INSTITUTE OF PHARMACY
Deen Dayal Upadhyaya Gorakhpur University,
Gorakhpur - 273009 (U.P.) India
(Accredited A++ by NAAC)

Ref No. 258/IOP/2025-26 Date. 28-01-2026

To,
The Director
Admission Cell
Deen Dayal Upadhyaya Gorakhpur University
Gorakhpur

Subject: Submission of Syllabus for PhD (Pharmacy)-Research Entrance Test 2025–26 (RET 2025–26)

Dear Sir,

I am writing to request, the Ph.D program in Pharmacy is to be started for the session 2025-26. For the purpose of research entrance test, I am submitting the syllabus for the PhD Program in Pharmacy to be followed for the Research Entrance Test 2025–26 (RET 2025-26).

Attachment- Ph.D Syllabus

Dr. Amit Kumar Nigam
(Director)

Ph.D (Pharmacy) SYLLABUS

RESEARCH ENTRANCE TEST- 2025-26

Part I: Research Methodology (35 Marks)

Basics of Research: Definition, characteristics, types, need of research. Identification of the problem, assessing the status of the problem, formulating the objectives, preparing design and actual investigation.

Literature Review: Importance of literature review, methods, and sources of literature review, review the literature selected, formulating the research problem based on extensive literature survey, developing the hypothesis, preparing the research design, development of a theoretical and conceptual framework, writing up the synopsis of the proposed Ph.D. program. Writing a Research Proposal: Research grant funding agencies, preparation of study protocols, preparing for application to funding agencies (problem, objectives, hypothesis to be tested, design of study, methodology, analysis of data).

Research Ethics, IPR and Scientific Communication: Ethics-ethical issues, ethical committees (human and animal); prewriting considerations, thesis writing, formats of report writing, preparing posters for scientific presentation, preparing, and delivering of oral presentation. Scholarly publishing-IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability, general consideration of IPR for patent drafting and submission.

Introduction to Statistics: Introduction to hypothesis, procedure for hypothesis testing, sample size, statistical tests of significance, parametric tests (students "t" test, ANOVA, correlation coefficient, regression), non–parametric tests (Wilcoxan rank tests, analysis of variance, correlation, chi-square test), null hypothesis, P-values, degree of freedom, interpretation of P-values. Data Collection and Computer applications: Methods of primary and secondary data collection, selection of appropriate method of data collection. Use of word processing, spreadsheet, and database software. Plotting of graphs.

Internet and its application: E-mail, WWW, Web browsing, acquiring technical skills, drawing inferences from data.

Reference Books:

1. Research Methodology: Methods and Trends by Dr. C. R. Kothari.
2. Fundamental of Statistics by S. C. Guptha.
3. Design and Analysis of Experiments by R. Pannerselvam.
4. Preparation for publication by King Edward Hospital Fund for London.
5. Practical Statistics for Pharmaceutical Analysis – James E. De Muth

PHARMACOLOGY

Pharmacokinetics: Processes involved in transportation of drug across cell membrane. Absorption, distribution, metabolism, and excretion of drugs. Basic concepts of clinical pharmacokinetics: i) Bioavailability & bioequivalence ii) volume of distribution iii) half-life iv) clearance.

Receptor Pharmacology and Mechanisms: Site and mechanisms of drug action, factors modifying drug action. Classification and families of receptors, regulation of receptors, drug receptor interaction theories, dose response curve and therapeutic Index.

Adverse drug reactions and drug Interactions: Types and mechanisms. Pharmacology of CNS and ANS Acting Drugs: Neurohumoral transmission, parasympathomimetics, parasympatholytics, sympathomimetics, sympatholytics, general anesthetics, sedatives, hypnotics and centrally acting muscle relaxants, anti-epileptics, antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.

Chemotherapy: General principles of chemotherapy, sulfonamides and cotrimoxazole, sntibiotics (Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides), antitubercular agents, antileprotic agents, antifungal agents, antiviral drugs, antimalarial drugs and chemotherapy of malignancy.

Cardiovascular Pharmacology: Cardiotonics, antiarrhythmics, antihypertensive, antianginal and antihyperlipidemic agents. Endocrine Pharmacology: Anterior pituitary hormones, thyroid hormones, hormones regulating plasma calcium level, ACTH and corticosteroids, insulin, oral hypoglycemic agents and glucagon.

Reference Books:

1. Pharmacological Basis of Therapeutics by Goodman and Gillman.
2. Pharmacology by H. P. Rang and M. M. Dale.
3. Basic and Clinical Pharmacology by B. G. Katzung.
4. Essentials of Medical Pharmacology by K. D. Tripathi.5. Principles of Pharmacology by H. L. Sharma and K. K. Sharma.

PHARMACEUTICAL CHEMISTRY

Structural Elucidation, Reaction Mechanisms: Structural elucidation of natural, synthetic and semisynthetic drugs by using spectroscopic data. [UV, IR, H1NMR, C13 NMR, Mass]. Generation, Stability, structure and reactivity of free radicals, Carbocations and Carbines. Mechanism of free radical, electrophilic, Nucleophilic (Addition and substitution) reactions, elimination reactions with examples.

Molecular Actions: Concept of receptors and receptor theories. The role of functional groups in drug receptors, interactions with specific reference to opioid, dopaminergic, adrenergic, cholinergic and GABAnergic receptors.

New Drug Development, Lead Approach and Drug Design: Identification of lead molecule for natural products. Lead optimization for the new drug development with

suitable examples from CVS, CNS and chemotherapeutic agents. History and development of QSAR, physicochemical parameters. Hansch analysis, free klison analysis.

Pharmaceutical Inorganic and Medicinal Chemistry: Pharmaceutical Impurities, Monographs, Isotopes, Dentifrices, desensitizing agents, & anticaries agents. Therapeutic classes of drugs, various classes of therapeutic agents, Different classes of therapeutic drugs. Mechanism of action and synthesis of the different classes of drugs included in I.P. and B.P. and U.S.P.; Various synthetic approaches to modern drugs; Systematic study, SAR.

Reference Books:

1. Organic Chemistry by Clayden, Greeves, Warren and Woihers.
2. Reactive Intermediates in Organic Chemistry by Tandom and Gowel.
3. Organic Synthesis - Special Techniques by V. K. Ahluwalia and R. Agarwal.
4. Principles of Medicinal Chemistry by William Foye.
5. Spectrometric Identification of Organic compounds by Robert M Silverstein
6. Principles of Instrumental Analysis by Doglas A Skoog, F. James Holler and Timothy A. Nieman.
7. Spectroscopy by Gary M. Lampman and Donald L. Pavia.

PHARMACEUTICS

Introduction to Pharmacokinetics: Pharmacokinetics models, physiological models, one compartment open model drug disposition, plasma elimination half-life, two compartment open model drug disposition. Drug Distribution-Apparent volume of distribution (one and two compartment models). Protein binding of drugs-Implications of drug protein binding in pharmacokinetics and therapy.

Biotransformation of Drugs: Phase-I and II biotransformation reactions and factors affecting biotransformation, Excretion of drugs-renal and non-renal drug excretion, mechanism of renal excretion, clearance by renal clearance, hepatic clearance, kinetics of drug absorption, one compartment model, evaluation of pharmacokinetic parameters.

Dosage Form Evaluation-Bioavailability: Rate and extent of bioavailability, assessing bioavailability, multiple dosing bioavailability, in vitro bioavailability studies (dissolution), Bioequivalence-General principles, criteria for establishing bioequivalence requirement, criteria for waiver of evidence for bioequivalence requirement and methodology. Pharmacokinetics parameters-logarithmic transformations. Multiple dosage regimens-drugs accumulation, i.v. and oral regiment, loading dosing, scheduling. Diseases-dose adjustment hepatic disease dose adjustment, renal disease dose adjustment, therapeutic drug monitoring. Non-compartment model pharmacokinetics-statistical movement theory, pharmacokinetics parameters.

Concept & Models for NDDS: Classification of rate-controlled drug delivery system (DDS), rate programmed release, activation modulated & feedback regulated DDS. Fundamentals of rate-controlled drug delivery-Introduction, mechanistic analysis of controlled release drug delivery, effect of system parameters in controlled drug delivery, evaluation of controlled release drug delivery systems.

Oral Drug Delivery and Delivery Systems: Development of novel drug delivery systems for oral controlled release drug administration, modulation of gastrointestinal transit time, overcome hepatic first pass elimination.

Transdermal Drug Delivery Systems: Skin site for transdermal drug administration, recent developments in transdermal drug delivery, fundamentals of skin permeation, technologies for developing transdermal systems, evaluation of transdermal systems, particulate drug carriers– liposomes and nanoparticles.

Target Oriented Drug Delivery Systems: Rationale for targeted drug delivery, biological processes and events involved in drug targeting, pharmacokinetics and pharmacodynamics considerations, targeted drug delivery systems, targeting in the gastrointestinal tracts and other mucosal surfaces.

Reference Books:

1. Biopharmaceutics and Pharmacokinetics-A Treatise by D. M. Brahmankar and Sunil B. Jaiswal.
2. Pharmaceutics, The Science & Dosage Form Design by M. E. Aulton.
3. Pharmaceutical Dosage Form and Drug Delivery System by H.C. Ansel
4. Bentley's Text Book of Pharmaceutics by E.A. Rawlins
5. Molecular Biotechnology: Principles and Applications of Recombinant DNA by B.R. Glick and J.J.Pasternak

PHARMACOGNOSY

Basic Concepts: General methods and Principles of extraction methods, types of extraction and their merits and demerits for crude drugs; selection and purification of solvents for extraction; screening of the plant extracts for chemicals, general methods of isolation of different classes of phytochemical.

Screening and Evaluation: Screening of plant extracts/phytochemicals for analgesic, antiinflammatory, anti-diabetic, diuretic, anti-fertility, anti-epileptic, hepatoprotective, immunomodulatory, anticancer cardiovascular and antimicrobial activity.

Techniques: Techniques employed in elucidation of bio synthetic pathway, Study of basic metabolic pathways (Shikimic, Acetate Mevalonate Pathway, Calvin Cycle), biogenesis of tropane, quinoline, imidazole, isoquinoline and indole alkaloids; sterols, anthraquinone, saponin glycosides and flavonoids compounds of pharmaceutical significance.

Current Scenario: Current status of anti-cancer, anti-HIV, anti-diabetic and Immunomodulatory herbal drugs. A review of biomedicals of recent discovery. Current status of plants used in alternative systems of medicines.

Herbal Formulations: Types of herbal formulations preparation of standardized extracts suitable for incorporation into solid dosage form like tablets, capsules etc. Recent trends in poly-herbal medicines. Herbal cosmetics and herbal teas. Manufacture, packaging, and approach to quality control of herbal formulations. GMP for herbal drug formulations.

Plant Tissue Culture: Current trends in tissue culture and its applications in pharmaceutical and allied fields. Immobilized cell systems and techniques of immobilization, biotransformation resulting into pharmaceutically important secondary metabolites, using tissue cultures. Micro propagation, Hairy-root cultures, and their applications in pharmacy.

Reference Books:

1. Instrumental methods of Chemical analysis by B. K. Sharma.
2. Phytochemical methods by J. B. Heraborne.3. Text book of Pharmacognosy by Trease and Evans.
4. A text book of Herbal cosmetics by Vimla Devi.
5. Quality control of herbal drugs and approach to evaluation of botanicals by Puloak Mukherjee.
6. Pharmacognosy and Phytochemistry (Vol I & II) by V. D. Rangari.