuir adsorption isotherms, adsorption from solutions.

Catalysis : Homogeneous and heterogeneous, activity and selectivity of solid catalysts, enzyme catalysis and its mechanism. Acid base catalysis, theories of catalysis, catalytic poisoning and Pharmaceutical application of catalysis.

Unit IV

States of Matter

Gaseous State: Measurable properties of gases; Gas laws — Boyle's law, Charles's law, Graham's law of diffusion, Avogadro's law, Dalton's law of partial pressure; Concept of Absolute scale of temperature; Ideal gas equation, Kinetic theory of gases; Concept of average, root mean square and most probable velocities; Real gases, deviation from Ideal gas law, compressibility factor, van der Waals equation, liquefaction of gases, critical constants.

Liquid State: Solutions, Lowering of vapour pressure and Raoult's Law, osmosis and osmotic pressure, measurement of osmotic pressure, isotonic solutions, pharmaceutical applications of osmosis, theories of semipermeable membranes, colligative properties, elevation of boiling point and its experimental determination, depression of freezing point and its determination, distribution law and solvent extraction method, electrolyte and non electrolytes, Debye-Huckel theory, ionic equilibria in blood, characterization of acid base functional groups.

Solid State: Classification of solids: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea); Bragg's Law and its applications, Unit cell and lattices, packing in solids (fcc, bcc and hcp lattices), voids, calculations involving unit cell parameters, imperfection in solids; electrical, magnetic and dielectric properties.

Unit V

Chemical equilibrium

Law of chemical equilibrium, Equilibrium constant, equilibrium degree of conversion and its control by reaction, conditions, LeChatelier principle, standard change of Gibbs energy during reaction, Equilibrium constants and their significance, Factors affecting equilibrium concentration, pressure, temperature, effect of catalyst. Acid-base catalysis, decomposition of medicinal compounds, accelerated stability analysis, kinetics of enzyme catalysed reactions.

Books Recommended

1. P W Atkins, the Elements of Physical Chemistry, 2nd Ed., OUP, 1996
2. P W Atkins, Physical Chemistry 7th Ed., OUP, 2002
3. B G Cox, Modern Liquid Phase Kinetics, Oxford Science Publications, 1994.
4. J.R. Barrante: Physical Chemistry of Life Sciences, Printeil.
5. K.J. Laidler: Physical Chemistry with Biological Applications, Benjamin.
6. S.C. Wallwork: Physical Chemistry for Students of Pharmacy and Biology, Longman.
7. L. M. Atherden: Bentley and Driver's-Textbook of Pharmaceutical Chemistry, Oxford University Press, Delhi.
8. A.J. Mce: Physical Chemistry, E.L. B.S., London.
9. H.H. Willard, L.L. Merritt and J.A. Dean: Instrumental Methods of Analysis, Van Nostrand Reinhold, New York.
10. Samuel Glasstone and David Lewis: Elements of Physical Chemistry, Macmillan Press, London.
11. A.H. Beckett and J.B. Staenlake: Practical Pharmaceutical Chemistry, Vol. I and II. The Athlone Press of the University of London.
12. Gross J.M. and Wiseall B. Principle of Physical Chemistry, Macdonald and Evans Plymouth, England.
13. Gareth Morris J. A Biologists Physical Chemistry, Edward Arnold, London.
14. Martin A.N. Physical Pharmacy, Lea and Febiger, Philadelphia.
15. Chang R. Physical Chemistry with Application to Biological System. Collier Macmillan Publisher, London.
16. Barrow G.M. Physical Chemistry. McGraw-Hill, London.
17. Yadav J.B. Advanced Practical Physical Chemistry, Geol Publisher House, Meenat, India.
18. Vogel's Text Book of Quantitative Inorganic Analysis including Elementary Instrumental Analysis, Longman, London.

Bachelor of Pharmacy I Semester

Course PY 105- Pharmaceutical Chemistry-II (Inorganic)

Hrs: 60
Max. Marks: 100
Credit: 04

Unit I

Elements and periodicity

Modern periodic law and present form of the periodic table, s, p, d and f block elements, periodic trends in properties of elements- atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

Unit II

Sources of impurities in pharmaceutical substances

Importance of limit test and general principles and procedure for limit tests of chloride, sulphate, iron, arsenic, lead and heavy metals.

Unit III

Essential and Trace Elements

Study the role of essential and trace elements in biological systems and their toxicity.

Major Intra and extra cellular electrolytes: Major physiological ions, electrolytes used in replacement therapy, physiological acids-base balance, electrolytes used in acid-base therapy, electrolyte combination therapy.

Unit IV

Inorganic Agents

Occurrence, preparation, physical characteristics, chemical properties, purity test, incompatibilities, assay and pharmaceutical uses of inorganic official compounds of the following elements;

Aluminum, Sodium, Magnesium, Lithium, Calcium, Iron, Copper, Silver, Antimony, Iodine, Boron, Potassium, Zinc, Nitrogen

Reagents: Preparation, properties and uses of the following reagents; Nessler's reagent, boron trifluoride, Grignard reagent, Potassium permanganate, potassium dichromate, Hydrogen peroxide, Iodine solution.

Unit V

Radiopharmaceuticals

Basic properties, production, quality control, stability, clinical and medicinal applications of radioisotopes used in pharmacy and medicine preparations of diagnostic and therapeutic agents.

Books Recommended

1. L.M. Atherdon, Bentley and Drivers: Textbook of pharmaceutical chemistry, Oxford, University press.
2. Pharmacopoeia of India, Govt. of India, Ministry of Health, Delhi.
3. J.H. Block, E. Roche, T.O. Soine and C. O. Wilson: Inorganic Medicinal and
4. Pharmaceutical chemistry, Lee Febiger, Philadelphia. PA.
5. Roger's Inorganic Pharmaceutical Chemistry of Lea and Febiger, Philadelphia, USA.
6. M. Ali: Text book of Pharmaceutical Inorganic chemistry, CBS, New Delhi.
7. Mellor's Modern Inorganic Chemistry, Longman Green and Co., Ltd., London.
8. Atkins P.W. Physical Chemistry, Oxford 1990 2.
9. Barrow G.M. Physical Chemistry, McGraw-Hill 1989
10. Beckett & Stenlake, Practical Pharmaceutical Chemistry
11. Liptrot G.F. Modern Inorganic Chemistry, Blantyre Printing
12. British Pharmacopoeia, Stationary Press, Royal Society of Pharmaceutical Press, London.
13. United State Pharmacopoeia, United State Pharmacopoeial Convention, Inc., Twinbrook Parkway, Rockyville M.D. 20852 USA.
14. Lovis F. Fieser D.C. Experiments in Inorganic Chemistry, Health and Company, Boston.
15. Vogel Text Book of Quantitative Chemical Analysis, Longman, London.
16. Remington Practical of the Science and Pharmacy, Mack Publishing Company, Easton, Pennsylvania, USA.

Bachelor of Pharmacy I Semester Course—PY106 Remedial Biology

Hrs: 60
Max.Marks:50
Credit: 02

List of Experiments

1. To study the simple and compound microscope.
2. To study the microscopic section of the Monocot and Dicot plant.
3. To identify the part of the plant by given section (root).
4. To identify the part of the plant by given section (stem).
5. To identify the part of the plant by given section (bark).
6. To identify the part of the plant by given section (leaf).
7. To identify the part of the plant by given section (seed).
8. To identify and differentiate the parts of the given plant sample morphologically.

Bachelor of Pharmacy I Semester Course—PY107 Computer Application

Hrs: 60
Max.Marks:50
Credit :02

Introduction to various components of computer, Use of External & Internal DOS Commands, MS- Office – MS Word, MS, Excel, Powerpoint. A simple documentation preparation & printing. Usage of printer & other components. Simple programs in C.

Bachelor of Pharmacy I Semester Course- PY108 PHARMACEUTICS- I

Hrs: 60
Max.Marks:50
Credit : 02

List of practical

study Indian Pharmacopoeia, British Pharmacopoeia, United States Pharmacopoeia and Extra Pharmacopoeia.

1. Prepare and submit Camphor Water I.P.
2. Prepare and submit Chloroform Water I.P.
3. Prepare and submit Conc. Dill Water I.P.
4. Prepare and submit Aqueous Iodine Solution I.P.
5. Prepare and submit Weak Iodine Solution I.P.
6. Prepare and submit Strong Iodine Solution I.P.
7. Prepare and submit Cresol with Soap Solution I.P.
8. Prepare and submit chloroxylenol Solution I.P.
9. Prepare and submit Simple Syrup I.P.
10. Prepare and submit Simple syrup U.S.P.
11. Prepare and submit Chloroform Spirit I.P.
12. Prepare and submit Simple elixir I.P.
13. Prepare and submit Calamine Lotion I.P.

14. Prepare and submit Calamine Lotion USP, oily.
15. Prepare and submit Turpentine Liniment I.P.
16. Prepare and submit Liquid Paraffin Emulsion I.P
17. Prepare and submit Tragacanth Mucilage I.P.
18. Prepare and submit Milk of Magnesia I.P
19. Prepare and submit Bentonite Magma U.S.P.
20. Prepare and submit Borax Glycerin I.P.
21. Prepare and submit Tannic acid Glycerin I.P.
22. Prepare and submit Mandle's Paint. B.P.
23. Prepare and submit Simple Linctuses I.P.
24. Prepare and submit Menthol and Eucalyptus Inhalation B.P.C
25. Prepare and submit orange / lemon Tincture I.P.
26. Prepare and submit compound benzoin Tincture I.P.
27. To prepare & submit codeine linctuses NFI , BNF.
28. To prepare & submit zinc sulphate & zinc chloride mouthwash IP.
29. To prepare & submit Potassium permanganate gargle NFI 1979.
30. To prepare & submit salicylic acid lotion BPC.
31. To prepare magnesium trisilicate mixture BPC.
32. To prepare & submit Chalk mixture pediatric BPC.
33. To prepare & submit magnesium hydroxide mixture BP.
34. To prepare & submit castor oil emulsion NFI .
35. To prepare & submit liquid paraffin & magnesium hydroxide emulsion BPC.
36. To prepare & submit lubricating gel.
37. To prepare & submit Peppermint water IP.
38. To prepare & submit sodium chloride solution IP.
39. To prepare & submit sodium chloride mouthwash .
40. To prepare & submit oral rehydration salt BP.
41. To prepare & submit soap liniment.
42. To prepare & submit sodium alginate jelly.
43. To prepare & submit lubricating jelly with cellulose ether base.
44. To prepare & submit compound syrup of ferrous phosphate IP 55 (Parrish's Food)
by chemical interaction.

Bachelor of Pharmacy I Semester
Course- PY109 Pharmaceutical Chemistry-I (Physical)

Hrs: 60
Max.Marks:50
Credit : 02

List of Practical

1. Determination of specific gravity of liquids using pycnometer and density bottle.
2. To study the effect of salt/Sugar in different concentration on density of water.
3. To study the effect of temperature on density of given liquid.
4. Determination of the viscosity of a liquid by Ostwald viscometer.
5. To study the effect of concentration on viscosity.
6. To study the effect of temperature on viscosity
7. Determination of the percent composition of a mixture of ethanol and water by viscometric method.
8. Determination of the surface tension of a pure liquid by the capillary rise method.
9. To determine the surface tension of liquid using stalagmometer.
10. To study the effect of temperature on surface tension.
11. To study the effect of surfactant on surface tension.
12. Determination of the percentage composition of mixture of ethanol and water by surface tension method.
13. Determination of interfacial tension between benzene and water by the drop size method.
14. Determination of the parachor value of an organic liquid.
15. Determination of solubility of benzoic acid over a range of temperatures and calculation of its heat of solution.
16. Determination of the mutual solubility curve of phenol and water.
17. Preparation of buffer solutions and measurement of pH.
18. Distillation of a mixture.
19. Determination of phase diagram in ternary system containing a single pair of sparingly miscible liquids.
20. Determination of distribution coefficient of substance between two immiscible liquids.(succinic acid between ether and distilled water).

Bachelor of Pharmacy I Semester
Course- PY-110 Pharmaceutical Chemistry-II (Inorganic)

Hrs: 60
Max. Marks: 50
Credit: 02

1. Limit test for Lead.
2. Limit test for Arsenic.
3. Limit test for Chloride.
4. Limit test for Sulfate.
5. Limit test for Heavy metals.
6. Standardization of sulphuric acid.
7. Standardization of hydrochloric acid.
8. Standardization of sodium hydroxide.
9. Standardization of potassium permanganate.
10. Standardization of sodium thiosulphate.
11. Determination of strength of solution of ammonia.
12. Quantitative determination of boric acid.
13. Assay of sodium bicarbonate.
14. Assay of sodium carbonate.
15. Assay of ferrous sulphate.
16. Assay of iodine solutions.
17. Preparation of Alum (potassium and ammonium).
18. Preparation of Ferrous sulfate.
19. Preparation of dibasic calcium phosphate.
20. Preparation of ferric ammonium citrate.
21. Preparation of light and heavy magnesium oxide and
22. Preparation of magnesium carbonate.
23. Preparation of calcium carbonate.
24. Preparation of magnesium trisilicate.
25. Preparation of zinc sulphate.
26. Purification of Copper sulfate.

BACHELOR OF PHARMACY II SEMESTER
Course PY 201A- ADVANCED MATHEMATICS (Elective paper)

Hrs: 60
Max. Marks: 100
Credit: 04

Unit I

Differential equations and its Applications I:

Revision of integral calculus, definition and formation of differential equations, equations of first order and first degree, variable separable, homogeneous and linear differential equations.

Unit II

Differential equations and its Applications II:

Differential equations reducible to such types, linear differential equations of order greater than one with constant coefficients, complementary function and particular Integral, Simultaneous linear differential equations, pharmaceutical applications.

Unit III

Biometrics:

Significant digits and rounding of numbers, data collection, random and non-random sampling methods, sample size, data organization, diagrammatic representation of data, bar, pie, 2-D and 3-D diagrams, measures of central tendency, measures of dispersion, standard deviation, standard error of means, coefficient of variations, confidence (fiducial) limits.

Unit IV

Probability:

probability and events, Bayes theorem, probability theorems, probability distributions, elements of binomial and poisson distribution, normal distribution curve and properties,

Unit V

Correlation and regression:

Method of least squares, statistical inference, Student's and paired t-test, F-test and elements of ANOVA, kurtosis and skewness, Applications of statistical concepts in Pharmaceutical Sciences.

BOOKS RECOMMENDED:

1. Paria G., Ordinary Differential Equations with Laplace transform, Scholar's Publications, Indore.
2. Paria G., Differential Calculus, Scholar's Publications, Indore.
3. Paria G., Integral Calculus, Scholar's Publications, Indore.
4. Paria G., Statistics and Stochastic Process Part I and II, Scholar's Publications, Indore.
5. Baisnab A, and M Jas, Introduction to statistics.

BACHELOR OF PHARMACY II SEMESTER
Course PY 201B- ADVANCED MATHEMATICS (Elective paper)

Hrs: 60
Max. Marks: 100
Credit: 04

Unit-I: Trigonometry

Trigonometric ratios, trigonometry table, sign of the trigonometric ratios, trigonometric ratios of $(-\theta)$, trigonometric ratios of sum of two angles, formulae to transform the product into sum or difference, Expression of trigonometric ratios of angle $2A$ in terms of angle A .

Unit II: Statistics

Data, measurement of central tendency, arithmetic, geometric and harmonic mean, combined mean, weighted arithmetic mean, median and mode.

Unit III: Determinants and Matrices

Determinants: properties of determinants, applications of determinants; Matrices: Introduction, types of matrices, Addition and subtraction of matrices, scalar multiplication of matrices, multiplication of matrices, adjoint and reverse of a matrix, solution of simultaneous equations by matrices.

Unit IV: Cartesian system of rectangular coordinates

Introduction, quadrants, distance between two points, Area of a triangle in terms of coordinates of its vertices, centroid of a triangle, in-centre of a triangle, locus and its equation, slope of a line, equations of a straight line (different), point of intersection of two straight lines, angles between two straight lines. Condition of concurrency of three straight lines. Distance of a point from a line

Unit V: Functions and Limits

Introduction, limits, meaning of left and right limits, continuity.

BOOKS RECOMMENDED:

6. Paria G., Ordinary Differential Equations with Laplace transform, Scholar's Publications, Indore.
7. Paria G., Differential Calculus, Scholar's Publications, Indore.
8. Paria G., Integral Calculus, Scholar's Publications, Indore.
9. Paria G., Statistics and Stochastic Process Part I and II, Scholar's Publications, Indore.
10. Baisnab A, and M Jas, Introduction to statistics.

Bachelor of Pharmacy II Semester
Course PY 202- PHARMACEUTICS-II (PHYSICAL PHARMACY)

Hrs: 60
Max. Marks: 100
Credit: 04

Unit I

Micromeritics and Powder Rheology:

Introduction, Particle size and size distribution: Average particle size, particle size distribution, number and weight distribution, particle number; Methods for determination particle size: optical microscopy, sieving, sedimentation; introduction to latest technique in particle analysis Particle volume measurement; Particle shape and surface area: particle shape, specific surface; Methods for determining surface area: adsorption method, air permeability method, pore size; Derived properties of powders: Porosity, packing arrangement, densities of powder, bulkiness and flow properties, Compaction: Compressed tablet, Pharmaceutical application.

Unit II

Solubility and Distribution Phenomenon:

General principles: the phase rule, solubility expressions; Solvent-solute interaction: polar solvents, nonpolar solvents, semipolar solvents; Solubility of gases in liquids: Effect of pressure, temperature, salting out, effect of chemical reaction; Solubility of liquids in liquids: Ideal and real solution, complete miscibility, partial miscibility, influence of foreign substance, three component systems, dielectric constant and solubility, molecular connectivity, molecular surface area and solubility; Solubility of solids in liquids: Ideal solutions, Phase diagrams and the ideal solubility equation, nonideal solution, extended Hildebrand solubility approach, solvation and association in solutions of polar compounds, solubility and the heat of solution, solubility of strong electrolytes, solubility of slightly soluble electrolytes, solubility of weak electrolyte, the influence of solvents on the solubility of drugs, combined effect of pH and solvents, influence of surfactants; influence of hydrotropic agents on solubility of drugs. Distribution of solutes between immiscible solvents.

Unit III

Surface and Interfacial Phenomenon:

Liquid interfaces: surface and interfacial tensions, surface free energy. Measurement of surface and interfacial tensions: Capillary rise method, The DuNouy Ring Method. Adsorption at liquid interfaces: surface active agents, Systems of Hydrophile - Lipophile classification, Type of mono-layers at liquid interfaces. Adsorption at solid interface, the solid-gas interface, the solid-liquid interface, Activated Charcoal, Wetting, Application of surface-active agents, Electric properties of interfaces.

Diffusion and Dissolution:

Concept of diffusion, Study state diffusion: Fick's first law, Fick's second law, study state, Procedure and apparatus. Dissolution: dissolution rate, dissolution of tablets, capsules and granules, Powder Dissolution: The Hixson-Crowell cube Root Law. Drug release: Drugs in polymer matrices, release from granular matrices, multilayer diffusion, membrane control and diffusion layer control phenomenon, diffusion principle in biological system.

Unit IV

Viscosity and Rheology:

Newtonian Systems: Newton's Law of flow; kinematics viscosity; Temperature dependence and theory of viscosity. Non-Newtonian Systems: plastic flow, pseudoplastic and dilatant flow. Thixotropy: measurement thixotropy, Bulges and spurs, Negative thixotropy, Thixotropy in formulations. Determination of Rheologic properties: choice of viscometer, Capillary viscometer, Falling sphere viscometer, Cup and bob viscometer, Cone and plate Viscometer, Pharmaceutical application of Rheology.

Complexation and protein binding:

Classification of complexes, methods of preparation and analysis, Pharmaceutical applications.

Protein binding: Binding equilibria, equilibrium dialysis and ultrafiltration, dynamic dialysis, hydrophobic interaction, self-association, factors affecting complexation and protein binding.

Buffered and isotonic solutions:

The buffer equation: Common Ion Effect and the Buffer Equation for a weak Acid and its salt, The buffer equation for a weak base and its salt. Factors influencing the pH of buffer solutions. Buffer capacity: Calculation of buffer capacity. Buffer in pharmaceutical systems and biologic system: In vivo biologic buffer systems, Pharmaceutical buffers, influence of buffer capacity and pH on Tissue Irritation, pH and Solubility. Buffered isotonic solutions: Measurement of tonicity, tonicity calculations, Methods of adjusting isotonicity and pH.

Unit V

Colloids:

Introduction to the dispersed System, Types of colloidal systems, Optical properties of the colloids, kinetic properties of the colloids, electrical properties of the colloids, Solubilization, Pharmaceutical application of the colloids, advanced thermodynamics of Micellization.

Coarse Dispersion:

Suspension: Interfacial properties of suspended particles, Settling in suspensions: theory of sedimentation, effect of Brownian Movement, Sedimentation of flocculated particles, Sedimentation parameters. Formulation of suspensions: Wetting of particles, Controlled flocculation, Flocculation in Structured Vehicles, Rheologic consideration, Preparation of suspensions, Physical stability of suspensions.

Emulsions: Emulsion types, Pharmaceutical applications, Theories of emulsification, Physical stability of emulsions, Preservation of emulsions, Rheologic properties of emulsions.

Semi-solids: Gels,

Syneresis and swelling, Classification of Pharmaceutical semisolids, Hydrophilic properties of Semisolids, Rheologic properties of semisolids, Universe of Topical Medications. Drug Kinetics in Coarse disperse system, Drug Diffusion in Coarse Disperse Systems.

BOOKS RECOMMENDED:

1. Lachman, L., Lieberman, H.A. and Kanig, J.L., The Theory and Practice of Industrial Pharmacy, Lea and Philadelphia.
2. Allen, L.V., Popovich, N.G., Ansel, H.C., Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems, Lippincott Williams and Wilkins.
3. Banker G.S. and Rhode C.T., Modern Pharmaceutics, Marcell Decker Inc., New York.
4. Aulton, M.E., Pharmaceutics The Science of Dosage Form Design, Churchill Livingstone, London.
5. Carter, S.J., Cooper and Gunn's Tutorial Pharmacy, CBS Publishers and Distributors, New Delhi.
6. Martin A., Physical Pharmacy, Lippincott Williams and Wilkins.
7. Gennaro, A.R., Remington: The Science and Practice of Pharmacy, Lippincott Williams and Wilkins.

Bachelor of Pharmacy II Semester
Course PY 203- PHARMACEUTICAL CHEMISTRY-III (ORGANIC-I)

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

Structure and Properties: Electronegativity, Polarity, Resonance; Electrophiles/Nucleophiles, Orbitals, π -Bonds, Hybridization and Shape, Isomerism, Polarity, Intermolecular Forces, isotope effects and isotopic labelling.

Reactive Intermediates: Stability and reactivity of Radicals, Cations, Anions, Nitrene and Nitrenium ion

Stereochemistry: Stereo-isomerism, classification and Nomenclature, Optical activity, Chirality, R/S Classification of Chiral Carbons. Miscellaneous Stereochemistry, Diastereomers; Racemic modification, Resolution of racemic mixtures.

Unit II

Hydrocarbons: Alkanes and cycloalkanes: Nomenclature, Physical and chemical properties of alkanes, Conformations and Stability of Acyclic Alkanes and Cycloalkanes.

Alkenes and alkynes: Nomenclature, Physical and Chemical properties of alkenes, Isomerism and general methods of preparation.

Aromatic hydrocarbons: Benzene and its homologues (Polynuclear compounds), nomenclature, sources of aromatic hydrocarbons, structure of benzene, chemical reaction of benzyne-mechanism and S_NAr Mechanism of nucleophilic substitution. Directive influence of substituents and their effect on reactivity. **Dienes and the Allyl system:** Conjugation, Reactivity.

Unit III

Organic compounds with functional groups containing halogens (X): Nomenclature, Structure, Properties, Reactivity of Alkyl Halides (haloalkanes and haloarenes): The S_N2 and S_N1 Substitution Reaction, The E1 and E2 Elimination Reactions, Substitution vs. Elimination reaction, reactivity of C-X bond in haloalkanes and haloarenes

Organic compounds with functional groups containing oxygen (Part I-): Alcohols: Nomenclature, Synthesis, reactivity of different Alcohols; conversion of Alcohols to Tosylates or Halides.

Phenols: Nomenclature, methods of preparation, physical and chemical properties; chemical reactivity of phenols in electrophilic substitutions, acidic nature of phenol.

Ethers: electronic structure, structure of functional group, nomenclature, important methods of preparation, physical and chemical properties, some commercially important compounds.

Unit IV

Organic compounds with functional groups containing oxygen (Part II):

Aldehydes and ketones : Electronic structure of carbonyl group, nomenclature, important methods of preparation, physical properties and chemical reactions, relative reactivity of aldehydic and ketonic groups, aldol condensation. nucleophilic addition reaction to >C=O groups.

Carboxylic acids: Electronic structure of -COOH, Nomenclature, important methods of preparation, physical properties and effect of substituents on α -carbon on acid strength, chemical reactions.

Derivatives of carboxylic acids: Electronic structure of acid chloride, acid anhydride, ester and amide groups, Nomenclature, important methods of preparation, comparative reactivity of acid derivatives.

Unit V

Organic Compounds with functional group containing Nitrogen: Structure, Nomenclature of Amino and Diazo Compounds.

Amines: Primary, secondary and tertiary amines, a general awareness, important methods of preparation, physical properties, basic character of amines, chemical reactions.

Diazonium salts: Preparation, chemical reaction and uses of Benzene diazonium chloride. Some commercially important nitrogen containing carbon compounds, (Aniline, TNT)

BOOKS RECOMMENDED:

1. Organic Chemistry, R.T. Morrison and R.N. Boyd, 6th Edition, New York.
2. Organic Chemistry, T.W.G. Solomons, 8th Edition, John Wiley & Sons, Inc
3. Advanced Organic Chemistry, J. March, Reaction Mechanisms and Structure, John Wiley and Sons, N.Y.
4. Mechanisms and structure in Organic Chemistry, E.S. Gould, Hold Rinchart and Winston, New York.
5. Advanced Organic Chemistry, Reaction Mechanisms, Bernard Miller, 2nd edition, Pearson education Ptc. Ltd. Singapore.
6. Named Organic Reactions, Thomas Lane & Andreas Plagens, 2nd edition, John Wiley and Sons, N.Y).
7. Organic Chemistry Finar Vol-1 & 2.
8. Structure and Mechanism in Organic Chemistry, Ingold, C. K., Cornell University.

Bachelor of Pharmacy II Semester Course PY 204- PHARMACOGNOSY-I

Hrs: 60
Max. Marks: 100
Credit: 04

Unit I

Study of following families with spatial reference to medicinally important plants; apocyanaceae, solanoceae, gramineae, labiatae, cruciferae, papaveraceae, umbellifereae, leguminosae, rubiaceae and liliaceae.

Unit II

.Definition, history, scope and development of Pharmacognosy. Scheme for pharmacognostical study of crude drug. Sources of crude drugs and methods of their classification. Traditional and alternative systems of medicines.

Unit III

Cultivation collection, drying, natural drying, artificial drying, processing and storage of crude drugs. Factors affecting cultivation of medicinal plants like climate, altitude, temperature, humidity, rainfall, soils, fertilizers and manures.

Unit IV

Pest control and natural pest control agents. Methods of pest control like mechanical, agricultural, biological chemical etc.

Unit VI

4. Quality Control of Crude Drugs: Different types of Adulteration and their evaluation using various methods like Organoleptic, Microscopic, Physical, Chemical, and Biological, Quantitative microscopy.

- a. General methods of their isolation, classification, properties and systematic pharmacognostic study of –
 - i. Carbohydrates, and drugs belonging to this class like; Agar, Gaur gum, Acacia, Ghatti gum Honey, Isapgol, Starch, Sterculia, Tragacanth, Bael Pectin,
 - b. Fixed oil, fats and waxes and drugs belonging to this class likes; Castor oil,
 - i. Olive oil Linseed oil, Karanj Oil, Neem Oil, Beeswax, Cocoa butter, Hydnocarpus oil, Kokum butter, Cod-liver oil, Shark liver oil, Woolfat, Lard, Yellow bees wax, Carnauba wax
 - c. Resins and resin combinations and drugs belonging to this class like; Podophyllum,
 - i. Tolu & Peru balsam, Turmeric, Ginger, Ipomoea, Myroballan, Asafoetida, Benzoin, colophonoy. Capsicum,
 - ii. Canabis, Myrrh, Guggul, Kaladana,
 - d. Tannins and drugs belonging to this class like Myrobalan, Bahera, Arjuna bark, Ashoka bark, Amla, black & Pale catechu.
 - i. Fibres: Plant fibres, Animal fibre, Synthetic fibres, Minral fibre. Flax, Cotton, Silk, Wool.
 - ii. Pharmaceutical aids like; Talc, Kaolin, Bentonite, Gelatin, Klesalghur, Asbestose.

BOOKS RECOMMENDED:

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

Bachelor of Pharmacy II Semester
Course PY-205 ANATOMY PHYSIOLOGY AND HEALTH EDUCATION-I

Hrs: 60
Max. Marks: 100
Credit: 04

Unit I

Scope of anatomy and physiology and basic terminology used in these subjects. Structure of cell, its components and their function:

Elementary Tissues of the Human Body: Epithelial, connective, muscular and nervous tissues; their sub-types and characteristics.

Unit II

Skeletal System: Structure, composition and functions of skeleton, Classification of joints, Types of movement at joint, disorders of joints.

Skeletal Muscles: Their gross anatomy, physiology of muscle contraction, physiological properties of skeletal muscle and their disorders.

Unit III

Haemopoietic System : Composition and functions of blood and its elements, their disorders, blood groups and their significance, mechanism of coagulation; disorders of platelets and coagulation.

Lymph and lymphatic system: Composition, formation and circulation of lymph, disorders of lymph and lymphatic system. Basic physiology and functions of spleen.

Unit IV

Cardiovascular System: Basic anatomy of the heart, physiology of heart, blood vessels and circulation. Basic understanding of cardiac cycle, heart sounds and electrocardiogram. Blood pressure and its regulation. Brief outline of cardiovascular disorders like; hypertension, hypotension, arteriosclerosis, angina, myocardial infraction, congestive heart failure and cardiac arrhythmias.

Respiratory System: Anatomy of respiratory organs, Functions of respiration, Mechanism and regulation of respiration, Respiratory volumes and vital capacity

Unit V

Health Education: First aid: emergency treatment of shock, snake bites, burns, poisoning, fractures and resuscitation methods.

Bachelor of Pharmacy II Semester
Course PY 206- PHARMACEUTICS-II (PHYSICAL PHARMACY)

Hrs: 60
Max. Marks: 50
Credit: 02

(Minimum fifteen experiments should be performed in the semester. Student should aware with safety parameters and handling of chemicals related to following experiments)

1. Determine the particle size and particle size distribution in the given sample of powder by optical microscopy.
2. Determine particle size distribution of the given granules by sieving method.
3. Determine the following derived properties of the given powdered sample
 - (a) Flow property (b) Bulk density (c) Granule density
 - (d) True density (e) Porosity (f) Carr's Index
 - (g) hussnor's retio
4. Determine the surface tension of the given sample by drop count and drop weight Method.
5. Determine the Critical Micelle Concentration (CMC) of the given surfactant by Surface tension method.
6. Determine partition coefficient of the given drug between benzene and water or octanol and water system
7. Plot phase diagram of phenol-water system
8. Determine the effect of salt on the solubility of given drug.

9. Determine the percent composition of an unknown solution of glycerin in water using Ostwald's viscometer
10. Study the effect of shear rate on the flow of 1% methyl cellulose solution.
11. Formulate suspension of the given drug and evaluate it for sedimentation parameters.
12. Study the effect of thickening agent concentration on the sedimentation of the suspension of the given drug.

13. Prepare acetate buffer and compare theoretical pH value with the experimental value.
14. Determine the viscosity of the following Newtonian and Non-Newtonian system

(a) Water	(b) Simple syrup I.P.
(c) Diclofenac gel	(d) Tooth paste

15. Determine the HLB value of the given surfactant
16. Evaluate the given sample of emulsion on the following parameters

(a) Type of emulsion	(b) Globule size distribution
(c) Physical stability	(d) Viscosity

17. Determine the optimum concentration of Bentonite required for the maximum physical stability of calamine lotion.
18. To observe the effect of hydrotropic agent sodium citrate on the solubility of salicylic acid.

Bachelor of Pharmacy II Semester
Course PY 207- PHARMACEUTICAL CHEMISTRY-III (ORGANIC-I)

Hrs: 60
Max. Marks: 50
Credit: 02

1. Purify the given organic compounds by distillation.
2. Purify the given organic compounds by recrystallization.
3. Introduction to the use of stereo models.
4. Synthesis, Purification, Characterization (by using Solubility, Melting Point, T.L.C. and percentage purity) of organic compounds and percent yield calculations of the following compounds:
 - A. 2, 4, 6-trinitro phenol (Picric acid) from phenol
 - B. Iodoform from ethyl alcohol
 - C. 2, 4, 6-tribromoaniline from aniline
 - D. 2, 4, 6-tribromo phenol from phenol
 - E. Phenylbutazone from phenol
 - F. Benzanilide from aniline
 - G. Phthalidimide from phthalic anhydride
 - H. Thiourea
 - I. Phenyl urea
 - J. Flourescein
 - K. Methly orange
 - L. Methly red

Bachelor of Pharmacy II Semester
Course PY 208- PHARMACOGNOSY-I

Hrs: 60
Max. Marks: 50
Credit: 02

(Student should perform Minimum fifteen experiments from following)

1. Study of different types of microscopes, camera lucida.
2. Morphological identification of following drugs Bael, Capsicum, Kaladana, catechu, guggul, honey.
3. Morphological identification of following drugs Arjuna bark, ashoka bark. Amla. Ghatugum and Bahera
4. Perform the morphological, microscopic and chemical evaluation "Ginger".
5. Perform morphological, microscopic and chemical evaluation of "Turmeric".
6. Perform morphological and chemical evaluation of "Myroballan".
7. Perform morphological and chemical evaluation of "Agar and Acacia".
8. Perform morphological and chemical evaluation of "Tragacanth".
9. Perform morphological, microscopic and chemical evaluation of "Isapgol".
10. Perform morphological, microscopic and chemical evaluation of "Starches obtain from potato, rice, maize and wheat".
11. Perform morphological and chemical evaluation of "Asafoetida".
12. Perform morphological and chemical evaluation of "Castor oil, linseed oil, olive oil, cod-liver oil".
13. Perform morphological and chemical evaluation of neem oil, coca butter and wool fat.
14. Perform morphological and chemical evaluation of lard, bees wax and carnauba.
15. Perform morphological and chemical evaluation of "Bees wax".
16. Perform morphological and chemical evaluation of "Benzoin".
17. Perform morphological, microscopic and chemical evaluation of "nylon, Silk and Cotton".
18. Perform morphological, microscopic and chemical evaluation of "Talc and Podophyllum".
19. Perform morphological, microscopic and chemical evaluation of "Peru and Tolu Balsam".
20. Identify the given mixture/sample of powder drugs by morphological microscopical and chemical
21. evaluation.

Bachelor of Pharmacy II Semester
Course PY 209- Course PY-205 ANATOMY PHYSIOLOGY AND HEALTH EDUCATION-I

Hrs: 60
Max. Marks: 50
Credit: 02

LIST OF PRACTICALS:

1. . Determine RBC count of the given blood sample
2. Determine WBC count of the given blood sample
3. Determine differential WBC count of the given blood sample
4. . Determine platelets count of the given blood sample
5. . Determine hemoglobin count of the given blood sample
6. Determine clotting time of the given blood sample.
7. Determine erythrocyte sedimentation rate of the given blood sample
8. Osmotic fragility of the blood.
9. Determine blood group.
10. Study of epithelial, connective, muscular and nervous tissue using slide.
11. Study human skeletal system with the help of chart, model and histological slides.
 - a. Study of human cardiovascular system with the help of chart, model and histological slides.
12. Record of blood pressure.

13. To understand ECG, PQRST waves and their significance.
- a. Study of human respiratory system with the help of chart, model and histological slides.
14. Study of lymphatic system with the help of chart, model and histological slides.

BACHELOR OF PHARMACY III SEMESTER
Course- PY 301 PHARMACEUTICS –III (PHARMACEUTICAL ENGINEERING -I)

Hrs: 60
Max. Marks: 100
Credit: 04

Unit I

Unit operations and processes, Material and energy balances, Dimensionless equations: formulas and groups.

Materials of Pharmaceutical Plant Construction-

Factors affecting the material selection for pharmaceutical plants, Physical: Chemical; Mechanical properties and use of the important materials of construction with special reference to Ferrous metals, Copper, Aluminum, Nickel, Glass, Plastics and their alloys, Heat and Corrosion resistant alloys.

Unit II

Corrosion and its Prevention –

General considerations, Types of Corrosion, Methods of reducing Corrosion, Simple mathematical problems.

Industrial Hazards and Safety measures-

Mechanical, Chemical, Electrical, Fire and Dust Hazards, Safety requirements, Legal requirements, Industrial dermatitis.

Unit III

Fluid Flow-

Fluid statics, Manometers, Types of flow, Reynold's Number and its significance, Concept of boundary layers, Bernoulli's theorem and its applications, Measurement of flow of – fluids, Valves.

Material Handling Systems-

Liquid handling: Different types of pumps.

Solid handling : Conveyors

Unit IV

Heat Transfer-

Heat transfer mechanisms, Heat transfer by conduction, Fourier's law, Natural and forced convection, Surface and overall heat transfer coefficients, Heat transfer by radiation, Heaters and heat exchangers.

Humidity, Air- Conditioning and Refrigeration- Basic concepts and definitions of various terms, Psychometric charts, Wet bulb theory, Measurement of humidity, Application of humidity measurement, air-conditioning and refrigeration in Pharmacy.

Unit V

Automated Process Control Systems:

Process variables, Temperature, Pressure, Flow, Level and Vacuum and their measurements. Elements of computer aided manufacturing (CAM).

Books Recommended:

1. J.F.Richardson and J.M. Coulron: Chemical Engineering
2. Walter L. Badger and J.T. Banchero: Introduction to Chemical Engineering
3. Perry: Handbook of Chemical Engineering
4. Lauer & Heckmann: Chemical Engineering Techniques

5. Peters: Elementary Chemical Engineering
6. S.J. Carter: Tutorial Pharmacy
7. N.D.Bhatt: Elementary Engineering Drawing.
8. McCabe W.L. and Smith J.C. Unit Operation of Chemical Engineering Mc Graw Hill
9. International Book Co., London.
10. Cooper and Gunn's Tutorial Pharmacy, CBS Publishers, New Delhi

Bachelor of Pharmacy III Semester
Course- PY 302 ANATOMY PHYSIOLOGY & HEALTH EDUCATION- II

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

Digestive system –

Gross anatomy and histology of the gastrointestinal system, Functions of its different parts

Oral cavity, Oesophagus, Stomach, Pancreas, liver, gall bladder, small intestine, large intestine.

Various gastrointestinal secretions, its regulation and their role in the absorption and digestion of food. Overview of Disorders of digestive system, dental, caries' disease, periodontal cirrhosis, hepatitis, gallstones, anorexia, peptic ulcers, appendicitis, gastrointestinal tumors.

Unit II

Central Nervous System

Neurohumoral transmission in the CNS Organization of nervous systems. Histology and physiology of neurons. Structure and function of brain and spinal cord, specialized function of cranial and spinal nerves. Reflex action, Neurotransmitter in brain, Electroencephalogram.

Overview: CNS Disorder. Parkinson's, cerebral palsy, poliomyelitis multiple sclerosis, epilepsy, dyslexia, Trigeminal neuralgia, headache, Reyes syndrome, Alzheimer's Disease, Neuritis, Sciatica.

The sensory, motor and integrative systems.

Unit III

Autonomic Nervous system

Structure and physiology of Autonomic nervous system (Sympathetic and parasympathetic). Visceral autonomic reflexes, control by higher centers

5. Urinary System

Structure and functions of the kidney and urinary tract Physiology of urine formation, acid-base balance. Overview of Disorder of urinary system, Gout, cystitis, nephrosis Renal failure, glomerulonephritis, Urinary tract infection.

Unit IV

Endocrine system

Endocrine glands, chemistry of hormones, mechanism of hormonal action, control of hormonal secretion (Feed back mechanism) Anatomy and physiology of Pituitary, thyroid, Parathyroid, Adrenals, Pancreas, ovaries, testes, thymus, Pineal, their hormones and functions. Overview of Disorders of endocrine system:

Pituitary dwarfism, gigantism, acromegaly, diabetes, insipidus, cretinism, Myxedema, exophthalmic goiter, aldosteronism, Addison's disease, Cushing's syndrome, pheochromocytoma, Diabetes mellitus.

Unit V

Reproductive system

Structure and function of male reproductive system testes, ductus epididymis vas deferens, ejaculatory duct, urethra, seminal vesicles, prostate, gland, bulbourethral, glands, penis, Hormones of male system and their regulation. Spermatogenesis, semen Structure and function of female reproductive system, ovaries, uterine tubes, Vagina, Vulva, mammary glands, Endocrine relations' Menstrual and ovarian cycles Oogenesis, coitus, Fertilization, pregnancy – its maintenance and parturition.

Overview of Disorders of Reproductive systems: - Sexually transmitted diseases Gonorrhoea, Syphilis, Genital herpes, Trichomoniasis, Prostatitis impotence, in fertility, Menstrual, abnormalities (Amenorrhoea, dysmenorrhoea) Ovarian cysts, endometriosis, cervical cancer, prostate cancer, breast cancer.

Sense Organ

Basic anatomy, Physiology of eye (Vision), ear (hearing), taste buds, nose (smell) and skin (superficial receptors).

Books Recommended

1. Gerard J. Tortora and Nicholas P. Anagnostakos ; Principles of Anatomy and physiology. Harper and Row publishers, New York.
2. Sujit K. Chaudhuri: Concise Medical Physiology.
3. C.C. Chatterjee: Human Physiology.
4. Kathleen J.W., Wilson Ross and Wilson: Anatomy and Physiology in Health and Illness
5. Arthur C. Guyton: Textbook of Medical Physiology.
6. Cyril A. Keele, Erie Neil, Norman Joels and Samson Wrights: Applied Physiology
7. Chatterjee, C.C, **Human Physiology**, Medical allied agency, Calcutta.
8. Shalya, Subhas, **Human Physiology** CBS publisher Delhi.
9. Ross and Wilson, **Human anatomy and Physiology**, Churchill Livingstone London.
10. Chaurasia, B.D, **Human anatomy, Regional and applied.** , CBS publisher New Delhi

Bachelor of Pharmacy III Semester **Course- PY-303 PHARMACEUTICAL CHEMISTRY IV** **(ORGANIC CHEMISTRY II)**

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

Photochemistry and Pericyclic reaction

Theory-energy transfer-characteristics of photoreactions – typical photoreaction. Electrocyclic reaction–sigmatropic rearrangement cycloaddition reactions. Neighboring group effect, Catalysis by transition metal complexes.

Unit II

Heterocyclic Chemistry

Nomenclature of Heterocycles

Nomenclature (Hantzsch-Widman system) for monocyclic (three, four, five, six and large membered), fused and bridged heterocycles.

Aromatic and Non-aromatic Heterocycles

General chemical behaviour of aromatic heterocycles, classification (structural type), Heteroaromatic reactivity and tautomerism in aromatic heterocycles, Strain–bond angle and torsional strains and their consequences in small ring heterocycles

Unit III

Synthesis, chemical reactivity and medicinal application of the following heterocycles

Three and four-membered heterocycles: aziridines and azetidines

Five membered hetero cycles: Furan, thiophen, pyrrole, pyrazole, oxazole, imidazole, triazole.

Unit IV

Benzo-Fused Five-Membered Heterocycles: Benzimidazole, benzthiazole and benztriazole.

Six-Membered Heterocycles with One, Two or More Heteroatoms: Pyridine and Pyrimidine.

Fused heterocycles: Quinoline, isoquinoline, acridine, coumarins.

Unit V

Organic Compounds with functional group containing nitrogen

Structure, nomenclature of nitro and cyano compounds.

Nitro compounds: Important methods of preparation, physical properties and chemical reactions.

Cyanides and isocyanides: preparation, physical properties and chemical reactions.

Structure, Nomenclature and reactivity of Sulphur containing compounds

BOOKS RECOMMENDED:

1. The Chemistry of Heterocycles, T. Eicher and S. Hauptmann, Thieme.
2. Heterocyclic Chemistry, J.A. Joule, K. Mills and G.F. Smith, Chapman and Hall.
3. Heterocyclic Chemistry, T.L. Gilchrist, Longman Scientific Technical
4. Contemporary Heterocyclic Chemistry, G.R. Newkome and W.W. Paudler, Wiley-Inter Science.
5. Heterocyclic Chemistry Vol. 1-3, R.R. Gupta, M. Kumar and V. Gupta, Springer Verlag
6. An introduction to the Heterocyclic Compounds, R.M. Acheson, John Wiley
7. Comprehensive Heterocyclic Chemistry, A.R. Katritzky and C.W. Rees, eds. Pergamon
8. Natural Products: Chemistry and Biological Significance, J.Mann, R.S. Davidson, J.B.
9. Hobbs, D.V. Banthorpe and J.B. Harborne, Longman, Essex.
10. Organic Chemistry, Vol 2, I.L. Finar, ELBS.
11. Stereoselective Synthesis: A Practical Approach, M. Nogradi, VCH
12. Name Reactions in Heterocyclic Chemistry by J. J. Li. Wiley, 2005.
13. Molecular Photochemistry, N.J. Turro, W.A. Benjamin
14. Introductory Photochemistry, A. Cox and T. Camp, McGraw Hill
15. Photochemistry, R.P. Kundall and A. Gilbert, Thomson Nelson

Bachelor of Pharmacy III Semester Course- PY-304 PHARMACEUTICAL MICROBIOLOGY

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

Introduction to the Science of Microbiology: Historical development, contribution of great scientists and scope of microbiology.

Microbiology Taxonomy- Classification of Bacteria and Viruses

Unit II

Identification of Microbes: Working of different types of microscopes, electron microscopy, stains and types of staining techniques. Structure and Morphology of bacteria and viruses.

Nutritional requirements, Cultivation and isolation of bacteria and viruses. Microbial genetics and variation.

Unit III

Control of microbes by physical and chemical methods

Disinfection: factors influencing disinfection, dynamics of disinfection.

Disinfectants and antiseptics, and their evaluation

Sterilization: Different methods, Validation of sterilization methods and equipments.

Sterility testing of pharmaceutical products.

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

Unit IV

Microbial diseases: Brief outline of communicable diseases. Their causative agents, Mode of transmission and prevention – Chicken pox, Measles, influenza, Diphtheria, Whooping, cough, Tuberculosis, Poliomyelitis, Hepatitis, Cholera, Typhoid, Food poisoning, Helminthiasis, Malaria, Filariasis, Rabies, Trachoma, Tetanus, Syphilis, Gonorrhoea and AIDS.

Unit V

Microbial assay of antibiotics and vitamins.

Food spoilage and Preservation of food.

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

Books Recommended

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
3. Gilbert S.Banker and Christopher T. Rhodes: Modern Pharmaceutics.
4. Remington's Pharmaceutical Sciences.
5. Pelczar and Reid: Microbiology.
6. Dawson and Mirne: Immunological and Blood products.
7. Rose: Industrial Microbiology.
8. Prescott and Dunn: Industrial Microbiology.
9. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
10. Cooper and Gunn's: Tutorial Pharmacy
11. Pepler: Microbial Technology.
12. I.P., B.P., U.S.P. - latest editions
13. Edward: Fundamentals of Microbiology
14. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi

Bachelor of Pharmacy III Semester **Course- PY-305 PHARMACOGNOSY-II (Theory)**

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

General methods of, isolations classification chemical properties and chemical tests and systematic pharmacognostical studies of Glycosides, and drugs belongs to this class: Liquorice, Ginseng, scorea, Sarasaparilla, Senega, Digitalis, Squill, Rhubarb, Cascara, Aloe, Senna, Psorelea, Gentian, Saffron, Chirata, Quassia, Thevetia, Mustard, Picrorrhiza

Unit II

Volatile oils and drugs belongs to this class: Dill, Fennel, Coriander, Caraway, Cassia bark, Cinnamon bark, Clove, Nutmeg, Cardamom, Musk, Palmrosa, Gaultheria, Valerian, Black Pepper, Lemon grass, Sandal wood Orange peel, Henna.

Unit III

Enzymes, Biological sources, preparation, properties, identification tests and uses of Diastase, Papain, Pepsin, Trypsin and Pancreatin.
Plant bitters and Sweetners.

Unit IV

Biological Source, identification characters chemical constituents and therapeutic uses of traditional drugs like: Kantkari, Satavari, Guduchi, Punarnava, Chitrak, Apamarga, Gokhru, Shankhpushpi, Aduva, Brahmi, Methi, Garlic, Nagarmotha, Neem, Shilajit Kapur kachari, Acorus

Unit V

The holistic concept of drug administration in Ayurvedic and Traditional system of medicine. Introduction to preparations like Asava, Arishta, Tailas, Churnas, Lepas, Lehyas and Bhasmas and their evaluation schemes.

Books Recommended:

1. C.K. Kokate, Gokhale and Purohit, A Text Book of Phamacognosy, Nirali Prakashan, Pune
2. S.S. Handa and V.K. Kapoor, Pharmacognosy, Vallabh Prakash, Delhi
3. G.E. Trease and W.C. Evans, Pharmacognosy (India Reprint J. P. Publication, Delhi)
4. T.E. Wallis, Text Book of Pharmacognosy, C.B.S. Publication, Delhi

5. V.E. Tylor, L.R.Brady & J.E. Robbers, Lea & Febiger Philadelphia, U.S.A.
6. C.K.Atal and B.M. Kapoor, Cultivation & Utilization of Aromatic Plants, Council of
7. Scientific Industrial Research (CSIR) New Delhi
8. Medicinal Plant Glycosides – Sim, Toronto
9. C.S.Shah & J.S.Quadry, A Text Book of Pharmacognosy

Bachelor of Pharmacy III Semester

Course- PY 306 PHARMACEUTICS –III (PHARMACEUTICAL ENGINEERING -I)

Hrs: 60

Max. Marks: 50

Credit: 02

LIST OF PRACTICALS

1. Determine the corrosion rate of different materials
2. Determine the corrosion rate of the metal in different environments
3. Calibrate a venturimeter and interpret the energy losses graphically.
4. Determine the rate of heat transfer using different materials.
5. Calculate the humidity at different places using dry bulb and wet bulb temperature method.
6. Determine the overall heat transfer coefficient of the given condenser
7. Determine the water vapour permeability across the given packaging material.
8. Determine the nature of flow of fluid and Reynolds Number by using Reynolds apparatus.
9. Determine the rate of flow of the given fluid by orifice meter.
10. Determine the rate of flow of the given fluid by venturimeter
11. Determine the pressure difference by simple and differential manometers.
12. Correlate flow factors and Reynolds Number using given pipe line assembly.
13. Determine the enlargement losses contraction losses and friction losses in a fluid flowing through a pipe.
14. Calculate the coefficient of discharge at orifice using orifice meter.

Bachelor of Pharmacy III Semester)

Course- PY 307 ANATOMY PHYSIOLOGY & HEALTH EDUCATION- II

Hrs: 60

Max. Marks: 50

Credit: 02

LIST OF PRACTICALS

1. To study human digestive system with help of chart and models and study histology of salivary glands, esophagus, stomach, Pancreas, liver, small intestine, large intestine.
2. To study human urinary system with help of chart and models study histology of nephron, urinary bladder, Ureter
3. To study male and female reproductive system with help of chart and models and study histology of testes, ductus, epididymis, ovary, uterus, mammary glands.
4. To study brain and spinal cord with help of chart and models and study histology of cerebrum, cerebellum, spinal cord
5. To study structure and physiology of special senses
6. To study structure and physiology of Eye
7. To study structure and physiology of Ear
8. To study structure and physiology of Skin
9. To study structure and physiology of Taste buds
10. To study structure and physiology of Nose
11. To perform urine analysis for physiological (normal) constituent present in urine sample
12. To study pathological (abnormal) constituent in the urine sample.
13. To perform quantitative test for presence of glucose in urine sample

Bachelor of Pharmacy III Semester
Course- PY-308 PHARMACEUTICAL CHEMISTRY IV
(ORGANIC CHEMISTRY II)

Hrs:60
Max.Marks:50
Credit :02

LIST OF PRACTICALS:

1. Synthesis and Characterization of – Benzthiazole.
2. Synthesis and Characterization of Quinoline.
3. Synthesis and Characterization of Benzimidazole.
4. Synthesis and Characterization of triazoles.
5. Synthesis and Characterization of pyrimidines.
6. Synthesis and Characterization of acridines.
7. Synthesis and Characterization of coumarins.
8. Synthesis and Characterization of azipine.
9. Synthesis and Characterization of oxazole.
10. Synthesis and Characterization of picric acid.
11. Synthesis and Characterization of 3- nitro benzaldehyde.
12. Synthesis and Characterization of 2 – mercapto oxadiazole.
13. Synthesis and Characterization of thiazolidinedione.
14. To perform the reduction of aromatic nitro group 2- amino group (Nitro benzene to aniline, nitrobenzoic acid to amino benzoic acid, etc)

Bachelor of Pharmacy III Semester
Course- PY-309 PHARMACEUTICAL MICROBIOLOGY

Hrs:60

Max.Marks:50
Credit :02

LIST OF PRACTICALS

1. Study the motility of the given sample of microorganism by hanging drop technique.
2. Identify the given sample of organism by simple staining technique
3. Identify the given sample of organism by Gram staining technique
4. Identify the given sample of organism by negative staining.
5. Identify the bacteria by performing IMViC test.
6. Prepare various types of culture media (Nutrient broth, nutrient agar, fluid thioglycolate media etc)
7. Prepare subculture of the given sample of microorganism by aseptic transfer technique.
8. Evaluate the given sample of disinfectant by R.W. Coefficient test.
9. Determine the sterility of the given sample by filtration method.
10. Determine the sterility of the given sample by direct inoculation method.
11. Evaluate the given sample of an antibiotic microbiologically by filter paper disc method.
12. Evaluate the given sample of an antibiotic microbiologically by cup plate method.
13. Assay the given sample of vitamin microbiologically.

Bachelor of Pharmacy III Semester **Course- PY-310 PHARMACOGNOSY-II**

Hrs:60
Max.Marks:50
Credit: 02

LIST OF PRACTICALS

1. Morphological identification of Senna pod, Squill Aloe, Senega
2. Morphological identification of Satavari, Guduchi, Apamarga Gokharu
3. Morphological identification of Nagarmotha, Neem, Garlic, Methi seed
4. Morphological identification of Nutmeg, Cardamom fruits and seeds.
5. Morphological and Microscopical identification of Senna leaf.
6. Morphological and Microscopical identification of Liquorice.
7. Morphological and Microscopical identification of Rhubarb.
8. Morphological and Microscopical identification of Dill & Fennel.
9. Morphological and Microscopical identification of Caraway & Coriander.
10. Morphological and Microscopical identification of Cinnamon bark & clove.
11. Identify the given mixture/sample of powder drug by morphological, i. microscopical & chemical evaluation of senna cinnamon Rhubarb Coriander.
12. General studies of marketed formulations.

BACHELOR OF PHARMACY IV SEMESTER
Course- PY-401 Pharmaceutics- IV (Pharmaceutical Engineering – II)

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

Size Reduction and Size Separation- Definition objectives and significance of size reduction, Factors affecting size reduction, Standard of powders, Sieves and their usage in grading of powders, Laws governing energy and power requirements of a mill, Classification of size reduction machines, Study of various types of mill including ball mill, hammer mill fluid energy mill energy mill etc. Fluid classification methods.

Evaporation-Basic concepts, Factors affecting evaporation, Types of evaporators, Study

of short tubs evaporators, Forced circulation evaporators and Film evaporators, Single and multiple effect evaporation, Evaporation under reduced pressure, Evaporation capacity, Heat and material balance, Scale formation, Foam and entrainment.

Unit II

Distillation- General theory applied to binary mixtures, Boiling point and equilibrium diagrams, Raoult's Law and Henry's Law, Constant boiling mixtures, Simple, steam and Equilibrium distillations, Rectification, Constructions of rectifying columns. Analysis of rectifying column: McCabe Thiel method and Lewis Sorel method for calculation of number of theoretical plates, Azeotropic and extractive distillations.

Drying- Introduction, Theory of drying Rate of drying curves, Classification of dryers, Study of dryers used in Pharmaceutical industries, Special drying methods.

Extraction- Principles of solid-liquid and liquid- liquid extraction, Theories of extraction of drugs, Diffusion battery, Podbielnaik extractor, Continuous counter-current extraction system.

Unit III

Crystallization-Importance of crystal purity, size, shape, geometry habit forms and types, Solubility curves and calculation of yields, Mier,s supersaturation theory and its limitations, Nucleation and crystal growth, Classification of crystallizers, Principles underlying the design and operation of Tank, Swenson-walker, Krystal and Vacuum crystallizer, Crystallizer employed for producing large crystals, Caking of crystals and its prevention.

Mixing-Theory of mixing, Solid-solid; solid-liquid and liquid-liquid mixers used in pharmaceutical industries.

Unit IV

Filtration and Centrifugation- Theory of filtration, Factors affecting filtration, Filter media, Filter aids, Classification of filters, Industrial filters including Filter press, Rotary filter, Membrane filter etc.

Principles of centrifugation, Industrial filters and centrifugation sedimenters.

Unit V

Compaction and Compression- Adhesion and Cohesion of particles, Strength of granules, Factors affecting strength of tablets, Physics of tablet compression.

Pilot Plant Scale Up Techniques- Concepts of pilot plant, scale up techniques in pharmaceutical industries.

Books recommended

- 1 Elementary Chemical Engineering - Max S. Peters, Published by McGraw Hill Book Company, New York, 1954.
- 2 Perry's Chemical Engineer's Handbook - Robert H Perry, Green D.W., Maloney O.7th Edition, 1998, McGraw – Hill Inc., New York.
- 3 Tutorial Pharmacy by Cooper & Gunn, ed. S.J.Carter, CBS Publishers & Distributors, Delhi, 6th Edition, 2000.
4. Unit Operations of Chemical Engineering, 5th edition – McCabe, Smith & Harriott, McGraw – Hill Inc., New York.
- 5 Pharmaceutical Engineering – K.Sambamurthy, 2002 NAI (P) Ltd., Delhi.

- 6 Pharmaceutics : The Science of Dosage Form Design - M.E. Aulton.
 7 The Theory & Practice of Industrial Pharmacy – Lachman L., Lieberman H.A. & Kanjig J.L., 3rd edition, 1990 Varghese Publishing House, Bombay.
 8 Alfonso G. Remington: The Science & Practice of Pharmacy. Vol.I & II. Lippincott, Williams & Wilkins Philadelphia.
 9 Jani G. K., Pharmaceutics II (Unit Operations), B. S. Shah Prakashan, Ahmedabad. 10 Subramanyam C.V.S., Thimma J, Suresh S.S. et. al., Pharmaceutical Engineering : Principles and Practice, 2002, Vallabh Prakashan, Delhi.

Bachelor of Pharmacy IV Semester

Course- PY- 402 Pharmaceutics –V (Dosage Form Design)

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

Pharmaceutical preformulation: -

Definition and scope, Establishment and importance of following physicochemical parameters Solubility, pKa and selection of suitable salt, partition coefficient, dissolution, polymorphism, microscopy and powder properties, stability and drug-excipient compatibility Pharmaceutical factors influencing drug formulation.

Unit II

Study of different types of formulation additives:

Diluents, Binders, Disintegrating agents, Lubricants, Solvents, Co-solvents and Vehicles, Preservatives, Suspending agents, Emulsifying agents, Antioxidants, Preservatives, colouring, flavoring and sweetening agents, Viscosity enhancers, ointment and suppositories bases

Polymers and biodegradable polymers:

Classification, Methods of synthesis, Properties, Characterization and evaluation. Brief introduction of biodegradable polymers, pharmaceutical applications of polymers.

Unit III

Dissolution stability and degradation study:

Chemical stability, pathways of degradation, physical and phase transformation, stability testing protocols for various pharmaceutical dosage forms, determination of expiry date (shelf life) and overage calculations, stabilization of pharmaceutical formulations.

Unit IV

Drug product design:

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

Unit V

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, mathematical models for predication of dissolution of profile.

BOOK RECOMMENDED

1. Swarbrick J., Boylan J.C., Encyclopedia of Pharmaceutical Technology, Second edition, Volume-1,2,3, Marcel Dekker, Inc. Newyork.
 - i. Qice yihong, ChenY, Zhang G.G.Z., Developing solid Oral dosage forms- Pharmaceutical Theory and Practice charon Tech Ltd.
2. Allen L.V., Popovich N.G., Ansel H.C., Ansel's Pharmaceutics design and drug delivery systems, Eight edition, B.I. Publication Pvt. Ltd.
3. Aulton M.E. Pharmaceutics- The science of dosage form design" second edition., Churchill Livingstone Pvt. Ltd.
4. Banker G.S., Rhodes C.T., Modern Pharmaceutics" second edition, Marcel Dekker, Inc., Newyork.
 Kanig J.J., Liebermen H.A., Lachman L. "The theory and Practics of Industrial Pharmacy, Varghese Publishing House, Bombay.
 Rowe RC, Sheskey P.J., Owen S.C., Handbook of Pharmaceutical Excipients, Fifth edition, Pharmaceutical Pr.

- Bugay D.E., Findlay W.P., Pharmaceutical Excipients, Marcel Dekker, Inc. Newyork.
a. Kim C.J., Advanced Pharmaceutics- Physiochemical Principle CRC Press, Florida.
b. Jan N.K., Pharmaceutical Product Development, CBS Publishers and distributors, New Delhi.
5. Shah D.H., "SOP Guidelines", Business Horizons Publishers, New Delhi.

Bachelor of Pharmacy IV Semester
Course- PY- 403 PHARMACEUTICAL ANALYSIS (THEORY)

Hrs: 60
Max. Marks: 100
Credit: 04

Unit I

Fundamentals, Significance of quantitative analysis in quality control, Different techniques of analysis. Theoretical considerations and pharmaceutical applications; with special reference to Indian pharmacopoeia; of the following analytical techniques -

Acid-Base titrations: Theoretical principles. Classification, Direct titration of strong acids, Strong bases, and weak bases, Back titrations, Acid –Base indicators, Choice of indicators and mixed indicators. Methods for determination of organically combined Nitrogen and in pharmaceutical applications.

Unit II

Oxidation-Reduction titrations: Concepts of oxidation and reduction, redox reactions, strengths & equivalent weights of oxidizing and reducing agents, redox indicators, potassium permanganate titrations, iodometry & iodometry, ammonium sulphate titrations, potassium iodate titrations. Pharmaceutical applications, preparation and standardization of redox titrants e.g. sodium thiosulphate etc.

Precipitation titrations: Detection of End Points in Precipitation reactions. Indicators used in Precipitation titrations, Preparation & standardization of titrants like silver nitrate, ammonium thiocyanate; titrations according to Mohr's and Volhard's methods; ammonium and potassium thiocyanate titrations; indicators; applications in pharmaceutical analysis

Unit III

Gravimetric analysis: Fundamentals of gravimetry, Precipitation reagents precipitation techniques, Specific examples of gravimetric estimation like Aluminum as hydroxy quinolate, Barium on Barium Sulfate, Lead as Chromate and Magnesium as Magnesium Pyrophosphate.

Non-aqueous titrations: Scopes and limitations, Solvents used in non aqueous titrations. Acid-base equilibria in non-aqueous media, Titration of weak acids and weak bases with specific examples given in Indian Pharmacopoeia.

Unit IV

Complexometric titrations: Theory of Complexometric analysis. Factor in influencing stability of complexes. pM indicators. Types of Disodium edetate titrations with suitable examples.

Conductometry: Ohm's law and ionic conductivities, Apparatus used for conductimetric titrations. Application of conductimetry in acid-base, Precipitation and complexometric titrations with suitable examples.

Unit V

Potentiometry: Theory and principles, Reference electrodes, Indicators electrodes and Ion selective electrodes. Instrumentation for potentiometric titrations. Application of potentiometry for end point determination in acid-base titration, redox titrations, precipitation titrations with suitable examples

Polarography & Amperometry: Introduction, theoretical principles, organic polarography, dropping mercury electrode, basic principles of polarographic instruments, methods of analysis, experiments including amperometric titrations.

Miscellaneous methods of analysis like diazotization titrations and Karl-fisher titrations.

BOOKS RECOMMENDED

1. A.H. Beckett and J.B. Stenlake: Practical Pharmaceutical Chemistry, Vol I and II, CBS Publishers and Distributors, New Delhi, India
2. H. H. Willard, L. L. Merritt and J. A. Dean: Instrumental Methods of Analysis, Van Nostrand Reinhold, New York.
3. L.M. Atherden: Bentley and Driver's Text book of Pharmaceutical Chemistry, Oxford University Press, Delhi.
4. G.L. Jenlnds, J.E. Christian, G.P. Hager: Quantitative Pharmaceutical Chemistry, McGrawHill, Company, New York.
5. Pharmacopoeia of India, Govt. of India, Ministry of Health, Delhi.
6. Bassett, R.C. Denney, G.H. Jeffery, J. Mendham: Vogel's Textbook of quantitative Inorganic Analysis, The ELBS and Longman, London.

Bachelor of Pharmacy IV Semester
Course- PY- 404 PHARMACEUTICAL CHEMISTRY-V (BIOCHEMISTRY)

Hrs: 60
Max. Marks: 100
Credit: 04

Unit I

Biochemical organization of the cell and transport processes across cell membrane

The concept of free energy, determination of charges in free energy system from equilibrium constant and reduction potential, bioenergetics, production of ATP and its biological significance.

Structure and Functions of Proteins:

Amino acids and Peptides, Determination of Primary structure and higher orders of structure.

Enzymes:

Nomenclature, Kinetics and its Mechanism of action, Mechanism of Inhibition, Isoenzymes, enzymes in technical diagnosis.

Co-enzymes:

Metals as coenzymes and their significance and Vitamins as coenzymes and their significance.

Unit II

Carbohydrate Metabolism:

Conversion of Polysaccharide to Glucose 1-Phosphate, Glycolysis and Fermentation and their regulation, Gluconeogenesis and Glycogenolysis, metabolism of galactose and galactosemia, role of sugar nucleotide in biosynthesis, pentosephosphate pathway.

The Citric acid cycle:

The significance, reaction and energetics of cycle, amphibolic role of cycle, Glyoxalic Acid Cycle.

Lipid Metabolism:

Oxidation of fatty acids, Beta Oxidation and energetic, alpha oxidation, omega oxidation, Biosynthesis of Ketone bodies and their utilisation, Biosynthesis of saturated and unsaturated fatty acids and eicosanoids, phospholipids, sphingolipids.

Unit III

Biological oxidation:

Redox Potential, enzymes and co-enzymes involved in oxidation reduction and its control. The respiratory chain, its role in energy capture and its control, energetic of oxidative phosphorylation, inhibitors of respiratory chain and oxidative phosphorylation, mechanism of oxidative phosphorylation.

Nitrogen & Sulphur Cycle:

Nitrogen fixation, ammonia assimilation, sulphur activation, sulphate reduction, incorporation of sulphur in organic compounds, release of sulphur from organic compounds

Unit IV

Metabolism of Ammonia and Nitrogen Containing monomers:

Nitrogen balance, biosynthesis of amino acids, catabolism of amino acids, conversion of amino acids to specialized products, assimilation of ammonia, urea cycle, metabolic disorders of urea cycle, metabolism biosynthesis, formation of bile pigment, hyperbilirubinemia, purine biosynthesis, purine nucleotide interconversion, pyrimidine biosynthesis, and formation of deoxyribonucleotides.

Disorders of Carbohydrate, Lipid and Protein Metabolism:

Biomedical Importance and Implications in Clinical Biochemistry. Diagnostic tests for detection of metabolic disorders.

Unit V

Biosynthesis of nucleic Acids:

Brief introduction to genetic organisation, organisation of mammalian genome, alteration and rearrangement of genetic material, biosynthesis of DNA and its replication, mutation, physical and chemical mutagenesis/ carcinogenesis, DNA repair mechanism, biosynthesis of RNA.

Genetic code and Protein synthesis:

Genetic code, Components of protein synthesis and inhibition of protein synthesis. Brief account of genetic engineering and polymerase chain reactions. Regulation of gene expression.

Books Recommended

1. Martin, D.W., Mays, P.A. and Redwell, V.M., Harper's Review of Biochemistry, Lange medical Publication.
2. Horrow, B. and Mazur, A., Text book of biochemistry, W.B. Saunders Co. Philadelphia.
3. Lehninger, A.L., Principles of Biochemistry, CBS Publishers and Distributors.
4. Lehninger, A.L., Biochemistry, Worth Publishers Inc.
5. Stryer, L., Biochemistry, W.H. Freeman and Co. San Francisco.
6. Plumer, D.T., An Introduction to Practical Biochemistry, Tata McGraw Hill, New Delhi.
7. Jayaraman, J., Laboratory manual in Biochemistry, Wiley eastern Ltd., New Delhi.

Bachelor of Pharmacy IV Semester Course- PY- 405 Pharmacology-I (Theory)

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

General Pharmacology

Introduction to pharmacology, sources of drugs, dosage forms and routes of administration, mechanism of action, combined effects of drugs, factors modifying drug action, tolerance and

dependence, pharmacogenetics.

Absorption, distribution and excretion of drugs, principle of basic and clinical pharmacokinetics adverse drug reactions and treatment of poisoning, ADME drug interaction, bioassay of drugs and biological standardization, discovery and development of new drugs. Introduction to clinical trials.

Unit II Pharmacology of Peripheral Nervous System

Neurohumoral transmission (autonomous and somatic)
Parasympathomimetic, parasympatholytic, sympathomimetics, sympatholytics, neuron blocking agents.
Neuromuscular blocking agents Local anaesthetic agents

Unit III Autocoids

Histamine, bradykinin 5- HT and their antagonists.
Prostaglandins, leukotrienes and platelet activating factors.

Unit IV

Analgesic, Antipyretic, Anti-inflammatory and Anti-Gout Drugs: Drugs acting on Respiratory System and Pathophysiology of respiratory system:

Unit V

Anti-asthmatic drugs including bronchodilators, Anti-tussives and expectorants

Books Recommended

1. Satoskar, R.S. and Bhandarkar, S.D., Pharmacology and Pharmacotherapeutics.
2. Tripathi, K.D., Essentials of Medical Pharmacology. Kulkarni, S.K., Handbook of Experimental Pharmacology, Vallabh Prakashan, New Delhi.
3. Crossland, J and Thomson, J.H., Essential of Pharmacology, Harper and Row, Publishers, New York.
4. Craig, C.R. and Stitzel, R.R., Modern Pharmacology, Little Brown and Company.
5. Rang, M.P. , Dale, M.M. and Ritter, J.M., Pharmacology, Churchill Livingstone.
6. Paul, L., Principles of Pharmacology, Chamman and Hall.
7. Herfindal, E.T. and Hirschman, J.L., Clinical Pharmacy and Therapeutics, William and Wilkins.
8. Katzung, B.G., Basic and Clinical Pharmacology, Prentice Hall International.
9. Hardmen, J.G., Limbired, L.E., Molinoss, P.B., Ruddon, R.W. and Gil, A.G., Goodman and Gillman's The Pharmacological basis of Therapeutics, Pergamon Press.
10. Satoskar, R.S. and Bhandarkar, S.D., Pharmacology and Pharmacotherapeutics.
11. Tripathi, K.D., Essentials of Medical Pharmacology.
12. Kulkarni, S.K., Handbook of Experimental Pharmacology, Vallabh Prakashan, New Delhi.
13. Crossland, J and Thomson, J.H., Essential of Pharmacology, Harper and Row, Publishers, New York.
14. Craig, C.R. and Stitzel, R.R., Modern Pharmacology, Little Brown and Company.
15. Rang, M.P. , Dale, M.M. and Ritter, J.M., Pharmacology, Churchill Livingstone.
16. Paul, L., Principles of Pharmacology, Chamman and Hall.
17. Herfindal, E.T. and Hirschman, J.L., Clinical Pharmacy and Therapeutics, William and Wilkins.
- Katzung, B.G., Basic and Clinical Pharmacology, Prentice Hall International.

Bachelor of Pharmacy IV Semester

Course- PY-406 Pharmaceutics- IV (Pharmaceutical Engineering – II)

Hrs:60

Max.Marks:50

Credit: 02

LIST OF PRACTICALS

A minimum total of 12 experiments should be performed.

1. Study the effect of diameter of balls, No. of balls volume of balls or feed amount on the particle size

- reduction wing ball mill.
2. Calculate the energy requirement (as per Riltinger's law) for the powder milling.
 3. Study the particle size distribution the given sample using standard sieve method.
 4. Determine the particle size distribution of a given sample using microscopy.
 5. Study the rate of sedimentation of the given sample.
 6. Study the effect of suspending agents on the rate of sedimentation of the given sample.
 7. Compare the efficiency of different suspending agents on the rate of sedimentation of the given sample.
 8. Study the effect of temperature, surface area and viscosity of the liquid on the rate of evaporation.
 9. Construct the boiling point diagram for the given mixture of alcohol and water.
 10. Separate the constituents of the given a zeotropic mixture by the addition of third agent.
 11. Study the rate of drying and determine EMC, CMC and FMC.
 12. Study the effect of surface area, material bed thickness, temperature and moisture content on the rate of drying.
 13. Compare the efficiency of single stage extraction with multiple stage extraction.
 14. Determine the percentage of acetic acid extracted from the mixture of benzene and acetic acid using water as our extracting agent.
 15. Prepare mier's super solubility curve for the given samples.
 16. Determine the percentage purity of the given sample using crystallization technique.
 17. Determine the mixing index for the mixing of give powders.
 18. Determine the effect of surface area, thickness of filter medium, viscosity of liquid, temperature and filter aid on the rate of filtration.

Bachelor of Pharmacy IV Semester
Course- PY- 407 Pharmaceutics –V (Dosage Form Design)

Hrs:60
Max.Marks:50
Credit: 02

LIST OF PRACTICALS

A minimum total of 10 experiments should be performed .

1. Establish the following preformulation parameters of the given drug sample.
 - a. Melting point (b) solubility (c) intrinsic solubility (d) pKa (e) Partition coefficient
2. Establish the following preformulation parameters of the given drug sample.
3. Particle size distribution (b) Flow proportion (c) Bulk deurity (d) Carr's index (e) Compression preparation.
4. Study the drug excipient compatibility of given drug with commonly used excipity by TLC technique.
5. Estimate the self life of the given drug
6. Study the effect of moisture content on chemical stability of aspirin.
7. Study the effect of temperature on stability of given photosensitive drug.
8. Determine the molecular Mass of given polymer by viscometer.
9. Perform the in-vitro dissolution study of given the sample of tablet.
10. Study the effect of presence of surfactant in dissolution of tablet cantoning poorly soluble drug.
11. Study the effect of solvent / co-solvent hydrotropic agents on solubility of given drug.
12. Study the effect of pH of dissolution on *in-vitro* dissuasion study.
13. Compare the dissolution profile of two marketed tablet products

Bachelor of Pharmacy IV Semester
Course- PY- 408 Pharmaceutical Analysis

Hrs:60
Max.Marks:50
Credit: 02

LIST OF PRACTICALS

A total of 15 experiments should be performed on the topics mentioned below

1. Acid base titrations: Preparation and standardization of acids and bases, some exercises related to the determination of acids and bases separately and in mixture form. Some official assay procedures of boric acid, ascorbic acid shall also be covered.
2. Oxidation-reduction titration: Preparation and standardization of some redox titrants, e.g., potassium permanganate, potassium dichromate, iodine, sodium thiosulphate etc. Some exercises related to the determination of oxidizing and reducing agents in the sample shall be covered. Exercises involving use of potassium iodate, potassium bromate, ceric ammonium sulphate shall be performed.
3. Precipitation titrations: Preparation and standardization of titrants like silver nitrate and ammonium thiocyanate, titrations according to Mohr's and Volhard's methods.
4. Gravimetric analysis: Determination of water of hydration, some exercises related to Gravimetric estimation of metal ions such as barium, magnesium and calcium shall be covered.
5. Diazotization reaction: Assay of sulphonamides.
6. Complexometric titration: Any two official assays done by this method.
7. Non-aqueous titrations: preparation and standardization of some non aqueous titrants, e.g., Perchloric acid, tetrabutyl ammonium hydroxide. Any two official assay given in Pharmacopoeia of India.

Bachelor of Pharmacy IV Semester **Course- PY- 409 Pharmaceutical Chemistry (Biochemistry)**

Hrs:60
Max.Marks:50
Credit: 02

LIST OF PRACTICALS

Qualitative and Quantitative chemical examination of Urine ,Blood and Faeces.

1. Food Analysis – Analysis of Milk ,Butter, Flour, Honey and Starch.
2. Systemic analysis of water for pharmaceutical purpose.
3. Separation of amino acids by two dimensional paper chromatography and gel electrophoresis.
4. Separation of lipids by TLC.
5. Separation of Serum proteins by electrophoresis on cellulose acetate.
6. Quantitative estimation of amino acids and proteins.
7. Determination of glucose.
8. Isolation and determination of RNA and DNA.

Bachelor of Pharmacy IV Semester **Course- PY- 410 Pharmacology-I (Practical)**

Hrs:60
Max.Marks:50
Credit: 02

LIST OF PRACTICALS:

1. Introduction to Experimental Pharmacology and various regulatory authorities.
2. Study of common laboratory animals and anesthetics used in animal studies.
3. Study of various routes of drug administration in experimental animals.
4. Preparation of various physiological salt solution and set up of isolated rat ileum preparation.
5. Study the effects of various agonists and antagonists on isolated rat ileum preparation.

6. Plot dose response curve of choline using isolated guinea pig ileum preparation.
7. Plot dose response curve of histamine using isolated guinea pig ileum preparation.
8. Study the effect of autonomic drugs mydriatic and miotic on rabbit eye.
9. Study the effect of local anesthetics on rabbit eye.
10. Study the peripheral analgesic activity of indomethacin using writhing test on mice.
11. Study anti-inflammatory activity of indomethacin using rat paw edema paradigm.
12. Study the neuromuscular effect of d-tubocurarine/ succinyl choline using rotarod apparatus.

BACHELOR OF PHARMACY V SEMESTER
Course- PY-501 PHARMACEUTICS- VI (COSMETIC TECHNOLOGY)

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

Fundamental of cosmetic science. Structure and functions of skin and hair.

Formulation considerations, preparation, packaging and evaluation of the following categories of cosmetics-

Face Preparation: Face powder, Compact powder, Talcum powder, Face packs and Masks.

Skin Preparation: Skin creams, Anti-wrinkle preparations, Barrier materials, Protective creams and gels, Vanishing creams, Cold creams, Cleansing creams, all purpose creams, emollient, Anti-perspirant, / deodorant, Moisturising and foundation formulation. Bleaching creams, Night and Massage creams, Hand creams, Protective skin tonics, Skin moisturizers, Sun-screen, Suntan, and anti-sun burn preparation.

Unit II

Shaving Preparation: Lather shaving stick, Lather shaving creams, Shaving foams, Shaving gels, Pre-and After shave lotions.

Shampoo and Bath preparations: Clear liquid shampoos. Aerosol shampoos, dry shampoos, Acid-balanced shampoos, Egg shampoos, Anti-dandruff Shampoos, Bath oils, Foam baths.

Hair Preparations: Hair tonics, Hair conditioners, Hair lotions, Hair sprays, Hair dressings, Hair setting lotions and creams, Hair dyes, Bleaches, Hair waving, Hair straightners and Hair strengthners.

Unit III

Dentifrice: Tooth powders, Tooth pastes, Denture cleansers.

Foot Preparation: Foot powders, Foot sprays, Foot creams, Corn preparations and Athlete's foot preparation.

Manicure Preparation: Nail polish, Nail lacquers and Nail bleaches.

Unit IV

Herbal Cosmetics: Cosmetics containing Aloe, Babul, Brahmi, Chandan, Cucumber, Haldi, Jatamansi, Khus, Mehandi, Neem, Reetha, Shikakai, Tulsi, Arnica, Bhringraj and Volatile oils .

Unit V

Cosmetic for babies.

Colored make-up preparations: Lipsticks, Rouge, Mascara, Eye make-up, Eye-liner, Eyebrow pencils.

BOOKS RECOMMENDED:

1. M. S. Balsam & Edward Sagarin (Eds.), Cosmetic Science and Technology, Vol. 1-3, Krieger Publishing company. Florida.
2. Mac Chesney, J. C., Packaging of Cosmetic an Toiletries, Newness- Butterworth, London.
3. E.G., Thomssen, Modern Cosmetics, Universal Publishing Corporation, Bombay.

4. Jellinek, J.S. Formulation and Functions of Cosmetics, John Willey & Sons, New York.
5. R. K . Nema, K. S. Rathode, B.K. Dubey, Text Book of Cosmetics, CBS- Publishers & distributors, New Delhi.
6. Sunil Nanda, Arun Nanda & R.K. Khar, Cosmetic Technology, Birla publications Pvt. Ltd., Delhi.
7. B. M. Mithal and R.N. Saha, A handbook of cosmetics, Vallabh Prakashan, Delhi.
8. P.P. Sharma, Cosmetics- Formulation, Manufacturing & Quality control, Vandana Publications Pvt. Ltd, Delhi.
9. Hildo Butler (Ed.), Poucher's Perfumes, Cosmetics & Soaps, Kluwer Academic Publishers, The Netherland.
10. S.C. Bhata, Perfumes, soaps, Detergents and Cosmetics Vol. 1 & 2, CBS Publishers and Distributors, New Delhi.
11. Drug and Cosmetics Act & Rules.

Bachelor of Pharmacy V Semester

Course- PY-502 PHARMACEUTICS- VII (DISPENSING, COMMUNITY AND HOSPITAL PHARMACY)

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

Dispensing Pharmacy:

Prescription, Handling of prescription, Sources of errors in prescription, Care required in dispensing prescriptions. Brief introduction of commonly used Latin terms in prescription. General Dispensing Procedures including labeling of dispensed products.

Unit II

Principles involved and procedures adopted in dispensing of typical prescriptions- Powders, Solutions, Mixtures, Emulsions, Lotions & Liniments.

Physical, Chemical and Therapeutic incompatibilities, Incompatibility of common occurrence and their correction.

Unit III

Basis of posology, Detection of over doses in prescription, knowledge of prophylactic and therapeutic doses with route of administration.

Unit IV

Community Pharmacy:

Organisation and structure of retail and wholesale drug stores, Legal requirements for establishment and maintenance. Dispensing of proprietary products, Maintenance of records of retail and wholesaler, Patient counseling, Role of Pharmacist in community health care and education, Hazards of medication.

A brief study of propriory products available in the market belonging to Chemotherapeutics, Vitamins, Anti-histaminics, expectorants and NSAID'S category.

Unit V

Hospital Pharmacy:

Organization and structure: Organization of a hospital pharmacy, responsibilities of a hospital pharmacist, pharmacy and therapeutic committee.

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

BOOKS RECOMMENDED:

1. Allwodd M. C. and Fell J. T., Text book of Hospital Pharmacy, Blackwell Scientific

Publication, Oxford.

2. Hassan W. E., Lea and Febiger, Philadelphia Hospital Pharmacy.
3. J.S. Qadry, R.K. Goyal & R.K. Parika, Merchant & Qadry's a text book of Hospital Pharmacy, B.S. Shah Prakashan, Ahmedabad.
4. Pratibha Nand & R.K. Khar, Text Book of Hospital & Clinical Pharmacy, Birla Publications Pvt Ltd., Delhi.
5. S.J. Carter (Ed.), Cooper & Gunn's Dispensing for Pharmaceutical Students, CBS Publishers & Distributors, New Delhi.
6. R.M. Mehta, Dispensing Pharmacy, Vallabh Prakashan, Delhi.
7. S.N. Sharma & N.K. Jain, the Concise Pharmaceutical Dispensing, Prakash B. Printers, Baroda.
8. N.K. Jain & G.D. Gupta, Modern Dispensing Pharmacy, PharmaMed Press, Hyderabad.
9. E.W. Martin, Dispensing of Medications (Formerly Husa's Pharmaceutical Dispensing) Mack Publishing Company, Eastern Pa.

Bachelor of Pharmacy V Semester
Course- PY-503 PHARMACEUTICAL CHEMISTRY -VI (MEDICINAL CHEMISTRY- I)

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

Introduction to medicinal chemistry

Principles of drug discovery: Basic principles of medicinal chemistry,

physicochemical and steric aspects (optical, geometric and bioisosterism) of drug molecules and biological actions.

Unit II

Receptors and drug action: Receptor theories, affinity, receptor and biologic response.

Drug metabolism: Phase I (biotransformation reactions), phase II (conjugation reactions), factor affecting drug metabolism. Prodrugs and drug latentiation: Basic concepts, prodrug of functional groups, bioprecursor prodrugs, chemical delivery system.

Unit III

Classification and mode of action, uses, structure activity relationship including

physicochemical, steric aspects and resents advances in research of the following categories of drugs:

Drugs affecting neurotransmission

Drugs affecting cholinergic neurotransmission: Neurochemistry and stereochemistry of acetylcholine, acetylcholine mimetics-muscarinic agonists, acetylcholinesterase inhibitors, acetylcholine antagonists-muscarinic anatanonists, nicotinc antagonists-neuromuscular blocking agents, ganglionic blocking agents.

Unit IV

Drugs affecting adrenergic neurotransmission: Neurochemistry and stereochemistry of norepinephrine, sympathomimetic agents, sympatholytic agents, drugs affecting catecholamine biosynthesis, drugs affecting catecholamine storage and release, ergot alkaloids, xanthine bronchodilators

Drugs affecting serotonergic neurotransmission: Neurochemistry and stereochemistry of serotonin, 5-HT agonists,

5-HT antagonists. Local anesthetics: Molecular mechanism of action, chemical aspects.

Unit V

Drugs affecting immune systems

Non-steroidal anti-inflammatory agents: Chemistry of chemical mediators of inflammation (prostaglandins, thromboxanes, prostacyclin and leukotrienes), antipyretic analgesics.

Antihistaminics and related antiallergics: Neurochemistry and stereochemistry of histamine, inhibitor of histamine release (mast cell stabilizers), inhibitors of released histamine, dual acting antihistaminics; H₁ antagonists, H₃ antagonists.

BOOKS RECOMMENDED:

1. Foye, W.C., Principles of Medicinal Chemistry, Lea and Febiger, Philadelphia.
2. Wolff, M.E. Ed., Burger's Medicinal Chemistry, John Wiley and Sons, New York.
3. Hansch, C., Comprehensive Medicinal Chemistry, Pergamon Press, Oxford.
4. Delgado, J.N. and Remers, W.A.R, Wilson and Giswold's Text Book of Organic, Medicinal and Pharmaceutical Chemistry, J.Lippincott Co., Philadelphia.
5. Nogrady, T., Medicinal Chemistry-A Biochemical Approach, Oxford University Press, New York, Oxford.
6. Kar, A., Medicinal Chemistry, Willey Eastern Ltd., New Delhi.
7. Patrick, G., An Introduction to Medicinal Chemistry, Scientific Distributors, Mumbai.
8. Malone, Dyson and Purey, May's Chemistry of Synthetic Drugs.
9. Parimoo, P., Text Book of Medicinal Chemistry, CBS Publishers and Distributors, New Delhi.
10. Thomas, G., Introduction to Medicinal Chemistry, CBS Publishers and Distributors, New Delhi.

Bachelor of Pharmacy V Semester Course- PY-504 PHARMACOGNOSY -III

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

General techniques of biosynthetic studies and basic metabolic pathways. Introduction to biosynthesis of secondary metabolites of pharmaceutical importance. A brief introduction of chemical nature of phytoconstituents.

Radio – tracer techniques and utilization in biogenetic studies.

Unit II

Phytochemical Screening: Preparation of extracts and different tests performed for screening of extracts for the presence of alkaloids, saponins, steroidal compounds, flavanoids, anthraquinones, phenolics, amino acids, carbohydrates, fats etc.

Unit III

Concepts of stereoisomerisms Nature, distribution, classification, general methods of isolation and properties of alkaloids and terpenoids.

Unit IV

Chemistry, biogenesis and pharmacological activity of atropine, reserpine, ephedrine, ergometrine, strychnine, quinine, morphine, digitoxin, sennosides, diosgenin, sarsapogenin, menthol, citral, taxol, rutin and artemisine.

Unit V

Systematic pharmacognostical study of alkaloidal drugs like; Tobacco, Belladonna, Hyoscyamus, Datura, Coca, Withania, Cinchona, Ipecac, Opium, Ergot, Rauwolfia, Vinca, Nuxvomica, Physostigma, Pilocarpus, Veretrum, Kurchi, Ephedra, Solanam, Tea, Colchicum, coffeae, aconiteetc.

BOOKS RECOMMENDED

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

Bachelor of Pharmacy V Semester Course- PY-505 PHARMACOLOGY-II

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

Pathophysiology of CNS diseases and pharmacology of drugs used to treat them

Neurohumoral transmission in CNS

- a. Cholinergic pathways
- b. Dopaminergic pathway
- c. Serotonergic pathways
- d. Noradrenergic pathways

General anesthetics

Hypnotics, sedatives, antianxiety agents, and centrally acting muscle relaxants.

Unit II

Psychopharmacological agents

- a. Antipsychotics
- b. Antidepressants
- c. Antimaniacs
- d. Hallucinogens

Unit III

Anti-epileptic drugs

Narcotic analgesics and antagonist

Drugs used in neurodegenerative diseases

a. Parkinson's Disease

b. Alzheimer's Disease

Unit IV

Drug addiction and drug abuse

a. Alcohol

b. Nicotine

c. Cannabis

CNS stimulants

Unit V

Pharmacology of drugs acting on gastrointestinal tract Antacids, antisecretory and antiulcer drugs Emetics and antiemetic

BOOKS RECOMMENDED

1. Herfindal, E.T., Gourley, D.R., (eds.) (2000) Textbook of therapeutics Drug and disease management. 7th ed. Baltimore: Lippincott Williams and Wilkins
2. Hardmen, J.G., Limbird, L.E., Gilman A.,G., (eds.) (2001) Goodman and Gilman's The pharmacological basis of therapeutics. 10th ed. USA: The McGraw Hill Companies
3. Kumar, V., Abbas, A.K., Fausto, N., (eds.) (2004) Robbins and Cotran Pathologic basis of disease. 7th ed. Pennsylvania: Saunders
4. Barar, F.S.K., (2000) Essentials of therapeutics. New Delhi: S. Chand and Company (P) Ltd.
5. Satoskar, R.S., Bhandarkar, S.D., Rege, N.N., (2007) Pharmacology and Pharmacotherapeutics. 12th ed. Mumbai: Popular Prakashan
6. Seth, S.D., (ed.) (2005) Textbook of Pharmacology. 2nd ed. New Delhi. Elsevier
7. Tripathi, K.D. (1999) Essentials of medical pharmacology. 4th ed. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd.
8. Mycek M.J., Haney, R.A., Champe, P.C. (2000) Lippincott's illustrated reviews: Pharmacology. 2nd ed. Baltimore: Lippincott Williams and Wilkins.
9. Rang, H.P., et al. (eds.) (2003) Pharmacology. 5th ed. Philadelphia: Elsevier
10. Katzung, B.G., (2004) Basic and clinical pharmacology. 9th ed. USA: The McGraw Hill Companies.
11. McKim, W.A., (2006) Drugs and Behavior: An Introduction to Behavioral Pharmacology. London: Prentice Hall.

Bachelor of Pharmacy V Semester
Course- PY-506 PHARMACEUTICS- VI (COSMETIC TECHNOLOGY)

Hrs:60
Max.Marks:50
Credit: 02

LIST OF PRACTICALS

1. Prepare, Pack and Evaluate Compact Powder.
2. Prepare and Pack Face Mask.
3. Prepare and Evaluate Talcum Powder.
4. Prepare and Evaluate Vanishing Cream.
5. Prepare and Evaluate Cold Cream.
6. Prepare and Evaluate Cleansing Cream.
7. Prepare and Evaluate Emollient Cream.
8. Prepare and Evaluate Sunscreen preparation.
9. Prepare and Evaluate After shave lotion.
10. Prepare and Evaluate Lather shaving cream.
11. Prepare and Evaluate Simple shampoo (Soap based).
12. Prepare and Evaluate Acid balanced shampoo.
13. Prepare and Evaluate Egg shampoo.
14. Prepare and Evaluate Anti-dandruff Shampoo.
15. Prepare and Evaluate Hair conditioner.
16. Prepare and Evaluate Tooth Powder.
17. Prepare and Evaluate Tooth Paste.
18. Prepare, Pack and Evaluate Lipsticks.
19. Prepare, Pack and Evaluate Nail lacquer.
20. Prepare and submit Herbal preparations. (Atleast 5 different types)

Bachelor of Pharmacy V Semester
Course- PY-507 PHARMACEUTICS- VII (DISPENSING, COMMUNITY AND HOSPITAL PHARMACY)

Hrs:60
Max.Marks:50
Credit: 02

LIST OF PRACTICALS:

1. Prepare and Dispense Simple Powder.
2. Prepare and Dispense Compound Powder.
3. Prepare and Dispense Powder containing small doses.
4. Prepare and Dispense Powder containing liquids.
5. Prepare and Dispense Powder containing liquefiable substances.
6. Prepare and Dispense Powder containing hygroscopic and deliquescent substances.
7. Prepare and Dispense Powder containing efflorescent materials.
8. Prepare and Dispense effervescent granules.
9. Prepare and Dispense Dusting Powder.
10. Prepare and Dispense Simple Mixture containing Soluble substances only.
11. Prepare and Dispense Mixture containing Diffusible solids.

12. Prepare and Dispense Mixture containing Indiffusible solids.
13. Prepare and Dispense Mixture containing Precipitate forming liquids.
14. Prepare and Dispense Mixture containing Slightly soluble liquids.
15. Prepare and Dispense Mixture containing Small doses of potent medicaments.
17. Prepare and Dispense prescription possessing Physical Incompability (Incomplete Solution).
18. Prepare and Dispense prescription possessing Physical Incompability (Precipitation).
19. Prepare and Dispense prescription possessing Physical Incompability (Separation of immiscible liquids).
20. Prepare and Dispense prescription possessing Chemical Incompability (Alkaloidal salts with alkaline substances).
21. Prepare and Dispense prescription possessing Chemical Incompability (Alkaloidal salts with soluble iodides).
22. Prepare and Dispense prescription possessing Chemical Incompability (Alkaloidal salts with salicylates).
23. Prepare and Dispense prescription possessing Chemical Incompability (Alkaloidal salts with benzoates).
23. Prepare and Dispense prescription possessing Chemical Incompability (Soluble salicylates with acids-Tolerated Incompatability).
24. Prepare and Dispense prescription possessing Chemical Incompability (Soluble salicylates with acids-Adjust Incompatability).
25. Prepare and Dispense prescription possessing Chemical Incompability (Soluble benzoates with acids-Tolerated Incompatability).
26. Prepare and Dispense prescription possessing Chemical Incompability (Soluble benzoates with acids-Adjusted Incompatability).
27. Prepare and Dispense prescription possessing Chemical Incompability (Soluble salicylates with ferric salts).
28. Prepare and Dispense prescription possessing Chemical Incompability (Soluble benzoates with ferric salts).
29. Prepare and Dispense prescription possessing Chemical Incompability (Evolution of carbon dioxide).
30. Prepare and Dispense prescription possessing Chemical Incompability of emulsifying agents.
31. Prepare and Dispense Emulsion containing Volatile oils.
32. Prepare and Dispense Emulsion containing Fixed oils.
33. Prepare and Dispense Emulsion containing Oleoresins.
34. Prepare and Dispense Calamine lotion.
35. Prepare and Dispense turpentine liniment.

Hrs:60
Max.Marks:50
Credit: 02

LIST OF PRACTICALS

1. Synthesis and characteriazation of Tropenone from Maleyde aldehyde.
2. Synthesis and characteriazation of Scopolamine from Tropenol.
3. Synthesis and characterization of chlorzoxazone from 2-amino-4-chlorphenol.
4. Synthesis and characterization of Clemastine.
5. Synthesis and characterization of Tripeleppamine.
6. Synthesis and characterization of Oxyphenbutazone.
7. Synthesis and characterization of trihexyl phenylidine.
8. Synthesis and characterization of Aspirin from salicylic acid.
9. Synthesis and characterization of Benzimidazole from benzyl chloride.
10. Synthesis and characterization of Sulphonilamide from Aniline.
11. Synthesis and characterization of Paracetamol from Para amino phenol.
12. Synthesis and characterization of Ibuprofen from isobutyl benzene.
13. Synthesis and characterization of Antipyrine
14. Synthesis and characterization of Phenyl benzoate.
15. Synthesis and characterization of Benzenilide.
16. Synthesis and characterization of Phenindione.
17. Synthesis and characterization of Methyl pyrazolone.

Bachelor of Pharmacy V Semester
Course- PY-509 PHARMACOGNOSY-III

Hrs:60
Max.Marks:50
Credit: 02

LIST OF PRACTICALS:

1. Identify Colchicum, Ipecac and Vinca leaves morphologically.
2. Identify Aconite, Hyoscyamus and Withania leaves morphologically.
3. Perform morphological, microscopic and chemical evaluation of Tobacco.
4. Perform morphological, microscopic and chemical evaluation of Withania.
5. Perform morphological, microscopic and chemical evaluation of Cinchona bark.
6. Perform morphological, microscopic and chemical evaluation of Rauwolfia root.
7. Perform morphological, microscopic and chemical evaluation of Nux vomica seeds.

8. Perform morphological, microscopic and chemical evaluation of Ephedra.
9. Perform morphological, microscopic and chemical evaluation of Kurchi bark.
10. Isolate Nicotine from tobacco.
11. Isolate Caffeine from tea leaves.
12. Isolate Quinine from cinchona.
13. Isolate alkaloids from nux vomica seeds.
14. Isolate starch from potatoes.
15. Perform morphological characterization like type of stomata and calculate the stomatal index, vein islets, vein termination numbers, microscopic and chemical evaluation of Datura leaves.
16. To identify and evaluate the given sample of Colchicum corm by morphological, microscopical and chemical evaluation.
17. To identify the given sample of powdered crude drug by various phytochemical tests. (Cinchona/Rauwolfia/Senna/Ephedra)

Bachelor of Pharmacy V Semester
Course- PY-510 PHARMACOLOGY-II

Hrs:60
Max.Marks:50
Credit: 02

LIST OF PRACTICALS

1. Bioassay for acetylcholine/histamine using isolated organ preparations (rat ileum/rat duodenum/rat colon/rat fundus/guinea pig ileum/guinea pig tracheal chain preparation/goat ileum)
2. Matching bioassay or Bracketing bioassay
3. Interpolation bioassay or graphical bioassay
4. Study the CNS depressants using cornea and pinna reflex test.
5. Study CNS stimulants by evaluation of locomotor activity (Actophotometer)
6. Study Central muscle relaxants using Rota rod apparatus
7. Study lenticular opacity produced by opioid analgesics in rodents.
8. Study anticonvulsant effect of some drugs using maximum electroshock method and chemical-induced convulsion method.
9. Study antianxiety effect of some drugs using elevated plus maze test or social interaction test or novelty suppressed feeding test in rodents.
10. Evaluate hypnotic activity of a drug by employing potentiation of thiopental induced sleeping time paradigm.
11. Study antipsychotic effect of some drugs using catalepsy test or inhibition of amphetamine stereotypy in rodents.
12. Study intravenous anesthetics using righting reflex test.

BACHELOR OF PHARMACY VI SEMESTER
Course- PY-601 PHARMACEUTICAL INDUSTRIAL MANAGEMENT

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

Status of pharmaceutical industries in India.

Project formulation, evaluation and implementation.

Pharmaceutical Factory Planning and layouts, preparation of flow diagrams, technical data sheets.

Unit II

Pharmaceutical Management :

Concepts on Management, Principles of Management, Administrative and Operative Management Entrepreneurship Development.

Material management: Basic principles of Material Management, Purchase, Store and Inventory control.

Unit III

Pharmaceutical Production Management :

Different aspects of Production Management , Performance Evaluation Technique, flow-process, know how process and maintainence.

Accountancy: Principles of accountancy, Journal entries and ledger posting, preparation of trial balance, cash book, bank reconciliation statement, rectification of errors, profits and loss account, balance sheet, purchase, keeping and pricing of stocks, treatment of cheques, bill of exchange, promissory notes and hundies, documentary bills.

Unit IV

Pharmaceutical Economics:

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

Pharmaceutical Marketing: Functions, wholesale, retail, and mail order business ,market research.

Unit V

Pharmaceutical Salesmanship :

Principles of sales promotion, advertising, and ethics of Sales, merchandising, Window display and literature detailing.

BOOKS RECOMMENDED:

1. Shukla, S. M., Advanced Accountancy, Mahershwari Sahitya Bhawan, Agra.
2. Gupta, R. L., Advanced Accountancy, Vol. I and II, Sultanchand & Company, New Delhi.
3. Kotler, P., Marketing Management, Prentice Hall of India Limited.
4. Stanton, W. J., Fundamentals of Marketing Tata McGraw Hill Limited, New Delhi.
5. Buskir K. and Richard H., Principles of Marketing – The Management View, Hold Rinehard and Winston Incorporated, New York.
7. Sherlekar, S. R., Marketing Management, Himalaya Publishing House, New Delhi.
8. Mote,V. L., Paul, S. and Gupta, G. S., Managerial Economics Concepts and Cases,
9. Tata McGraw Hill Limited, New Delhi.

Bachelor of Pharmacy VI Semester
Course- PY-602 PHARMACEUTICAL ANALYSIS-II

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

The theoretical aspects, basic instrumentation, elements of interpretation of spectra and pharmaceutical application of the following analytical techniques –

Chromatography: Paper Chromatography TLC, GLC, HPTLC and HPLC.

Ultraviolet and visible spectrophotometry: Beer-lambert law, electronic transitions, instrumentation, methods, chemical derivatisation, structural analysis, applications.

Unit II

Infra red spectrophotometry & FT-IR: Introduction, Theory, instrumentation, interpretation of spectra, its advantages and applications in structure elucidation.

Fluorimetry.

Unit III

Mass Spectroscopy: Introduction, ionization techniques, mass analyzers, fragmentation rules, instrumentation, the mass spectrum & its applications.

Unit IV

NMR Spectroscopy: Introduction, continuous-wave (CW) NMR spectrometry, pulsed fourier transform spectrometry, chemical shift, spin coupling, spin decoupling & its applications.

Unit V

Atomic Absorption.

X- Ray Diffraction.

Flame Photometry.

Immunoassay techniques: Enzymes & radioimmunoassay techniques, theory, methods & its applications.

BOOKS RECOMMENDED:

1. Svehla, G. Vogel's Text Book of Micro and Semi Micro Qualitative Inorganic Analysis, Orient Longman, Hyderabad.
2. Beckett, A.H. and Stenlake, J.B., Practical Pharmaceutical Chemistry, The Athlone Press of the University of London.
3. Chatten, L.G., Text Book of Pharmaceutical Chemistry, Marcel Dekker, New York.
4. Connors, K.A., A Text Book of Pharmaceutical Analysis, Wiley Interscience, New York.
5. Higuchi, J. and Hansen E.B., Pharmaceutical Analysis, Interscience Publisher John Willey and Sons, New York, Sydney.
6. Silverstein, R.M., Bassier, G.C., and Morrill, T.C., Spectrophotometric Identification of Organic Compounds, John Wiley and Sons Inc.
7. Willard, Merritt and Settle, Instrumental Methods of Chemical Analysis, CBS Publisher and Distributors, New Delhi.
8. Ewing, G.W., Instrumental Methods of Chemical Analysis,.

Bachelor of Pharmacy VI Semester
Course- PY-603 PHARMACEUTICAL CHEMISTRY – VII (MEDICINAL CHEMISTRY-II)

Hrs: 60

Max. Marks: 100

Credit: 04

Unit I

Classification and mode of action, uses, structure activity relationship including physicochemical, steric aspects and recent advances in research of the following categories of drugs:

Drug Acting on CNS

General Anesthetics: Stages of Anesthesia , Pharmacokinetic Principles, Theories of the mechanisms.

Hypnotics and Sedatives : Testing and developments of new Hypnotics.

Antiscizure agents: Drugs effective against partial and generalized tonic- clonic scizure.

Opiod Analgesics : Endogenous opioid peptides and their physiologic functions, Neurobiology of drug abuse and addiction.

Antiparkinsonian and Spasmolytic agents : Pharmacotherapy of Parkinsons disease.

Hallucinogens, Stimulants, and related drugs of Abuse.

Psychopharmacological Agents: Antipsychotic agents, Antidepressants, Anxiolytics.

Unit II

Drug Acting on GIT :

Laxative

Antidiarrhoeal

Anti spasmodic

Antiulcers Drugs.

(C) Drug Acting on Hormonal System:

? Insulin and oral Hypoglycemic agents: Etiology of Diabetes, Biochemistry and Pathogenesis of Diabetes, Production of Insulin.

? Adrenocorticoids: Mechanism of steroid Hormone action, Development of Adrenocorticoid drugs.

? Sex Hormones: Male sex Hormones, Female sex Hormones.

? Thyroid and Antithyroid agents : Biochemistry and Physiology of Thyroid Hormones, Biosynthesis of Thyroid Hormones.

(D) Vitamins

(II) Principles of Drug Design (Theoretical Aspects). Scientific Aspects of Drug Discovery, Preclinical Development, Mechanism based Approaches (Computer Aided Drug Design and Molecular Modeling)

BOOKS RECOMMENDED:

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

2. Wolff, M.E. Ed., Burger's Medicinal Chemistry, John Wiley and Sons, New York.
3. Hansch, C., Comprehensive Medicinal Chemistry, Pergamon Press, Oxford.
4. Delgado, J.N. and Remers, W.A.R, Wilson and Giswold's Text Book of Organic, Medicinal and Pharmaceutical Chemistry, J.Lippincott Co., Philadelphia.
5. Nogrady, T., Medicinal Chemistry-A Biochemical Approach, Oxford University Press, New York, Oxford.
6. Kar, A., Medicinal Chemistry, Willey Eastern Ltd., New Delhi.
7. Patrick, G., An Introduction to Medicinal Chemistry, Scientific Distributors, Mumbai.
8. Malone, Dyson and Purey, May's Chemistry of Synthetic Drugs.
9. Parimoo, P., Text Book of Medicinal Chemistry, CBS Publishers and Distributors, New Delhi.
10. Thomas, G., Introduction to Medicinal Chemistry, CBS Publishers and Distributors, New Delhi.

Course- PY-604 PHARMACOGNOSY – IV

Hrs: 60
Max.Marks:100
Credit :04

General introduction classification and brief description of different chromatographic techniques with detailed emphasis on application of paper chromatography, column chromatography, TLC, HPLC and HPTLC in the evaluation of herbal drugs.

Historical development of plant tissue culture technique, types of culture, nutritional requirements, surface sterilization of explants, growth and maintenance. Application of PTC in development of phytoconstituents.

An introduction of marine pharmacognosy and novel agents from marine sources like cardiovascular active substances, cytotoxic, antimicrobial, antibiotic, anti-inflammatory, antispasmodic agents, marine toxin etc.

Herbs as health food, cosmeceuticals.

An introduction to cultivation and utilization of aromatic plants with special reference to sandalwood oil, menthe oil, eucalyptus oil, lemon grass oil, clove oil.

Production and analysis of phytoconstituents of pharmaceutical importance like quinine, strychnine, atropine, morphine podophyllotoxin, papain, vincristine, ephedrine and Tannic acid, Spectral analysis of herbal drugs with emphasis on application of UV, IR, NMR, mass.

Natural dyes, Immunomodulators and Adaptogens.

LIST OF PRACTICAL:

Hrs: 60
Max.Marks:50
Credit :02

1. To perform paper chromatography of sugars
2. To perform TLC of alkaloids
3. To perform TLC of extract of rauwolfi, datura
4. To perform TLC of volatile oils i.e. eucalyptus oil, menthe oil

6. To identify the presence of eugenol in clove oil by TLC
7. To determine volatile oil content of eucalyptus leaf
8. To determine volatile oil content of fennel fruits
9. To isolate ammonium glycyrrhizinate from glycyrrhiza
10. To extract aloin from aloe
11. To extract tannic acid from myrobalan
12. To perform column chromatography a natural dye.

BOOKS RECOMMENDED:

1. Trease, G.E. and Evans, W.C., Pharmacognosy, Bailliere, Tindall, Eastbourne, U.K.
2. Tayler, V.E., Brady, L.R. and Roberts, J.E., Pharmacognosy Lea and Febiger, Philadelphia
3. Kokate, C.K., Purohit, A.P. and Gokhale, S.B., Pharmacognosy Nirali Prakashan, Pune
4. C.R Atal and B.M. Kapoor, Cultivation & Utilization of Aromatic Plants, Council of Scientific Industrial Research (CSIR) New Delhi.

Pharmacology-III (PY 605)

Hrs: 60
Max.Marks:100
Credit :04

Pathophysiology of diseases of cardiovascular system and pharmacology of drugs used for their treatment

- a. Cardiac Glycosides
- b. Antiarrhythmic drugs
- c. Antianginal drugs
- d. Antihypertensive drugs

Pharmacology of drugs acting on hematopoietic system

- a. Hematinics
- b. Drugs affecting coagulation, bleeding and thrombosis
- c. Plasma expanders
- d. Hypolipidaemic drugs

Pharmacology of drugs acting on urinary system

Pathophysiology of diseases of endocrine system and pharmacology of drugs used for their treatment

- a. Hypothalamic and pituitary hormones
- b. Thyroid hormones and antithyroid drugs
- c. Insulin, oral hypoglycemic agents and glucagons
- d. Corticosteroids
- e. Androgens and drugs for erectile dysfunction
- f. Estrogens, progestins and contraceptives
- g. Oxytocin and drugs acting on uterus
- h. Drugs affecting calcium balance

List of Practicals

Hrs: 60
Max.Marks:50
Credit :02

1. Determine the strength of given sample (acetyl choline/ histamine) by three point bioassay method using isolated organ preparation (rat ileum/ rat duodenum/ rat colon/ rat fundus/ guinea pig ileum).
2. Determine the strength of given sample (acetyl choline/ histamine) by four point bioassay method using isolated organ preparation (rat ileum/ rat duodenum/ rat colon/ rat fundus/ guinea pig ileum).
3. Record the concentration response curve of oxytocin using rat uterus preparation.
4. Determine the sympatholytic activity of given drug sample using isolated guinea pig ileum preparation.
5. Compare the diuretic/saluretic activity of different drugs in rats.
6. Determine the effect of anticoagulants by subaqueous tail bleeding time method in rodents.
7. Study the effect of oral hypoglycemic agents in diabetic rodents.
8. Study the effect of thyroid hormones on the tensile strength of connective tissues in rats.
9. Study the effect of growth hormone on the weight gain in female rats.

BOOKS RECOMMENDED

1. Herfindal, E.T., Gourley, D.R., (eds.) (2000) Textbook of therapeutics Drug and disease management. 7th ed. Baltimore: Lippincott Williams and Wilkins
2. Hardmen, J.G., Limbird, L.E., Gilman A.,G., (eds.) (2001) Goodman and Gilman's The pharmacological basis of therapeutics. 10 th ed. USA: The McGraw Hill Companies
3. Kumar, V., Abbas, A.K., Fausto, N., (eds.) (2004) Robbins and Cotran Pathologic basis of disease. 7th ed. Pennsylvania: Saunders
4. Barar, F.S.K., (2000) Essentials of therapeutics. New Delhi: S. Chand and Company (P) Ltd.
5. Satoskar, R.S., Bhandarkar, S.D., Rege, N.N., (2007) Pharmacology and Pharmacotherapeutics. 12th ed. Mumbai: Popular Prakashan
6. Seth, S.D., (ed.) (2005) Textbook of Pharmacology. 2nd ed. New Delhi. Elsevier
7. Tripathi, K.D. (1999) Essentials of medical pharmacology. 4th ed. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd.
8. Rang, H.P., et al. (eds.) (2003) Pharmacology. 5th ed. Philadelphia: Elsevier
9. Katzung, B.G., (2004) Basic and clinical pharmacology. 9th ed. USA: The McGraw Hill Companies.
10. Pillai, K.K., (2009) Experimental Pharmacology. New Delhi, CBS Publishers and Distributers.
11. Kulkarni, S.K., (2005) Handbook of Experimental Pharmacology. New Delhi, Vallabh Prakashan.
12. Vogel, H.G., (ed.) (2002) Drug Discovery and Evaluation. Pharmacological Assays. 2nd Ed. Heidelberg, Germany, Springer-Verlag.

**B.PHARMACY -VII SEMESTER
PY-701 PHARMACEUTICS VIII
(PHARMACEUTICAL TECHNOLOGY I)**

**Hrs: 60
Max.Marks:100
Credit :04**

Formulation considerations, technology involved, equipment (machine) employed, problems to be encountered, packaging evaluation and CMP (India, WHO & USFDA) requirements of the following dosage forms.

1. Solid Dosage Forms- Tablets, Tablet coatings and Capsules.
2. Liquid Dosage Forms- Liquid Orals, Dry Syrups.
3. Semisolid Dosage Forms- ointments, Creams, Suppositories, Gels.
4. Sterile Dosage Forms- Parenteral (Small Volume Parenterals & Large Volume Parenterals) and ophthalmic Preparations.
5. Pharmaceutical Aerosols

Blood Products and Plasma Substitutes:

Collection, processing and storage of whole human blood, concentrated human RBC, dried human plasma, human normal immunoglobulin, plasma substitutes, ideal requirements, PVP, Dextran, etc. for control of blood pressure,

Surgical products:

Definition, surgical cotton, surgical gauzes, bandages, adhesive tapes, absorbable and non absorbable sutures, ligatures and catguts, Medical prosthetics and organ replacement materials.

Books Recommended

1. Rawlins, E.A., Text Book Of Pharmaceutics, Bailliere Tindall.
2. Lachman, L. , Liberman, H.A. and Kanig, J.L., The Theory and Practice of Industrial Pharmacy, Lea and Febiger, Philadelphia.
3. Liberman, H.A., Lachman, L. and Ker Inc. New York.
4. Pharmacopoeia Of India, Ministry of Health and family Welfare, Govt. of India, New Delhi.
5. Avis, K.E., Lachman, L. and Liberman, H.A., Pharmaceutical Dosage Forms-Parenteral Medication Vol.1-2, Marcel Decker Inc., New York.
6. Banker G.S. and Rhode C.T., Modern Pharmaceutics, Marcell Decker Inc., New York.
7. Bean, H.S., Beckett, A.H. and Carless, A.H., Advances in Pharmaceutical Sciences, Vol.1-4, Academic Press, London.

List of Practicals

Hrs: 60
Max.Marks:50
Credit :02

1. Prepare and evaluate Paracetamol Compressed Tablets.
2. Prepare and evaluate Effervescent Tablets of Aspirin.
3. Prepare and evaluate Dispersible tablets of Diclofenac Sodium.
4. Perform the Sugar Coating on the given sample of Tablets.
5. Perform the Film Coating on the given sample of Tablets.
6. Perform the Enteric Coating coating on the given sample of Tablets.
7. Prepare and evaluate Tetracycline HCL Capsules.
8. Prepare and evaluate Antacid Suspension.
9. Prepare and evaluate B-Complex Syrup.
10. Prepare and evaluate Amoxicillin Dry Syrup.
11. Prepare and evaluate Castor Oil Emulsion.
12. Prepare and evaluate Diclofenac Sodium Suppositories.
13. Prepare and evaluate Vaporizing Ointment.
14. Prepare and evaluate Non-Staining Iodine Ointment containing Methyl Salicylate.
15. Prepare and evaluate Antiseptic Cream.
16. Prepare and evaluate Diclofenac Gel.
17. Prepare and evaluate Ciprofloxacin Eye Drop.
18. Prepare and evaluate Water for Injection.
19. Prepare and evaluate Oxytetracycline Injection.
20. Perform the Stability Studies of given sample of Paracetamol Tablets.
21. Prepare and evaluate an aqueous injection of a poorly water – soluble drug using hydroalcoholic solubilization technique.

PY702 : Pharmaceutics-X
(Biopharmaceutics and Pharmacokinetics)

Hrs: 60
Max.Marks:100
Credit :04

Introduction to biopharmaceutics and pharmacokinetics development and their role in drug formulation.

Biopharmaceutics

Definition , passage of drugs across biological barrier , Physiochemical , Biological and Pharmaceutical factors influencing biopharmaceutical performance of drugs.

1. Gastrointestinal absorption of drugs: Passage of drugs across biological membranes, nature of biological membranes, gastrointestinal absorption mechanisms.
2. Factors affecting drug absorption : Physiological factors, dietary factors, physiochemical factors, pH partition hypothesis, dosage form factors.
3. Methods of studying gastrointestinal absorption: In vitro and in vivo methods.
4. Drug disposition: Distribution in blood, cellular distribution, plasma protein binding, tissue protein binding.
Drug Excretion: Routes of drug excretion, renal excretion of drugs, factors affecting renal excretion, biliary and salivary excretion of drugs.
Drug biotransformation: Pathways of drug metabolism, drug metabolizing enzymes, factors affecting drug metabolism and drug response, inhibition and stimulation of drug metabolism.

Pharmacokinetics

Absorption, distribution metabolism and excretion of drugs, fluid compartment and circulatory system, protein binding, significance of plasma drug concentration measurement.

Compartment Models

Model selection criteria, algebraic information criterion, one – compartment and two compartment models, Wagner- Nelson and Loo Riegelman methods for estimation of absorption constants. Curve fittings, regression procedure and area under blood level curves.

Clinical Pharmacokinetics

Urinary excretions, computation of pharmacokinetic parameters from urine data, hepatic clearance, biliary excretion, excretion ratio, dosage regimen adjustment in patients with and without renal failure, pharmacokinetic drug interaction and their significance in combination therapy.

Bioavailability and Bioequivalence

Bioavailability and Bio-equivalence, Federal requirements, Methods of determination of bioavailability using blood level and urinary excretion data, design and evaluations, bioavailability assessment.

Books recommended

1. Gibaldi, M. and Perrier, D., Pharmacokinetics, 4th edn. Pharma mid press, Hyderabad
2. Notari, R.E., Biopharmaceutics and pharmacokinetics-An Introduction, Marcel Decker New York.
3. Jaiswal, Brahmankar Biopharmaceutical quality and pharmacokinetics.
4. Leepeter I.D., Pharmacokinetic analysis
5. Niazi Textbook of Biopharmacokinetics and clinical pharmacokinetics.
6. Venkaateshwaru V., Biopharmaceutics and pharmacokinetics, Phared Puss, Hyderabad.
7. Wagner-pharmacokinetics for the pharmastudies.
8. Dhachinamoorthi D: Biopharmaceutics and pharmacokinetics : A practical manual
9. Shargel : pharmacokinetics & Biopharmacokinetics & Biopharmaceutics

LIST OF PRACTICALS

Hrs: 60
Max.Marks:50
Credit :02

1. Determine the percentage protein binding of the given drug.
2. Determine oral bioavailability of the given drug/formulation by urinary excretion method using animal model.
3. Perform bioequivalence study of two different brands of the marketed tablets of the given drug using animal model.
4. Determine the rate of in-vitro absorption of the given drug using everted intestinal sack.

5. Determine the effect of different pH condition on solubility of a weakly acidic or basic drug and study PH partition hypothesis.
6. Establish IVIVC for the given sample of drug.
7. Calculate elimination rate constant and elimination half life of given excretion data by sigma minus method.
8. Calculate elimination rate constant and elimination half life of the given drug data administered by i.v. bolus injection represented by one compartment model.
9. Calculate various pharmacokinetic parameters from the given data generated after single extra vascular administration of drug represented by one compartment model.
10. Calculate various pharmacokinetic parameters from the given data obtained by using two compartment open model.

**PY - 703 : PHARMACEUTICAL CHEMISTRY VIII
(MEDICINAL CHEMISTRY-III)**

**Hrs: 60
Max.Marks:100
Credit :04**

The synthesis of the selected drugs, mode of action, classification, uses, SAR of the following category of drugs:

Drugs acting on Cardiovascular system :

- Cardiac Glycosides
- Antiarrhythmic drugs
- Antianginal drugs
- Antihypertensive drugs
- Antihyperlipidemic drugs

Drugs acting on Urinary system :

- Diuretics
- **Chemotherapeutic Agents**
- Anti metabolites(Including Sulpha drugs)
- Anti viral & Anti HIV,
- Anti neoplastic,
- Anti malarials,
- AntiProtozoal
- Anti tubercular,
- Anthelmintics,
- Antifungals
- B-lactum antibiotics
- Aminoglycosides
- Protein synthesis inhibitors (Tetracyclins, chloramphenicol, Macrolides)
- Miscellaneous antibiotics (Bacitracin, Glycopeptides, Polymyxins)
- Immuno- suppressive

Drugs affecting uterine motility

Oxytocins (including prostaglandins and Ergot alkaloids).

Books Recommended:

1. Foye, W.C., Principles of Medicinal Chemistry, Lea and Febiger, Philadelphia.
2. Wolff, M.E. Ed., Burger's Medicinal Chemistry, John Wiley and Sons, New York.
3. Hansch, C., Comprehensive Medicinal Chemistry, Pergamon Press, Oxford
4. Delgado, J.N. and Remers, W.A.R, Wilson and Giswold's Text Book of Organic, Medicinal and Pharmaceutical Chemistry, J.Lippincott Co., Philadelphia.
5. Nogrady, T., Medicinal Chemistry-A Biochemical Approach, Oxford University Press, New York, Oxford.
6. Kar, A., Medicinal Chemistry, Willey Eastern Ltd., New Delhi.
7. Patrick, G., An Introduction to Medicinal Chemistry, Scientific Distributors, Mumbai.
8. Malone, Dyson and Purey, May's Chemistry of Synthetic Drugs.
9. Parimoo, P., Text Book of Medicinal Chemistry, CBS Publishers and Distributors, New Delhi.
10. Thomas, G., Introduction to medicinal Chemistry, CBS Publishers and Distributors, New Delhi.
11. Sten lake B.J. medicinal and pharm. Chemistry pharma mid press, Hyderabad

Historical Development :

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.

Enzyme Immobilization –

Techniques of Immobilization of enzymes, Kinetics and factors affecting enzymes kinetics, Enzymes based sensors, Study of enzymes such as Hyaluronidase, Penicillinase, Strepto- Kinase, Amylases etc. Immobilization of bacteria and plant cells, Applications of Immobilization.

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.

Microbiological Transformation –

Introduction, Types of reactions mediated by micro organisms. Design of biotransformation processes, Selection of organism, Biotransformation processes and its improvements with special reference to steroids.

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.

LIST OF PRACTICALS

Hrs: 60
Max.Marks:50
Credit :02

1. Detect the presence of the amylase enzyme in saliva.
2. Isolate the DNA from cauliflower.
3. Perform VDRL test for the given sample of blood.
4. Isolate the phospholipid from egg yolk .
5. Perform WIDAL test for the given sample of blood.
6. Perform DOT ELISA test of the given sample of blood.
7. Isolate the total RNA from yeast tablet.
8. Immobilize the given enzyme by adsorption method using calcium alginate beads.
9. Perform titre value of antibody in given blood sample.

Chemotherapy of Microbial Diseases

General principles
Synthetic organic antimicrobials (Sulphonamides, quinolones etc.)
B-lactum antibiotics
Aminoglycosides
Protein synthesis inhibitors (Tetracyclins, chloramphenicol, Macrolides)
Antitubercular drugs, antileprotic drugs, antiprotozoals, anthelmintics, antifungals
Antiretroviral and antiviral drugs
Miscellaneous antibiotics (Bacitracin, Glycopeptides, Polymyxins)

Chemotherapy of cancer and immunosuppressive agents

Basic concepts of Pharmacotherapy

Individualization of drug therapy : Clinical pharmacokinetic and pharmacodynamics Drug use during pregnancy, Pediatrics and Geriatrics
Adverse drug reactions and drug induced diseases
Drug interactions
Therapeutic drug monitoring

Clinical Toxicology

Definition of poison
General principles of treatment of poisoning
Treatment of opioid, barbiturate, organophosphorous, and atropine poisoning Heavy metals and heavy metal antagonists

BOOKS RECOMMENDED

1. Herfindal, E.T., Gourley, D.R., (eds.) (2000) Textbook of therapeutics Drug and disease management. 7th ed. Baltimore : Lippincott Williams and Wilkins
2. Hardmen, J.G. Limbird, L.E. Gilman A., G., (eds.) (2001) Goodman and Gilman's The pharmacological basis of therapeutics. 10th ed. USA : The McGraw Hill Companies
3. Barar, F.S.K., (2000) Essential of therapeutics. New Delhi: S. Chand and Company (P) Ltd.
4. Satoskar, R.S. Bhandarkar, S.D., Rege, N.N., (2007) Pharmacology and Pharmacotherapeutics. 12th ed. Mumbai: Popular Prakashan
5. Seth, S.D., (ed.) (2005) Textbook of Pharmacology. 2nd ed. New Delhi. Elsevier.
6. Tripathi, K.D. (1999) Essentials of Medical pharmacology. 4th ed. New Delhi : Jaypee Brothers Medical Publishers (P) Ltd.
7. Rang, H.P., et. (eds.) (2003) Pharmacology. 5th ed. Philadelphia Elsevier.
8. Katzung , B.G., (2004) Basic and clinical pharmacology. 9th ed. USA : The Mcgraw Hill Companies.
9. Dipiro, J.T., et al. (eds.) (1997) Pharmacotherapy. A pathophysiologic approach. 3rd ed. Stanford, Connecticut: Appleton and Longe.
- 10) Craig, C.R., Stitzel, R.E. (1999) Modern pharmacology with clinical applications. 5th ed. USA.
11. Guidelines for poison control. (1999) WHO, Geneva: AITBS Publisher, Delhi
12. Curry – Drug disposition and pharmacokinetics with a consideration of pharmacokinetics with a consideration of pharmacological and elinical relationships, 3rd edn., pharummed pre

Kenakin Terry P: A pharmacological Primer – theory applications & methods, pharma med pre

BACHELOR OF PHARMACY I SEMESTER
Course- PY801 Pharmaceutics-X (Pharm. Technology-II)

Hrs: 60
Max.Marks:100
Credit: 04

Unit-I

Granulation technology: production of granules on large scale by various techniques, evaluation of granules. Compression and consolidation of powdered solids. Heckel plots. Force displacement (F-D) Curves.

Unit-II

Microencapsulation techniques: Coating of particles. Fluidized bed and air suspension coating. Phase separation co-precipitation, multiorifice centrifugal, spray drying, spray congealing, polymerization complex emulsion techniques. Top bottom and tangential spray coating machines. Evaluation of microcapsules.

Unit-III

Sustained and controlled drug delivery systems: concept of sustained release, designing of sustained release products, zero order and first order approximation concept. Matrix and reservoir based techniques. Product evaluation and testing.

Novel drug delivery systems: Transdermal drug delivery systems. Osmotic drug delivery systems. Liposomes and implants.

Unit-IV

Packaging of Pharmaceutical Products: Objective of packaging, packaging components, types, functions, containers and closures, foil and blister packaging. Packaging equipment, legal and official requirements for containers and closures. Package testing.

Unit-V

Pilot plant scale-up techniques: General considerations, personnel requirements, space requirements, review of formula and raw materials. Processing equipments. Process evaluation. GMP considerations.

Books & References Recommended:

1. Leon Lachman, Herbert A. Liebermann and Joseph L. Kanig., The Theory and Practice of Industrial Pharmacy.
2. Banker G.S. and Rhodes C.D., Modern Pharmaceutics.
3. Remington's Pharmaceutical Sciences.
4. Aulton M. E., The Science of Dosage Form Design.

Bachelor of Pharmacy I Semester
Course- PY802 PHARMACEUTICS-XI (Pharmaceutical Jurisprudence)

Hrs: 60
Max.Marks:100
Credit: 04

Review of Indian regulatory legislations for drug and pharmaceutical industries, and pharmaceutical education.

An elaborated study of the following:

- a. Pharmacy Act 1948
- b. Drugs and Cosmetics Acts 1940 and Rules 1945
- c. Medicinal and Toilet Preparations (Excise Duties) Act 1955
- d. Narcotic Drugs and Psychotropic Substances Act 1985 and Rules
- e. Patent Act 1970
- f. Essential Commodities and Drug Price Control Order
- g. Drugs and Magic Remedies Act (Objectionable Advertisement Act 1954)

A brief study of the following:

- a. Medical Termination of Pregnancy Act 1970 and Rules 1975
- b. AICTE Act 1987
- c. Prevention of Cruelty to Animal Act 1960
- d. Poison Act and rules
- e. MRTP Act
- f. Minimum Wages Act 1948
- g. State Shops and Establishment Act and Rules
- h. Factories Act 1948
- i. Insecticides Act 1968.

Brief Study of various prescription and non-prescription products, medical and surgical accessories, diagnostic aids and appliances marketed in India.

Books Recommended:

1. Jain N. K., A Textbook of Forensic Pharmacy.
2. Mittal, B.M., A Textbook of Forensic Pharmacy.
3. Malik V., Drug & Cosmetic Act.
4. The Gazette of India. The Drugs and Cosmetics act and rules.
5. The Gazette of India. The Patent act 1970 and its latest amendments.

Bachelor of Pharmacy I Semester
Course- PY803 PHARMACEUTICAL ANALYSIS-III

Hrs: 60
Max.Marks:100
Credit: 04

Analytical method development: Development of new analytical methods for bulk drugs and dosage forms using titrimetry, UV/visible spectrophotometry and HPLC. Development of analytical methods for combination drug products, derivative spectrophotometric methods. Development of stability indicating assay procedures. Drug analysis in biological fluids like blood plasma and urine.

Validation of analytical methods: Parameters of validation, pharmacopoeial requirements of analytical method validation.

Validation of analytical instruments: UV/visible spectrophotometer and HPLC as per Indian Pharmacopoeia.

ICH guidelines for impurities in drug substances and drug products, Residual solvents.

Water analysis: Validation and qualification of water purification systems. Total organic carbon, pH, and conductivity test. Moisture content analysis in drug and dosage forms.

Quality control testing: Dosage form evaluation as per monograph with special reference to Indian Pharmacopoeia. Drug identification test, drug content and assay, content uniformity. Sampling considerations.

Good laboratory practices.

Books and References recommended:

1. Indian Pharmacopoeia, 2007.
2. Current ICH guidelines.
3. Vogel's, Quantitative Inorganic Analysis.
4. Beckett, Pharmaceutical Analysis.

Bachelor of Pharmacy I Semester
Course- PY803A PACKAGING TECHNOLOGY

Hrs: 60
Max.Marks:100
Credit: 04

Packaging material science: Basic materials used in packaging, their properties, method of manufacturing and applications-Paper, Plastics, Glass, Metal, and Elastomers.

Containers and closures: Introduction and applications of Glass containers, Plastic containers,

Collapsible tubes, Plastic tubes, Aerosol containers, Closures, Liners, and Rubber stoppers. Introduction and applications of Form-Fill-Seal (FFS) technology.

Tamper resistant and child resistant packages: Introduction, method of preparation, and applications of Blister and Strip packs, Film Wrappers, Bubble packs, Shrink seals, Sachet and Pouches, Tape seals, Breakable caps, Sealed tubes, Aerosol containers, etc.

Quality control and quality assurance of packaging materials: Detection of defects in packaging materials, Quality testing of formed packs, Quality testing of containers and closures, Testing of child resistance and temper evidence property of packaging materials. Quality control tests for containers and closures as per Indian Pharmacopoeia.

Legal and regulatory requirements: Requirements of labels and labeling as per Drug & Cosmetics act and rules. Product / patient information literatures. Regulatory aspects of storage, handling and distribution of packaging materials with special emphasis on cGMP and cGLP

requirements.

Suggested Books:

1. Dean, D.A.; Evans, E.R.; and Hall I.H., *Pharmaceutical Packaging Technology*.
2. Leon Lachman, Herbert A. Lieberman, Joseph L. Kanig, *The Theory and Practice of Industrial Pharmacy*.
3. *Drug and cosmetic Act and Rules*.

PY804C : FOOD AND NUTRACEUTICAL TECHNOLOGY

Hrs: 60
Max.Marks:100
Credit :04

Functional foods and nutraceuticals:

- (a) Sources and role of Tocotrienols, polyunsaturated fatty acids, sphingolipids, lecithin, choline, terpenoids. Vegetables, Cereals, milk and dairy products as Functional foods.
- (b) Nutritive and Non-nutritive food components with potential health effects. Effect of processing on Nutrients. Soy proteins and soy isoflavones in human health; Functional foods from wheat and rice and their health effects. Role of Dietary fibers and nuts in disease prevention. General ideas about role of Probiotics and Prebiotics as nutraceuticals.
- (c) Properties, structure and functions of various Nutraceuticals: Glucosamine, Octacosanol, Lycopene, Carnitine, Melatonin and Ornithine alpha ketoglutarate. Use of proanthocyanidins, grape products, flaxseed oil as Nutraceuticals.

Food processing and preservation:

- (a) General principles and techniques of food processing and food preservation, shelf life of food and nutraceutical products. Food stability: methods to enhance stability- freezing, lyophilization, and air drying techniques.
- (b) Contamination and microbial spoilage of food products: Milk and milk products, eggs and poultry, fish, breads and cereals, meat, canned foods, vegetables and fruits. Food borne infections and intoxications.
- (c) Methods of food preservation, approved preservatives, Radiation and food preservation: Role of radiation in food preservation. Principles underlying destruction of micro- organisms by irradiation. Effect of irradiation on food constituents. Legal status of food irradiation.

Regulatory affairs:

- (a) Regulatory aspects of food and nutraceutical products. The prevention of Food Adulteration Act 1954, The Food Safety & Standards Act, 2006.
- (b) Regulatory certifications: FPO regulations, Manufacturing guidelines, Manufacturing and marketing licenses, AGMARK, Green Label certification, Organic food certifications.

Books recommended:

1. Essentials of Food and Nutrition by Swaminathan M., Ganesh and Co, 1985
2. Handbook of Nutraceuticals and Functional Foods Edited by Robert E.C. Wildman, Routledge Publishers.
3. Nutraceuticals by L. Rapport and B. Lockwood, Pharmaceutical Press.
4. Dietary Supplements of Plant Origin, M. Maffei (Ed.), Taylor & Francis, 2003.
5. Food packaging principals and practice, Gordon L. Robertson, Marcel and Dekker Inc. New York. 1993.

PY805A : PERFUMES AND COLOURS

Hrs: 60
Max.Marks:100
Credit :04

Perfumes:

Historical background & present scenario of perfumery industry.

Definition of odour, its classification. Definition of perfumes, attars, cologne, deodorants, aromatic waters. Chemical classification of perfumes obtained from plant and animal sources. Essential oils: Introduction, study of various physical and chemical properties of essential oils. Study of various isolation methods of essential oils.

Formulation of perfumes, formulation excipients, manufacturing methods of perfumes, deodorants, colognes, and aromatic waters.

Regulatory considerations: Analysis & standardization of perfumes. Toxicological aspects of use of perfumes, safety study of perfumes on naked skin including various dermatological tests.

Application of perfumes in various cosmetic products like skin cosmetics, hair cosmetics, men's toiletries etc.
Colours:

Definition of colour, lake, dye, pigment. Theory of color formation at molecules level including Hund's Rule of multiplicity volume band approach & molecular orbital approach to colour.

Detailed classification of colour obtained from natural sources like plant & animal sources, colours obtained from mineral sources, synthesis colours, dyes & pigments. FDA classification of colours. Various physiochemical properties of dyes & colours.

Manufacturing of colors: manufacturing methods of colours, dyes, lakes, and pigments. Regulatory aspects of use of colours in drug and cosmetics as per schedule Q of Drug and Cosmetic Act. Analysis of colours using instrumental methods & chromatographic methods. Applications of colours in various cosmetics like skin, nail, and hair cosmetics, etc.

Suggested Books:

1. Sagarine, Cosmetic Science and Technology, Vol. 1-4.
2. Harry's Cosmetology.
3. The Chemistry and Manufacture & Cosmetics, Vol. IV - Mainson G. De. Nawarre.
4. Colour and Cosmetic colour material - New Cosmetic Science - Mitsui.
5. The Cosmetic Industry - edited by Norman Scientific & Regulatory foundation - F. Estrin.

PY805B : CLINICAL RESEARCH

Hrs: 60
Max.Marks:100
Credit :04

Introduction: Clinical pharmacy, duties and activities of a clinical pharmacist in hospital, monitoring of pharmacotherapy (patient chart review, medication counseling, clinical out put review), ward round participation, patient relevant history (diseases and medication), prescriptions, drug prescribing guidelines, therapeutic drug monitoring.

Patient data analysis: Introduction to common medical terminologies and abbreviation used in clinical pharmacy. Patient case history & case history formats, use of case history in evaluation of drug therapy. Clinical laboratory tests: Interpretation of laboratory tests used in evaluation of disease state: Tests for hormones, body organ function, blood, urine, microbial culture, etc.

Drug and poison information: Introduction to information resources and institutes, systemic approach in answering drug information queries, preparation of reports. Detection and assessment of adverse drug reactions and their documentation.

Clinical pharmacokinetic: Individualization of drug therapy, introduction to clinical pharmacokinetics models, determination of drug clearance and volume of distribution, renal and non-renal clearance, hepatic clearance.

Clinical trial: Designs of clinical trials, Good clinical practices (ICH & GCP guideline for safety and efficacy), Institutional Ethical Committee and its function.

Various phases of clinical trials, introduction to monitoring and auditing of clinical trials. Basic concepts of biostatistics. Clinical research organization (CRO): Organizational structure, present status and future prospects of clinical research organizations in India.

Books Recommended

- 1 Hefindal, E. T., Clinical Pharmacy & Therapeutics-. Williams & Wilkins.
- 2 Katzung, B., Basic and Clinical Pharmacology, Lange Medical Publication, California
- 3 Laurence D.R. and Bennet, P.N., Clinical Pharmacology, Churchill Livingstone
- 4 Walker, R. & Edwards, C., Clinical Pharmacy & Therapeutics, Churchill Livingstone
- 5 DiPiro, J.T. et.al., Pharmacotherapy a pathophysiological approach, McGraw-Hill companies, Inc.
- 6 Green and Harris, Pathology and Therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice, Chapman and Hall Publications.

PY805C : HERBAL DRUG TECHNOLOGY

Hrs: 60
Max.Marks:100
Credit :04

Introduction: Definition, source of herbal raw materials, identification, authentication, Collection and processing of herbal drugs. Seasonal & geographical variations, natural & artificial drying methods. Packaging & labeling of herbal drugs prior to extraction.

Standardization techniques: WHO guidelines for assessing quality of herbal medicine. Analysis of raw herbal extracts and their formulation using TLC, HPTLC, GC, HPLC, UV& IR techniques.

Herbal Formulations: Principles of Ayurveda, Ayurvedic dosage forms and their evaluation as per Ayurvedic pharmacopoeia. Formulation considerations of herbal infusion, decoction, lotion, washers, insect repellents, tincture, syrups, compresses, poultice, plasters, ointments, oils and salves, tablets and capsules.

Plant Tissue Culture Techniques & its Application in Pharmacy: Introduction, techniques of initiation and maintenance of various types of cultures for industrial level production of phyto- constituents. Immobilized cell techniques & biotransformation studies including recent developments in production of biological active constituents in static, suspension and hairy root cultures.

Brief account of plant based industries of India and world involved in R & D work on medicinal and aromatic plants and manufacturing herbal medicine. Regulatory requirements for herbal medicine industries: Infrastructure, Quality control, safety and stability, import and export of herbal products. Analytical Pharmacognosy – drug adulteration and detection.

Books Recommended:

1. Herbal Drug Technology by S.S. Agrawal & M. Paridhavi.
2. Modern Methods of Plant Analysis by Peach & Tracey
3. Biotechnology by S.S. Purohit.
4. Quality control of herbal drugs: an approach to evaluation of botanicals by Pulok K. Mukherjee.
5. Pharmacognosy by C.K. Kokate, A.P. Purohit and S.B. Gokhale
6. Ayurvedic Pharmacopoeia of India