

**SLT INSTITUTE OF PHARMACEUTICAL SCIENCES  
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)**

**Scheme of Examination**

**Pre Ph.D. CourseWork in Pharmacy**

Subject Code	Subjects	Contact hours/		Maximum Marks	Total Marks
		Theory	Tutorials		
PY-PH-1	Paper-I Research Methodology	4	2	100	100
PY-PH-2	Paper-II Modern Analytical Techniques	4	2	100	100
PY-PH-3	Paper-III Elective [Any one paper to be chosen by the candidate] Pharmaceutics OR Pharmaceutical Chemistry OR Pharmacology OR Pharmacognosy	4	2	100	100

**SEMINAR:** For being qualified in seminar the average marks given by different members of the panel of examiners should not be below 50%. The evaluation process will be as follows-

1	Subject Content	-	40
2	Presentation Skills	-	20
3	Justification & Scope of the Work	-	10
4	Ability to answer question asked	-	20
5	Resources used (Bibliographical references)	-	10
<b>Total</b>		-	<b>100</b>

**Note:** Candidates securing 50% or above will be qualified in seminar.

## **PAPER-I RESEARCH METHADODOLOGY (PY-PH-I)**

### **UNIT 1: RESEARCH**

1. Definition of research, application of research and types, research and types, research process and steps.
2. Literature review: importance of literature review, method and sources of literature review, review the literature selected, development of a theoretical and conceptual framework, writing up the review.

### **UNIT 2: RESEARCH DESIGN**

Design of experiments – objectives, strategies and basic principles; simple comparative experiments- basic statistical concept, sample mean and variance, random variable, standard normal distribution, statistical hypothesis degree of freedom, two sample t-test, F-test, Chi-square test, P-value, Confidence Intervals, Paired t-test; Analysis of Variance (ANOVA) for fixed effect model, ANOVA for randomized complete block design to control effects of nuisance factor; correlation regression.

### **UNIT 3: RESEARCH PROPOSAL**

1. Content – Preamble, problem, objective, hypothesis, design of study, measurement procedure, analysis of data, organization of report, displaying data tables, graphs and charts.
2. Writing a research paper report- development an outline; Key elements- objectives, introduction, design of work, experiment methods, procedure, measurements, result, discussion, conclusion, referencing and the various formats for reference. Report writing- Prewriting considerations, thesis writing, formats of report writing, formats of publications in scientific journals.

### **UNIT 4: INTELLECTUAL PROPERTY RIGHTS**

Indian Patent Act 1970 & its latest amendments; intellectual property right- concepts, copyright, design. Trademark, trademark, application, processing of patent. Patent term extension, criteria for granting patents; patent writing.

### **UNIT 5: COMPUTATIONAL ANALYSIS**

1. Introduction to the creation and advancement of database, algorithms, computational and statistical technique for data analysis.
2. Application of Microsoft excel for quantitative and statistical data analysis, power point, introduction to internet database surfing.

## **Paper-II Modern Analytical Techniques (PY-PH-2)**

**UNIT 1:**Principles, methods, interpretation of data and application of chromatographic techniques: TLC, Gc, HPLC, Ion chromatography, Gel electrophoresis.

**UNIT 2:**Principles, methods, interpretation of data and application of spectroscopic techniques: UV-Visible, IR, NMR, Mass, Fluorimetry and AAS.

**UNIT 3:**Principles, methods, interpretation of data and application of LC-MS, GC-MS, Thermal methods (TGA, DTA & DSC), XRD, SEM and TEM.

**UNIT 4:** Assay of drugs and metabolites in biological fluids.

**UNIT 5:** Bioassay, various types of bioassays, advantages and limitations of bioassay with suitable examples, radioimmunoassay, ELISA and their applications in medicine.

### **Paper-III Optional Paper: Pharmaceutics (PY-PH-III)**

**UNIT 1:** Pharmacokinetic and Pharmacodynamic basis of controlled drug delivery.

Formulation development of:

- a) Controlled release oral drug delivery systems
- b) Parenteral controlled release drug delivery systems
- c) Chemically modified drug delivery system

**UNIT 2:** Drug targeting to particular organs:

- a) Problems of drug delivery to the brain and targeting to brain
- b) Drug targeting in neoplastic diseases
- c) Drug targeting to gastro-intestinal tract

**UNIT 3:** Design, fabrication, evaluation and applications of the following controlled release systems:

- a) Micro particulate drug carriers: Microspheres, Nanoparticles
- b) Vesicular carriers: Liposomes, Niosomes, Transfersomes, Ethosomes
- c) Cellular carriers: Resealed erythrocytes.

**UNIT 4:** Chronotropic drug delivery systems

Designing of Chronotropic Systems: Multi-Layered tablets and capsules, Press coated tablets, Core-cup-tablets, Multiparticulate systems, Pulsincap systems, Chrono- modulating microchips.

**UNIT 5:** Kinetics and drug stability, Strategy of stability testing, method of stabilization, method of accelerated stability testing in dosage forms as per ICH guidelines, Comparison of stability testing requirements of ICH with other international regulatory agencies, Determination of shelf life.

### **PAPER-III Optional Paper: Pharmaceutical Chemistry (PY-PH-III)**

**UNIT 1:** Molecular modelling in drug design: Introduction, Molecular mechanics, Quantum mechanics, Molecular dynamics, Energy minimization techniques, Conformational search, Known and Unknown receptor.

**UNIT 2:** Analog design; Quantitative structure activity relationship (QSAR): Introduction, Parameters, Quantitative models and applications; 2D QSAR approaches for drug design; Recent trends in QSAR; Pharmacophore mapping.

**UNIT 3:** Structure based drug design: Introduction, structure aided drug design process, methods to derive three dimensional structure (obtaining the target, crystallography, nuclear magnetic resonance, homologous modelling), the design process, software-aided drug design, optimization of the identified compounds, examples of structure aided drug design. Docking and Scoring functions; *de novo* drug design.

**UNIT 4:** Peptides and peptidomimetics; Design and application of prodrugs; Drug metabolism and drug design; Natural products as lead for new pharmaceuticals.

**UNIT 5:** Classification, synthesis mode of action, structure activity relationship and recent advances of following categories of drugs – Antihistamines (H<sub>1</sub>, H<sub>2</sub>, H<sub>3</sub> & H<sub>4</sub>), Antihypertensives, Anxiolytics, Oral hypoglycaemic agents, NSAID's including COX-2 inhibitors, Fluroquinolones as Antibacterial agents, Classical antiviral agents and design of new antiviral agents; Anticancer agents.

### **Paper-III Optional Paper: Pharmacology (PY-PH-III)**

**UNIT 1: Principles of Pharmacological and Clinical Evaluation of drugs:** Commonly used laboratory animals in pharmacological research. Standard techniques used in laboratory animals, euthanasia of experimental animals, regulations for laboratory animal care as per CPCSEA guidelines.

**UNIT 2: Toxicology:** Principles of toxicity evaluations: Safety evaluation of new drugs in animals including acute, sub-acute, sub-chronic and chronic toxicity. ED50 and LD50 determination. Various guidelines for toxicity studies like ICH and OECD.

**UNIT 3: Molecular mechanism of drug action:** Theory of receptor occupancy and cellular signaling systems such as G-proteins, cyclic nucleotides, calcium and phosphatidyl inositol and intracellular receptors.

**UNIT 4: Endogenous bioactive molecules and different classes of receptors:** such as cytokines, neuropeptides, neurosteroids, nitric oxide and arachidonic acid metabolites. Angiotensin, Glutamate, Adrenergic, Cholinergic, Dopamine, Serotonin, GABA, Opioid and Purinergic receptors.

**UNIT 5: Introduction to clinical Trial:** Types of clinical research, phases of clinical research, role of clinical trial in new drug developments. IND, NDA, ANDA:- Parts and contents.

### **Paper-III Optional Paper: Pharmacognosy (PY-PH-III)**

**UNIT 1:** Identification of medicinal plants: Preparation of herbarium specimen and its authentication, Collection and preparation of medicinal plants for pharmacognostic research.

**UNIT 2:** General methods of extraction, isolation and purification of alkaloids, glycosides and aglycones, tannins, essential oils, fixed oils and fats with special emphasis on bioactivity guided drug discovery.

**UNIT 3:** Structure elucidation of plant constituents viz. morphine, atropine, quinine, digoxin, diosgenin, glycyrrhetic acid, rutin, podophyllotoxin and menthol.

**UNIT 4:** Standardization of phytopharmaceuticals and standardized extracts of alkaloids, glycosides and aglycones, tannins, essential oils, fixed oils and fats by modern analytical techniques with special emphasis on HPLC and HPTLC studies; WHO guidelines for standardization and quality control of herbal drugs.

**UNIT 5:** Evaluation of biological activity of crude drug extracts and pure phytopharmaceuticals for:

- a. Analgesic and antipyretic activity
- b. Anti-inflammatory and antiarthritic activity
- c. Immunomodulatory activity
- d. Antidiabetic activity
- e. Hepatoprotective activity
- f. Antioxidant activity
- g. Anticancer activity
- h. Antimicrobial activity

Toxicity studies: acute, subacute and chronic.