



Syllabus for Written Examination

(For Special Internal Competition)

Post: **Assistant Professor/Lecturer**

Subject: **Pharmaceutics**

1. **The knowledge of the related subject matters which are generally included in the concerned bachelor and master level courses (60%)**
 - (a) **Fundamentals of Pharmaceutics** - Drugs, dosage forms, drug discovery, and drug manufacturing. Principles of formulation, pharmacodynamics, and pharmacokinetics. Regulatory aspects, clinical trials, and good manufacturing practices (GMP) to ensure drug safety and efficacy.
 - (b) **Physiochemical Phenomena and Pharmaceutical Properties** - Micrometrics, disperse systems, rheology, and drug stability. Solubility, dissolution, and bioavailability studies. Degradation mechanisms, shelf life, and stability testing of pharmaceutical products.
 - (c) **Dosage Form Design and Manufacturing** - Solid, semi-solid, liquid, and gaseous dosage forms. Pharmaceutical excipients, polymers, and formulation strategies. Sterile products, radiopharmaceuticals, cosmeceuticals, and regulatory considerations.
 - (d) **Pharmaceutical Processing and Industrial Safety** - Mixing, milling, drying, compression, and filtration techniques. Pharmaceutical packaging, evaluation, and regulatory standards. Industrial hazards, plant safety, GMP compliance, and risk assessment in pharmaceutical manufacturing.
 - (e) **Biopharmaceutics and Pharmacokinetics** - Absorption, distribution, metabolism, and excretion (ADME) principles. Reaction rate and order, pharmacokinetic models, bioavailability, and bioequivalence studies. Dose adjustments, therapeutic drug monitoring, and clinical pharmacokinetic applications.
 - (f) **Advanced Drug Delivery Systems** - Sustained and controlled drug delivery, microencapsulation, and transdermal drug delivery. Novel drug delivery systems such as liposomes, niosomes, and nanoparticles. Targeted drug delivery mechanisms and stimuli-responsive formulations.
 - (g) **Pharmaceutical Preformulation and Technology Transfer** - Preformulation studies, drug-excipient compatibility, and polymorphism. Pilot plant scale-up, technology transfer processes, and pharmaceutical plant design. Utilities and services essential for pharmaceutical production and regulatory compliance.
 - (h) **Pharmaceutical Unit Operations and Process Development** - Heat transfer, fluid flow, solid-liquid extraction, and crystallization techniques. Bioprocessing, fermentation technology, and microbial production of pharmaceuticals. Process development, scale-up strategies, and process analytical technology (PAT).
2. **Basic Knowledge of the recent trends in Pharmaceutics (15%)**
 - (a) **Advances in Drug Delivery Systems** - Smart drug delivery, stimuli-responsive systems, nanocarriers, hybrid drug delivery, 3D-printed pharmaceuticals, personalized formulations, controlled-release, site-specific delivery, improved bioavailability, patient compliance, therapeutic outcomes.

- (b) **Nanotechnology and Biopharmaceuticals** - Nanomedicine, liposomes, niosomes, dendrimers, micelles, targeted therapy, monoclonal antibodies, biosimilars, RNA-based therapeutics, mRNA vaccines, siRNA, gene editing, cancer treatment, infectious diseases, genetic disorders, regulatory advancements.
- (c) **Artificial Intelligence (AI) and Machine Learning in Pharmaceutics** - AI in drug discovery, formulation optimization, pharmacokinetics, robotics, automation, predictive modeling, quality assurance, precision manufacturing, AI-driven compliance, regulatory streamlining.
- (d) **Personalized Medicine and Pharmacogenomics** - Genomics, biomarker-based therapies, individualized drug treatments, pharmacogenomic testing, drug selection, optimized dosing, precision medicine, oncology, neurology, chronic disease management, patient safety, therapeutic efficacy.
- (e) **Regulatory Innovations and Quality Assurance** - FDA, EMA, real-time quality monitoring, Process Analytical Technology (PAT), AI-based compliance tools, sustainability, green chemistry, eco-friendly packaging, waste reduction, environmental responsibility in drug production.
- (f) **Vaccine Technology and Digital Pharmaceutics** - mRNA vaccines, next-generation vaccines, immunotherapies, digital pills, embedded sensors, medication adherence, blockchain technology, drug traceability, counterfeit prevention, efficiency, pharmaceutical safety.
- (g) **Future of Pharmaceutics and Emerging Research Areas** - Bioengineered drug implants, artificial organs, quantum computing, drug modeling, ethical challenges, regulatory concerns, AI integration, nanomedicine, gene editing, precision therapies, futuristic pharmaceuticals.

3. National and Global Trends and Issues Regarding Pharmaceutics Education (10%)

- (a) Curriculum Reforms and Multidisciplinary Integration – AI, nanotechnology, bioinformatics, competency-based education, interdisciplinary approaches, integration with biotechnology and biomedical sciences.
- (b) Digitalization and Globalization in Pharmaceutical Education – MOOCs, virtual labs, Simulations, AR/VR for training, joint degree programs, faculty exchange, and international accreditation standardization.
- (c) Emerging Research and Industry-Academia Collaboration – Biopharmaceuticals, gene therapy, precision medicine, green chemistry, regulatory affairs, clinical trials, and pharma startup incubation.
- (d) Policy Reforms and Government Initiatives – Research grants, innovation funding, scholarships, national accreditation policies, and regulatory alignment standards.
- (e) Challenges in Higher Education and Skill Development – Limited access to research facilities, funding gaps, ethical pharmaceutical research, pharmacovigilance, clinical training deficiencies, and regulatory compliance education.
- (f) Future of Pharmaceutical Education – Big data in pharmaceuticals, lifelong learning programs, telepharmacy, digital health integration, sustainability in pharmaceutical practices, and competency-based learning.

4. Teaching and Research Methodology (10%)

- (a) Teaching Skills & Strategies – Effective communication, student-centered learning, classroom management, and use of technology in higher education in Pharmaceutics.
- (b) Common research methods – Conceptualizing a Research Topic, Identifying research gaps, formulating hypotheses, data collection, aligning with current trends, and exploring multidisciplinary research areas.
- (c) Curriculum Review & Lesson Planning – Designing industry-relevant curricula, structuring lesson/work plans, integrating theory with practical learning, and incorporating emerging technologies.

- (d) Academic Planning & Reference Material Development – Preparing quality reference materials, using open educational resources (OER), and structuring academic calendars effectively.
- (e) Culturally Responsive Teaching – Promoting diversity and inclusion, adapting to different learning styles, and module based teaching & evaluation.
- (f) Research Paper & Proposal Writing – Structuring research papers, writing proposals, maintaining academic integrity, and selecting high-impact journals.
- (g) Assessment & Evaluation Methods – Implementing effective assessment techniques, feedback mechanisms, and ensuring student engagement through innovative teaching practices.

5. Governance, Policies, and Legal Framework of Gandaki University (5%)

Overview of Gandaki University’s establishment, vision, academic structure, governance bodies, strategic plans, key acts, laws, and bylaws, and Nepal’s higher education policies.