Gandaki University
गण्डकी विश्वविद्यालय

Syllabus for Written Examination

(For Special Internal Competition)

Post: **Assistant Professor/Lecturer**
Subject: **Environment Science/Climate Science/Environment Technology**

1. **The knowledge of the related subject matters which are generally included in the concerned bachelor and master level courses (60%)**

   (a) **Wastewater treatment Engineering:** Point and non-point source pollution; select the most suitable technological process for wastewater treatment based on the process of selection steps. Criteria for technology selection, application of mechanical, physical and chemical principles, chemistry, biology, and formula for calculating wastewater treatment facilities.

   (b) **Advance in solid waste treatment:** Integrated solid waste management; characteristics of the composition of solid waste; researches on solid waste treatment technologies (Artisanal collection, recycling, landfilling, heat treatment; biotechnology).

   (c) **Organic and biochemical analytical separations:** Modern separation methods, and their applications in different fields of environmental industry. Basic principles of chromatography and electrophoresis, capillary gas chromatography, HPLC capillary, electrophoresis, supercritical fluid chromatography, mass spectrometry.

   (d) **Industrial energy processes:** Advanced applied thermodynamics of importance, primarily to the environmental and safety issues in connection with heat and power production. Knowledge and skill in using modern methods for the economic evaluation of the energy requirements in industrial energy processes. Development in research and application in the field of industrial ecology. Role of industrial ecology applied to strategic sustainable development on a global scale. Energy conversion for the different technical thermodynamic processes. New energy technology and its importance to process industry. Economic aspects and consequences of heat and power production. Measures to improve the efficiency in energy use. Environmental and safety matters in connection with energy conversion processes

   (e) **Renewable fuel production:** Problems created by fossil materials. Evaluate strategies for development of new technologies and/or products taking into account for environmental and process safety issues in the chemical industry. Compare and judge different raw materials for production of a product, considering environmental and safety issues. Compare, in particular, fossil and renewable raw materials taking into account the different process systems needed for production of a specified product.

   (f) **Electrochemical technology in pollution control:** Emergence of electrochemical technologies as important approaches for effective and efficient pollution remediation. Electrochemical Remediation Technologies for polluted soils, sediments and groundwater. Fundamentals, field applications, as well as opportunities and challenges in developing and implementing electrochemical remediation technologies.

   (g) **Environmental modeling:** Idea, methods and basic tools of environmental modeling. Different modeling approaches, their scope and limitations. Fate and transport of pollutants. Applications of modelling in environmental management & decision making.

(h) **Recent advances in environment science/technology:** Advanced research methods and its application. Role of LAPA in adaptive measures related to climate change hazards.

2. **Basic Knowledge of the recent trends in Environment science (15%)**

   (a) **Emerging Trends in Wastewater Treatment and Pollution Control** – Membrane bioreactors, AOPs, IoT-based monitoring, SUDS for pollution control.

   (b) **Advances in Solid Waste Management and Circular Economy** – Zero-waste strategies, AI-driven recycling, waste-to-energy, biodegradable materials.

   (c) **Cutting-Edge Analytical Techniques in Environmental Science** – Chromatography, nanotechnology in sensing, microplastics detection, remote sensing.

   (d) **Industrial Ecology and Sustainable Energy Innovations** – Green chemistry, Life Cycle Assessment (LCA), hydrogen energy, AI-driven energy optimization.

   (e) **Breakthroughs in Renewable Fuel Technologies** – Algae-based biofuels, hydrogen from renewables, Sustainable Aviation Fuels (SAFs), carbon capture (CCUS).

   (f) **Electrochemical Innovations in Environmental Remediation** – Electrocoagulation, bioelectrochemical systems, electrokinetic soil remediation, green battery tech.

   (g) **Advances in Environmental Modeling and Data Science Applications** – AI in climate modeling, predictive analytics, GIS-based EIA, cloud-based environmental data.

   (h) **Climate Change Adaptation and Resilience Strategies** – Nature-based solutions (NbS), LAPA initiatives, carbon trading, extreme weather modeling.

   (i) **Advances in Sustainable Water Resource Management** – Smart water grids, desalination, precision irrigation, community-led conservation.

   (j) **Policy and Global Trends in Environmental Governance** – Paris Agreement, SDGs, environmental justice, corporate sustainability (ESG reporting).

3. **National and Global Trends and Issues Regarding Environment Science Education (10%)**

   (a) Curriculum Reforms and Multidisciplinary Approach – Integration of STEM, policy, and social sciences; focus on competency-based and research-driven education.

   (b) Digitalization and E-Learning – Growth of MOOCs, virtual labs, AI-driven learning, and challenges in hands-on skill assessments.

   (c) Globalization and International Collaboration – Joint research programs, academic exchange initiatives, and involvement of UNEP, IPCC, UNESCO in environmental education.

   (d) Emerging Fields and Research Priorities – Focus on climate change adaptation, circular economy, industrial ecology, and AI applications in environmental monitoring.

   (e) Sustainability and Green Campus Initiatives – Adoption of green buildings, carbon neutrality goals, campus biodiversity programs, and community engagement.

   (f) Policy Reforms and Government Initiatives – Implementation of SDG-aligned curricula, climate-resilient research funding, and scholarship expansion.

   (g) Industry-Academia Collaboration and Employability Trends – Demand for environmental professionals, partnerships for sustainable technology, and entrepreneurship in clean energy.

   (h) Challenges in Environmental Science Education – Limited funding, gaps in field-based learning and infrastructure, and need for stronger policy support.

   (i) Ethical and Social Responsibilities – Promotion of environmental ethics, climate justice, indigenous knowledge, and sustainability leadership.

   (j) Future of Environmental Science Education – AI, IoT, blockchain in environmental data, resilience education, and global networking platforms for policy engagement.

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 Environment Sciences.

   (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.