

4th SEMESTER

PHARMACEUTICS-III (Physical Pharmacy – II)

PH. 4.1 THEORY

3 hours/week

UNIT -I

- 1. Micromeritics and powder Rheology :** Particle size and distribution, average particle size, number and weight distribution, particle number, methods for determining particle size, volume, shape, surface area, specific surface, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

UNIT -II

- 2. Rheology :** Newtonian systems, Law of flow, kinematic viscosity, effect of temperature, Newtonian and non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling sphere, rotational viscometers.

UNIT -III

- 3. Dispersion Systems:** Colloidal dispersions, types, properties of colloids, protective colloids, applications of colloids in pharmacy; Suspensions: Interfacial properties of suspended particles, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheological considerations, Emulsions : theories of emulsification, physical stability and rheological considerations.

UNIT -IV

- 4. Kinetics and Drug Stability:** General considerations & concepts, half-life determination, Influence of temperature, light, solvent, catalytic species, Accelerated stability study, determination of expiry date.
- 5. Solubility & related phenomenon :** Solubility expression, Determination of solubility, Solubility of gases in liquids, Solubility of liquids in liquids, Solubility of solids in liquids.

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

PHARMACEUTICS-III

(Physical Pharmacy – II)

PH. 4.2 PRACTICAL 3 hours/ week
(A minimum of 15 experiments shall be conducted)

1. Determination of particle size and particle size distribution using various methods of particle size analysis.
2. Determination of derived properties of powders like density, porosity, compressibility, angle of repose etc.
3. Study of rheological properties of various types of systems using different viscometers.
4. Preparation of various types suspensions and determination of their sedimentation parameters.
5. Preparation and stability studies of emulsions.
6. Determination of critical solution temperature phenol water system.
7. Determination of half-life, rate constant and order of reaction.
8. Preparation of pharmaceutical buffers and determination of buffer capacity.

RECOMMENDED BOOKS:

1. Martin's Physical Pharmacy & Pharmaceutical Sciences by P.J.Sinko.(Lippincott Williams and Wilkins, Baltimore)
2. Cooper and Gunn's Tutorial Pharmacy edited by S.J. Carter (CBS Publishers, Delhi)
3. Bentley's Textbook of Pharmaceutics edited by E.A. Rawlins (All India Traveler Book Seller, New Delhi)

BASIC ENGINEERING – II

(Unit Operations II)

PH. 4.3 THEORY 3 hours/week

UNIT -I

1. **Fluid Flow:** Type of flow, Reynold's number, Viscosiy, concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure.
2. **Dehumidification and Humidity Control:** Basic concepts and definition, wet bulb and adiabatic saturation temperature, psychrometric chart and measurement of humidity, application of humidity, measurement in pharmacy, equipments of dehumidification operations.

UNIT -II

3. **Material Handling Systems:**
Liquid handling – different types of pumps.
Gas handling – various types of fans, blowers and compressors.
Solid handling – Conveyers

UNIT -III

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

UNIT -II

3. **Enzymes:** Nomenclature, factors affecting enzyme action, enzyme kinetics and its mechanism of action, mechanism of inhibition, enzymes and iso-enzymes in clinical diagnosis.
4. **Co-enzymes:** Vitamins as co-enzymes and their significance, metals as co-enzymes and their significance.

UNIT -III

5. **Carbohydrate Metabolism:** Glycolysis and fermentation and their regulation, Gluconeogenesis, Glycogenolysis, Glycogenesis, and Pentose phosphate Pathway.
6. **The Citric Acid Cycle:** Significance, reactions and energetic of the cycle, Amphibolic role of the cycle and Anaplerosis.

UNIT -IV

7. **Lipid Metabolism:** Oxidation of fatty acids; β -oxidation & energetics, α -oxidation, ω -oxidation, Biosynthesis of ketone bodies and their utilization, Biosynthesis of saturated and unsaturated fatty acids, control of lipid metabolism, Essential fatty acids & Biosynthesis of eicosanoids (prostaglandins, thromboxanes and leukotrienes), phospholipids and sphingolipids.
8. **Proteins and Nucleic acids:** Outlines of the mechanism of protein and nucleic acid synthesis and catabolism. Principles of biological oxidation and detoxification mechanisms.

BIOCHEMISTRY

PH 4.6

PRACTICAL

3 hours/week

(A minimum of 15 experiments shall be conducted)

1. Preparation of standard buffers (citrate, phosphate and carbonate) and measurement of pH.
2. Colorimetric estimation of blood glucose.
3. Estimation of cholesterol, creatinine, urea and uric acid in biological fluids.
4. Qualitative test for normal and abnormal constituents of urine.
5. Estimation of reducing sugars in urine.
6. Estimation of bilirubin content the blood.
7. Enzymatic hydrolysis of glycogen by alpha and beta amylases.
8. Effect of temperature on the activity of alpha amylases.
9. Estimation of Blood Cholesterol
10. Estimation of SGOT, SGPT by UV Spectrophotometer.
11. Estimation of serum alkaline phosphate and acid phosphatase levels.
12. Estimation of serum sodium, potassium and calcium levels.

RECOMMENDED BOOKS:

1. Harper's Biochemistry R.K.Murray and Others (Prentice Hall of India, New Delhi)
2. Biochemistry by Stryer.(W.H.Freeman, New York)
3. Text Book of Biochemistry by West & Todd (Oxford & IBH Pub., Co., New Delhi)
4. Fundamentals of Biochemistry by Dr.A.C.Deb (New Central Book Agency, Calcutta)
5. Text Book of Biochemistry by Dr.A.V.S.S.Rama Rao (UBS Publishers & Distributors, New Delhi)
6. Text Book of Biochemistry by Dr.Satyanarayana

COMPUTER APPLICATIONS

PH. 4.7

THEORY

3 hours / week

UNIT -I

1. **Computer fundamentals:**

History: Introduction to Computer, Computer classifications (According to generation, size and use).

Hardware: Introduction to hardware, CPU, Mother board, Input devices, Output devices, Storage Devices and Memory. Various ports and slots available with mother board – ISA, PCI Serial, Parallel, PS/2 and USB and their uses.

Networking: Introduction to networking, Classification of networking like LAN, WAN, MAN. Hardware of networking – Modem, Hub, Cables.

Power devices used in various line conditions like CVT, UPS.

Number systems – Binary, Octal, Hexadecimal and their uses in computer

Software: Introduction to software, Simple example and use of Machine language, Assembly language and Higher level languages. Operating systems and classifications of application software according to their use.

UNIT -II

2. **Application of computers in pharmacy**

Introduction to various uses of computer in pharmaceutical research and development, industries, authorities, education and hospitals.

3. **Operating systems:**

Introduction to different types of file manipulation and storage maintenance functions by using DOS, WINDOWS (98 & XP) & LINUX –

File manipulations: Directories / folder / files searching, creating, copying, moving, deleting, renaming.

Maintenance: Checking, Scanning and formatting a floppy disk, CD Writing.

UNIT-III

4. **Programming Language (Programming with C)**

Introduction to programming; Problem analysis, algorithm, flow chart, coding, execution, debugging and testing, program documentation.

Introduction to C: Programming rules. C-Declarations: C-Character set, Key words, identifiers, constants, variables, defining variables, data type, declaring variables, initializing variables, conversion types etc.

Operators and expression, input and output statement in C.

Decision statements: **If**, **if.... Else**, **Nested if..... else**, **Go to**, **Switch ()..... Case**, **break**, default statement, loop control statement: **While**, **Do.....While**, **for**, **nested for**.

Arrays: One dimensional

Two dimensional

The **scanf ()** and **printf ()** functions

Preprocessor directives: **# include**, **# define**

UNIT -IV

5. **Internet:**

History of internet, Introduction to Internet Browsers, URL. Introduction to email and how to check and compose an email? Important websites related to pharmaceutical information – like sites for information regarding drugs, medical literature, plants, adverse effects, clinical data, patent sites, FDA, WHO, etc.

COMPUTER APPLICATIONS

PH. 4.8

PRACTICAL

3 hours/week

(A minimum of 15 experiments shall be conducted)

1. Demonstration of hardware.
2. Operating system: DOS, WINDOWS & LINUX
Searching directories or folders
Creating and deleting files and folders
Copying and Moving files and folders / directories
Saving in floppies and CD Writing.
Formatting and checking by floppy disks and Bootable CD.
3. Simple programming in C or C++: at least five programs.
4. Create and save a document in a word processor program like MS WORD. Type few paragraphs, format them, and paste an image.
5. Create and save presentations in POWERPOINT
6. Create and save a work sheet using MS EXCEL. Input data in cells, copy and move the data, make calculations, plot a graph from X and Y sets of data.
7. Internet (Search Engine, email, groups)

RECOMMENDED BOOKS:

1. Computer and common sense, 4th edn., Hunt & Shelly, Prentice-Hall India.
2. DOS 6 & 6.22: An Introduction with computer fundamentals. Pradeep Nair, Payal Lotia, BPB Publications.
3. DOS 6 & 6.22 Instant Reference, 2nd Edn. Robert M. Thomas, BPB Publications.

4. Windows 98 Instant Reference, Peter Dyson, BPB Publications.
5. ABCs of Windows 98, Sharon Crawford & Neil J. Salkin, BPB Publications.
6. Programming in ANSI C by E.Balguruswamy (TMH, New Delhi)
7. Programming in C++ by D.Ravichandran (TMH, New Delhi)
8. Complete Reference MS- Office
9. Complete Reference Windows XP.
10. Complete Reference Internet
11. Linux OS

MATHEMATICS AND STATISTICS

PH. 4.9 THEORY

3 hours/week

UNIT -I

Integration :- Integration as inverse process of differentiation, Definite integrals (simple cases). Integration by (i) Decomposition (ii) by substitution (iii) by parts. Integration of Logarithmic, Trigonometric, Algebraic and exponential functions.

Differential Equations :- Introduction to differential equations, Formation of differential equations, Solution of differential equations of first order and first degree by the methods of variable separable, Homogeneous, reducible to homogeneous and linear equations, Reducible to linear equations, Exact differential equations. Differential equations of order greater than one with constant coefficients, Pharmaceutical applications.

UNIT -II

Laplace transforms: Theorem, properties and uses (problems)

UNIT -III

Statistics -I :- Introduction to statistics, Data collection random and non-random sampling methods, Sample size, Diagrammatic representation of data, bar, pie, 2-D and 3-D diagrams, Measures of central tendency, Measures of dispersion, Standard deviation, Measures of skewness, Measures of kurtosis, Correlation and regression analysis, Methods of least squares, Probability and events, Probability theorems, Baye's Theorem on probability.

UNIT -IV

Statistics- II :- Probability Distributions – Binomial, Poisson and normal distributions (normal curve and properties), Tests of hypothesis (statistical inference) Standard error, Fiducial (confidence) limits, Tests of significance for small samples- Students t-distribution and t-tests, Paired t-test, chi-square tests and F-test (Pharmaceutical applications).

RECOMMENDED BOOKS:

1. Integral Calculus by Shanti Narayan.
2. Statistical Methods by S.P.Gupta. (S.Chand, New Delhi)
3. Higher Engineering Mathematics by B.S. Grewal. (Khanna Publishers, Delhi)
4. Mathematical Methods by Potter & Gold Berg.(Prentice Hall of India, New Delhi)

PHARMACEUTICAL CHEMISTRY-IV (Organic Chemistry-III)

PH. 4.10 THEORY

3 hours/week

UNIT-I

Heterocyclic compounds: Nomenclature Chemistry, preparation and some important reaction of- Furan, Pyrrole, thiophen, imidazole, Oxazole, indole, pyridine, pyrimidine, quinoline, isoquinoline, piperidine, thiazole, acridine.

Polynuclear Aromatic Hydrocarbons: Preparation and chemical reactions of anthracene and phenanthrene.

UNIT-II

Carbohydrates: Classification, reducing and non-reducing sugars, chemistry (Excluding structure elucidation) of glucose, fructose, sucrose, maltose, lactose, starch and cellulose, Ascending and descending of sugars.

Lipids (Fats and Oils): Classification and structure, physical and chemical properties (saponification, Hydrogenation, oxidation).

UNIT-III

Amino acids and Proteins: Structure of commonly occurring amino acids, Synthesis of amino acids and their physical properties and some characteristic chemical reactions, classification of proteins, physical properties, purification of proteins, concept of polypeptides.

Nucleic acids: Composition, general concept on the structure of RNA and DNA.

UNIT-IV

Study the following reactions with mechanism.

Benzoin condensation reaction, Reformatsky reactions, Beckmann rearrangement, Michael addition, Mannich reaction, Oppenaur oxidation, Claisen condensation, Knoevenagel condensation, Diels – Alder reaction and their applications.

RECOMMENDED BOOKS:

1. Organic Chemistry by R.T. Morrison and R.N.Boyd.(Prentice Hall of India, New Delhi)
2. Advanced Organic Chemistry by B.S.Bahl and Arun Bahl.(S.Chand, New Delhi)
3. Bentley and Driver's Text Book of Pharmaceutical Chemistry.(Oxford University Press, New Delhi)
4. Organic Chemistry – Reactions and Reagents by O. P.Agarwal.
5. Organic Chemistry by I.L. Finar Vol. I & Vol. II.(Longman, Singapore)