B.PHARM - FIRST YEAR

I.T.1. DISPENSING AND GENERAL PHARMACY
(Theory)[3hrs/Week]

1. **History of Pharmacy:** Development of Pharmacy Education, Industries and Research.
   b) Pharmacy Ethics: Introduction to code of Ethics of Pharmacy.

2. **Galenicals:** Methods of preparation, storage and packing. Of Infusions, Decoctions, Tinctures, Liquid extracts, Dry extracts, Study in detail of extraction processes, like Maceration and Percolation.

3. **Principles and various methods involved in the preparation of the following:** Solutions, Aromatic waters, Syrups, Mucilages, Spirits, Elixirs, Magmas and Glycerines.

4. **Pharmaceutical calculations (only in C.G.S system):** Percentage calculations, Proportional calculations, allegation, Isotonic solutions, Proof spirits and Displacement values.

5. **Principles of dispensing:** The form of prescription Handling, Pricing and Refilling of prescription, Prescription containers, Labelling and Packing.

6. **Posology:** Calculation of doses and a general know-how of the doses.

7. **Principles involved and procedures adopted in the dispensing of the following classes of Pharmaceutical preparations:** Mixtures, Emulsions, Powders, Lotions, Liniments, Ointments, Creams, Pastes and jellies, Suppositories, Pessaries, Nasal bougies, Inhalations, Eye drops, Ear drops, Throat paints and Gargles.

8. **Incompatibility:** Scope, Classes of incompatibility, Correction of incompatibilities, Handling of incompatible prescriptions pertaining to: alkaloidal incompatibility, Incompatibility of soluble iodides, soluble salicylates and benzoates with acids, ferric salts and alkaline substances, incompatibility causing evaluation of carbondioxide of soluble barbiturates and emulsifying agents.

I.P.1. DISPENSING AND GENERAL PHARMACY
(Practicals) [3hrs/week]
1. Preparation involving Pharmaceutical calculations.
3. Preparation of some solutions, Aromatic waters, syrups, Mucilages, Elixirs, glycerines, Magmas.
5. Incompatible mixtures and their handling.

I.T.2. PHARMACEUTICAL INORGANIC CHEMISTRY
(Theory) [2hrs/week]
A systematic study of the following pharmaceutical inorganic compounds with reference to their preparations, properties, tests for identity and purity, pharmaceutical uses and assay methods as given in Indian Pharmacopoeia (IP).

1. **Group IA- Sodium and Potassium Compounds**: Sodium acid citrate, Lithium carbonate, sodium benzoate, sodium borate, sodium citrate, sodium chloride, sodium hydrogen sulphide, sodium metabisulphate, sodium lauryl sulphate, sodium phosphate, sodium hydrogen phosphate, sodium borate, sodium potassium tartrate, potassium permanganate, potassium dichromate, potassium chloride, potassium bromide and potassium iodide.

2. **Group IIA- Magnesium, Calcium and Barium Compounds**: Light and heavy magnesium oxide, magnesium hydroxide, magnesium sulphate, magnesium trisilicate, magnesium stearate, calcium gluconate, calcium acetate, calcium pantothenate and barium sulphate.

3. **Group IIIA and IIIB - Boron and Aluminium Compounds**: Boric acid, aluminium hydroxide gel, aluminium magnesium trisilicate, alum.

4. **Group IVA and IVB Compounds**: Bentonite, light and heavy kaolins and kaolin poultice.

5. **Group VA and VB, Nitrogen, Antimony, and Bismuth Compounds**: Strong and diluted ammonia solutions, strong ammonium acetate solutions, aromatic spirit of ammonia, ammonium chloride, antimony sodium tartrate, sodium antimony gluconate, bismuth subcarbonate.

6. **Group VIB- Sulphur, Selenium Compounds**: Sublimated sulphur, precipitated sulphur and selenium sulphide.

7. **Group VIIA and VIIB- Hydrogen, Oxygen and Halogen Compounds**: Purified water, water for injection, hydrogen peroxide, chlorinated lime, aqueous iodine solution and strong iodine solution.

8. **Group VIII-Iron Compounds**: Ferrous sulphate, ferrous gluconate, ferric ammonium citrate, iron and quinine citrate.

9. The occurrence of impurities in pharmaceutical preparations: Types of impurities and limit test for chlorides, sulphate, arsenate, lead and iron.

**I.T.3. PHARMACEUTICAL ANALYTICAL CHEMISTRY:**
(Theory) [2Hrs/Week]

1. **Balances etc.**: Different types of balances and weighing. Types of analyses, obtaining samples, measurement of sample and types of pipettes.

2. **Computation of Analytical Results**: Significant numbers, sources of errors and their rectification, statistical treatment of data and rejection of data.


4. **Principles of Volumetric and Gravimetric Analyses**: Standardization, use of primary and secondary standards, Acid-base concepts, common ion effect and solubility product, PH and Buffers.
5. **General principles and theory** of: acidimetry, alkalimetry, oxidation-reduction methods, precipitation methods. An account of indicators used in these titrations.

6. **Complexometric Titrations**: Theory, types and applications in pharmaceutical analysis. Masking and Demasking and its applications.

7. **Non-aqueous Titrations**: Theory, types of solvents used, and applications in pharmaceutical analysis.

Application of the above methods in the analysis of drugs official in IP 1996.

**I.P.2. PHARMACEUTICAL INORGANIC AND ANALYTICAL CHEMISTRY**
(Practicals) [3Hrs/Week]

Detection and assay of some pharmaceutical inorganic substances
Limit tests and tests for purity

**I.T.4. PHARMACEUTICAL ORGANIC CHEMISTRY - I**
(Theory)[4hrs/Week]


2. **A Study of Hydrocarbons**:
   (B) **Aromatic Hydrocarbons**: Kekule's structure of Benzene, Bond lengths,Heats of hydrogenation and stability, Molecular orbital picture of Benzene, Aromaticity, Huckel’s rule, Nomenclature of Benzene derivatives, characteristic reactions of Benzene, theory of reactivity and orientation in monosubstituted benzenes. Polynuclear aromatic hydrocarbons: Nomenclature, structure and aromatic character of Napththalene and Anthracene. Resonance structures, Electron density and reactivity. Electrophilic substitution, Oxidation and reduction reactions.

3. **Halogen Compounds**:
   (A) **Aliphatic**: Nomenclature, positional and Conformational isomerism, two major methods of preparation, Characteristic Nucleophilic substitution reactions, SN1 and SN2, Walden inversion, Elimination reaction, and saytzeff’s rule Factors that play role.
   (B) **Aromatic**: Nomenclature, Low reactivity of halobenzenes towards nucleophilic substitution, Benzyne ion concept.
4. Hydroxy Compounds and Ethers:
   (A) Alcohols: Nomenclature, classification, Two important methods of preparation, physical properties, Hydrogen bonding, characteristic Nucleophilic substitution, reactions (Replacement of -OH by -Cl), Elimination reactions Reimer Tiemann reaction and Relative reactivities of 1°, 2° and 3° alcohols.
   (B) Phenols: Nomenclature, Two important methods of preparation, Physical properties, Acidity of Phenols, Stability of phenoxide ion, Reactions of Phenols, Kolbe-Schmidt reaction stability of conjugated dienes, and Fries rearrangement.
   (C) Ethers: Nomenclature, Williamson's synthesis, Action of HI on ethers (Ziesel’s method).


6. Carboxylic acids and their derivatives:
   (B) Acid derivatives: (Acid Chlorides, anhydrides, esters and amides). Nomenclature, Reactions like hydrolysis, Reduction of esters and amides, Hofmann's degradation of amides. Brief account of Malonic and acetoacetic esters. Their importance in synthesis.

7. Nitrogen Compounds:
   (A) Amines: Nomenclature, Basicity of amines, Classification, Relative reactivity, Hinsberg method of separation, Acylation reactions, Diazotisation and Reactions of Diazonium salts.

I.P.3. PHARMACEUTICAL ORGANIC CHEMISTRY - I
(Practicals)[3 hrs/Week]

   A. Organic Preparations: Iodoform, nitrobenzene, n-butyl acetate, sulphanilamide, B-naphthyl methyl ether, benzoic acid, aspirin, acetylilide and p-bromoacetamide.
   B. Identification of Mono-functional Organic Compounds: by studying their physical properties, detection of extra elements, characteristic functional group reactions and preparation of one of the rational derivatives. The following types of compounds are included for the study: Acids, phenols, amines, aldehydes and ketones, amides, esters, hydrocarbons and carbohydrates.
   Note: Water soluble compounds should be avoided.

I.T.5. BIO-STATISTICS AND COMPUTER APPLICATIONS
(Theory)[3hrs/Week]

   Section - A : Bio-statistics

   2. Data collection and treatment: 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, standard deviation and standard error of means, co-efficient of variation, confidence (fiducial) limits, probability and events.
3. **Probability and Distributions**: Bayer’s theorem, probability theorem, probability distribution, elements of binomial and poison distribution, normal distribution curve and properties, kurtosis and skewness;

4. **Regression**: Correlation and regression analysis, method of least squares, non-linear regression.

5. **Statistical inference**: Common parametric and non-parametric tests employed in testing of significance in biological/pharmaceutical experiments and elements of ANOVA (One way and two way).

6. **Design of experiments**: Basic concepts of CRD, RBD and Latin square designs.

7. **Sampling and Quality Control**: Concept of Random sampling, statistical QC charts.

8. Applications of statistical concepts in pharmaceutical sciences.

**Section - B: Computer Applications**

1. **Concept**: History of computers, simple model of computer and its working parts of the computer, CPU, memory, input/output devices, computer languages and their hierarchical machine language, assembly language, high level language comparison of high level and low level languages especially C, C++, PASCAL etc.,

2. **Introduction to microcomputers and concepts of operating systems**: Elements of DOS, UNIX, etc., introduction of computer networks.

3. **Database management**: Spread sheets (like MS-EXCEL, ACCESS), concepts and objectives of database and database management system, advantages and disadvantages of the database management system and examples of DBMS packages (like DBASE III).

4. **Flow chart and algorithm development**: Definition and properties of the algorithm, Flow chart symbols and their uses, Examples of efficient algorithm and flow-chart, conversion of algorithm/flow-chart to high-level languages.

5. **Introduction to computer programming**: C language: Constant and string variables, expressions, functions, structures, repetition statements (loops), nested loop, definite and indefinite loop and arrays. Concepts of files. Sequential files and random access files, Simple program writing for bio-statistical methods.

6. **Computer applications in pharmaceutical and clinical studies.**

**LP.4. BIO-STATISTICS AND COMPUTER APPLICATIONS**

(Practicals)[3hrs/Week]

1. **Sample programs in C**: Program to calculate simple and complex arithmetic expressions, program using structures, program using loops and nested loops, program using functions and simple programs using arrays.

2. Operating systems like WINDOWS, UNIX, etc.

Software packages like MS-WORD, EXCEL, ACCESS, POWER POINT.

**LT.6. REMEDIAL MATHEMATICS**

(Only for students admitted under B.P.C and D.Pharm streams)

(Theory)[2hrs/Week]

An introductory review of elementary

2. **Trigonometry**: Trigonometric ratios and the relation between them. Sin (A±B), Cos (A±B) and Tan (A±B) formulae only. Trigonometric ratios of multiple angles. Height and distances with simple problems only.

3. **Analytical geometry**: Distance between two points,. Area of a triangle. Co-ordinates of a point dividing a given segment in a given ration. Locus. Equation to a straight line in different forms. Angle between straight lines. Point of intersection.

4. **Differential calculus**: Continuity and limits, differentiation, derivability and deviation, RH derivatives and LH derivatives, differential general theorems and derivation, derivatives of trigonometric functions (including reverse trigonometric functions) logarithmic differentiation, partial differentiation, maxima and minima (elemental).

5. **Integral calculus**: Integration as reverse process of differentiation, definite integrals, integration by substitution and by parts, integration of algebraic functions, evaluation of area and volume in simple cases.

6. **Differential equations**: Formulation and derivation, order and degree, first order and degree, linear equation with constant co-efficiency, homogeneous linear equations (first method of solution only); simultaneous differential equations which are linear and of first order.

**I.T.6. REMEDIAL BIOLOGY**

(Only for students admitted under M.P.C stream)

(Theory( [2Hrs/Week)

**Section -A (Botany)**

I. **Plant Cell**: It’s structure and living and non-living inclusions. Plant cell division. Different types of plant tissues and their functions.

II. **Morphology and Histology of**: root, stem, bark, wood, leaf, flower, fruit and seed. Modifications of roots and stems.

III. **Plant Taxonomy**: Classification, study of the following families with special reference to medicinally important plants: Apocynaceae, Solanaceae, Umbelliferae, Labiatae, Leguminosae, and Liliaceae.

**Section - B (Zoology)**

I. **Animal cell**: Structure, living and non-living inclusions. Animal cell division. Different types of cells and tissues, their functions.

II. **Study of comparative anatomy** of different vertebrates – fish, amphibians, reptiles, aves and mammals.

III. **Basic study of the following systems of frog**: GI, nervous, cardiovascular; genitourinary, musculo-skeletal, respiratory systems.

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

**I.P.5. REMEDIAL BIOLOGY**

(Practicals) [3Hrs/Week)

I. Study of microscopes – care, use and type of microscopes.
II. Morphology of plant parts indicated in theory
III. Study of tissue arrangements in transverse section of monocot and dicot root, stem and leaf.
IV. Systematic study of representatives of five families mentioned in theory.

V. Study of different systems of frog and rat.

**LT.7. PHARMACOGNOSY – I**
(Theory) [2 hrs/week]

(I) Definition, History, Scope and Development of Pharmacognosy.
(II) Sources of natural drugs, Organized and unorganized drugs; Classification of crude drugs; systematic description of a crude drug.
(III) An account of biological source, chief constituents and uses of crude drugs and biomedicinals officinal in I.P., B.P., USP and E.P.
(IV) **Cultivation, Collection, Processing and Storage of Crude Drugs:** Factors influencing cultivation of medicinal plants. Types of soils and fertilizers of common use. Pest management and natural pest control agents. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants.
(V) **Quality Control of Crude Drugs:** Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation.
(VI) **An Introduction to Chemical Constituents of Drugs:** Their general isolation, classification and properties.