DEPARTMENT OF PHARMACEUTICAL TECHNOLOGY, JIS UNIVERSITY

PART A-- RESEARCH METHODOLOGY

1. **Introduction to research:** Meaning, objective, motivation and types of research. Research and scientific method.

2. **Research problem:** Selection, Necessity and technique of defining the problem.

3. **Research Design:** Meaning and need for research design. Basic principles of research design.

4. **Sampling Design:** Criteria and characteristic of good sample design. Random sample design.

5. **Method of data collection**: Collection and observation. Different method of data collection.

6. **Processing and analysis of data:** Problem in data processing. Statistics in research.

7. **Testing of Hypothesis:** Basic concept and procedure for hypothesis testing.

8. **Analysis of variance and covariance:** What is ANOVA, Basic principle of ANOVA, ANOVA Technique, Coding method, Two way ANOVA. ANOVA in latin-square design, Analysis of Co-variance.

9. **Interpretation and Report Writing:** Meaning, Why, Technique, Precaution of interpretation. Significance of report writing, step involve in report writing, layout of research report.

10. **The compute and its role in research.**

Part—B Syllabus of the Subject

Pharmaceutics:

- New Drug Delivery Systems
- BA/BE Studies
- Nanotechnology Based Formulation Development
- Thermodynamic Approach to Drug-Excipient Interactions
- Exploration of Natural Gum as Pharmaceutical Adjuvants
- Standardization of Ayurvedic Drug/Polyherbal Formulations

Pharmaceutical Chemistry:

- In silico design, synthesis (conventional, microwave, development of combinatorial solution phase synthetic techniques) and evaluation of novel candidate compounds with special reference to heterocyclic moieties and small peptides in the field of antimicrobial, antiprotozoal, antiviral, anti HIV, anticancer, analgesic, antihistaminic, anticonvulsant, cardiovascular, antidiabetic and other activities.

• Natural products-chemistry/pharmacology/structure standardization/ using spectroscopic methods (UV-VIS/IR/NMR/MS etc.)
• Studies on synthetic nutraceuticals
• Molecular modeling, docking, QSAR and solution phase ADME studies using CADD based software like Sybyl 7.1, Glide, Flex X and Scigress Explorer.

Pharmacology:

• Anti tumor & immunomodulatory studies of compounds from synthetic and natural sources.
• General pharmacological screening of new moieties from synthetic and natural sources.
• Toxicological studies of bioactive molecules (natural and synthetic sources)
• Neuropharmacological studies of bioactive molecules
• Studies of bioactive molecules on experimentally induced urolithiasis, nephropathy, neuropathy and diabetes in animal models.
• Biochemical; and Molecular Pharmacological studies of bioactive molecules.

Pharmacognosy:

• Validation of traditional systems of medicine
• Validated methodologies for development of new herbal formulations.
• Microcomputerized identification of indigenous drugs & development of standards
• Development of Drug molecules from natural sources and their enhancement by biotechnological approaches.
• Exploring natural resources for novel drug delivery systems.

PART 2: PHARMACEUTICAL TECHNOLOGY

1. General Principles involved in Organic Chemistry, Classification and Nomenclature of Organic Compounds, Aromaticity, Heterocyclic chemistry, General Chemistry of carbohydrates, Fats & Proteins. Stereoisomersim. Reaction mechanism and named reactions.

2. Different classes of therapeutic agents – Antiamoebic, Anthelmintic, Antibacterial sulpha drugs, Antimycobacterial, Antifungal and Antiviral. Thyroid & anti thyroid drugs. Antiallergic agents. Antiulcer agents & Proton Pump Inhibitors. Hypoglycemic agents. Antimalerials. Sedative-hypnotics. Antiepileptic agents. Neuroleptics. Anti-anxiety drugs. Diuretics. Antibiotics. Steroids. Anticancer agents. Narcotic analgesics, NSAIDS. Adrenergic drugs. Neurotransmitters. Cholinergic agents. Neuronal blockers. Drugs used in neuromuscular disorders. Drugs used in the treatment of Parkinson's disease. Central & peripheral muscle relaxants. Antihypertensive & antianginal agents. Eicosanoids. Prostaglandins, prostacyclins, & thromboxanes.

3. Introduction to quantitative structure activity relationship. [QSAR]. LFER. Hammett's equation. Use of substituent constants such as π, σ, Es, & physicochemical parameters such as pKa, partition coefficient, Rm, chemical shifts, molar refractivity,

simple & valance molecular connectivity to indicate electronic effects, lipophillic effects, & steric effects. Hansch analysis. Basic concepts of drug design with reference to physicochemical parameters related to ligand and receptor design.

4. Combinatorial chemistry. Introduction & basic terminology. Databases & libraries. Solid phase synthesis technique. Types of supports & linkers, Manual parallel & automated parallel synthesis. Houghton's tea bag method, micromanipulation, recursive deconvolution. Mix & split method for the synthesis of tripeptides. Limitations of combinatorial synthesis. High Throughput Screening.

5. Spectroscopy of Organic Compounds, Structural Analysis. Theory and instrumentation, of the following: UV, IR, NMR and Mass Spectrometry, HPLC, HPTLC, GC and hyphenated techniques (LC-MS), TGA, DTA, DSC and XRD. Basic Principles of chromatography and separation.

6. Biochemistry of carbohydrates, Proteins, Lipids, Vitamins. Enzymes and Nucleic acids. Fermentation Technology, Recombinant Technology. Genomics and proteomics.

7. Microscopy and staining procedures. Sterilization and aseptic techniques. Immunology, Vaccinces

8. Organization of screening for the pharmacological activity of new substances with emphasis on evaluation using in-vivo, in-vitro, ex-vivo, in-situ, in silico toxicity evaluation and other possible animal alternative models.

9. General Pharmacology, Pharmacology of Central and Peripheral Nervous System. Autacoids, Immunopharmacology, Principles of toxicology. Chemotherapy.

10. Factors affecting quality of crude drugs. Standardization of herbal medicines. Adulterations and evaluation of crude drugs. Extraction and Isolation techniques. Herbal Cosmetics. Traditional herbal drugs.

11. Fundamentals involved in Physical, Chemical and Biological evaluation of crude drugs. Monograph preparation of herbal drugs and standard tests involved thereof.

12. Approaches for enhancement of production of secondary metabolites using techniques like tissue culture, r-DNA technology and biotransformation. (b) Biological sources, method of preparation, active constituents, adulterants of antidiabetic, Anti-inflammatory, antiasthmatic, antibacterial and anticancer drugs.

13. Preformulation (Physical, Chemical and Biopharmaceutical Characteristics of Medicinal Agent). (b) Stability Testing and Dating. (c) Diffusion and Dissolution.

14. Product Development Approaches for the Conventional Dosage Form (Tablet, Capsule, Sustained Release Formulation, Injectables, and Ointment).

15. Fundamentals, Basic Concepts and Approaches involved in Newer Drug Delivery Systems.

16. Biopharmaceutics: Biopharmaceutical Consideration in drug Design (Factors influencing Dosage Form Design, Drug Dissolution & Bioavailability. Rate-limiting steps in Bioavailability). Bioavailability and Bioequivalence Studies.

17. Pharmacokinetics: Principle, Basic concept and Characteristics of Compartment Models. Nonlinear (Dose dependent) Pharmacokinetics.

18. Micromeretics and Powder rheology, Viscosity & rheology, dispersion system, Solubility studies