## Syllabus for Entrance test to Ph. D. Programme in Pharmaceutical Sciences

**UV- Visible spectroscopy:** Introduction, origin and Theory of Spectra instrumentation, interaction with EMR, characteristic absorption spectra of organic compounds, derivative spectroscopy, Solvent effects, Pharmaceutical applications.

**Infra-Red Spectroscopy:** Introduction, origin and Theory of Spectra instrumentation, Sample Handling, absorption of Common Functional groups, interpretation of spectra, Recent Advances in IR spectroscopy.

**Chromatography:** Basic Principle instrumentation, Methodological Techniques and Quantitative Analysis of drugs and their Metabolites using Column, Paper chromatography, TLC, Ion-exchange chromatography, GC, HPLC and HPTLC.

**Statical Analysis** Design of Experiments and Data collection, Analysis of Data collected and interpretation of the Analysis ('T' Test, 'F' Test, Chi-square Test), Statistics in Biological Testing.

**Computer aided drugs design:** A brief introduction of CADD and their application in designing of molecules.

**Formulation Considerations:** Application of Pre-formulation in development of Solid, Oral liquid and parenteral dosage forms, Solubility, Dissolution rate, pKa, Partition Coefficient Stability etc., In-vitro and In-vivo Evaluation Techniques.

**Fundamental Aspects of Product Development:** Studies of Wettability, Solubility, Dissolution, Partition and Absorption, Surfactant and Hydrocolloids and their role in drug delivery and targeting.

**Designing of Oral Pharmaceuticals:** Formulation, Evaluation, Stability studies and Recent advances in these dosage forms- Tablets, Capsules, Suspension, Emulsions, Coating of Solids Liquids, Advances in Coating techniques.

**Developments of Parenterals:** Concepts, formulation, evaluation of large volume parenterals and small volume parenterals, environmental and quality assurance in manufacturing.

**Dermatological Preparations:** Anatomy and Physiology of skin, Mechanism of absorption through skin including mathematical treatment, formulation and evaluation of ointments, creams, pastes, gels including herbal cosmetic creams.

**Stability Studies:** Basic concepts, consideration of physical and chemical stability studies, determination of shelf life, problems encountered during storage of dosage forms.

**Polymers and their applications in development of NDDS:** Introduction, basic properties of Biodegradable and non-Biodegradable polymers and their uses.

**Sustained release drug delivery system:** Principle involve, advantages and disadvantages, rate dose consideration, physico-chemical and biological properties of drugs relevant to sustained release formulation, microencapsulation, evaluation and stability studies of SRDF.

**Oral controlled drug delivery systems:** Principle involved basic concept, osmotic pressure control, membrane permeation control, pH independent, ion exchange, controlled Gel diffusion, controlled and hydro dynamically balanced systems, and evaluation.

**Mucosal drug delivery system** Introduction anatomy and physiology of oral mucosa, mechanism of trans-mucosal permeation and mucous membrane models, buccal, nasal cavity, pulmonary, rectal, vaginal drug delivery system, delivery of peptides based pharmaceutical.

**Transdermal Drug Delivery System:** Fundamentals of transdermal permeation and factors effecting it, permeation enhancers, development of trans dermal drug delivery systems, evaluation and recent developments.

**Targeted drug delivery systems:** Principles of targeting, method of targeting, preparation and evaluation of vesicular carrier systems such as liposomes, aquasomes, niosomes, pharmacosomes, dendimers and particulate carrier systems such as nano particles, micro spheres, modified micro spheres, solid-lipid nano particles (SLN), liquid crystals, resealed erythrocytes, monoclonal antibodies, interaction of colloidal delivery systems with biological environment, surface modification of colloidal drug delivery systems.

**Parenteral drug delivery systems:** Basic concept and approaches to parenteral controlled release of drug, formulation of controlled release, implants.

**Intra-vaginal and intrauterine drug delivery systems:** Introduction, vaginal contraceptive ring, mediated IUD, copper IUD, hormones releasing IUD.

**Drug absorption:** Gastrointestinal absorption of drugs, mechanism of drug absorption, phytochemical, biological and dosages forms factors influencing absorption, buccal absorption, salivary excretion of drugs.

**Drug distribution, bio-transformation and excretion:** Factors effecting drug distribution, volume of distribution, protein binding, mechanism of biotransformation and factors affecting it, renal and non renal excretion, concept of clearance and kinetics.

**Bioavailability and bioequivalence:** Introduction, factors influencing bioavailability methods to determine bioavailability, designing the study for assessment of

bioavailability and bioequivalence, invitro and invivo co-relation of bioavailability, methods to enhance bioavailability, statistical concepts.

**Pharmacokinetics:** Basic consideration of one, two and multiple compartment modules including IV-Bolus, IV-Infusion and extra vascular administration, kinetics of multiple dosing, dosage regimen (loading and maintenance doses)

**Clinical pharmacokinetics:** Concepts, absorption, distribution and renal excretion, hepatic clearance and elimination, diposition and absorption kinetics, therapeutic regimen, therapeutic response and toxicity, dosage regimen, clinical based studies.

**Non-linear pharmacokinetics:** Recognition of nonlinearity, one and two compartment open model with Michaelis-Menton kinetics,determination of Km, non-linear tissue constants.

**Applications of computer:** Introduction, application of computers in pharmacokinetics and biostatics.