Dept. of Forest Resources

Scientific research of forest resources is of great importance to the economy, environment, and social and cultural aspects in Korea, where 63% of the land is occupied by mountainous forests. Our graduate degree program provides an integrative curriculum across a wide range of disciplines to understand, manage, and conserve forests and the ecosystem services they provide. Our educational goal is to provide rich opportunities to acquire professional skills and knowledge that will promote sustainable management of forest resources, and to help the students pursue their professional careers. Our program takes full advantage of both the traditional approach and the state of the art knowledge and science to achieve this goal. Forest ecology, biometrics, climate change, landscape ecology, remote sensing and geographic information systems, tree pathology and physiology, forest therapy, forest management, forest policy, and data science and artificial intelligence are some of the specialties provided by the program.

☐ **Courses**
❏ **Forest Resources Major Courses**

· **Topics in Forest Environment and Resources (3)**
  This course teaches the methodology for sustainable management of forest environment and resources. It also discusses issues to apply these methodologies and to reflect them in forest policy.

· **Topics in Forest Ecology (3)**
  This course comprehensively interprets the structure and function of forest ecosystems and discusses how such knowledge can be utilized in forest ecosystem management.

· **Thesis Research (3)**
  Students will learn an overall process and system of methodologies in conducting forest science research. Topic selection, research design and planning, literature search and review, actual analysis, delivery and review of results will be covered in this lecture. Students will have an opportunity to practice writing scientific proposals and reports through critical group review.

· **Topics in Environmental GIS (3)**
  Students will learn advanced GIS analysis techniques and their applications to decision-making for sustainable forest management.

· **Landslide Informatics (3)**
  The course explores advanced statistical methods and models necessary for research

on landslide prediction and damage assessment. It covers theoretical tools for analyzing collected research data and computer programming methods required for analysis.

· **Topics in Forest Culture (3)**

Analyzing the impact of forest on cultural development and civilization. Areas of emphasis in history, philosophy, literature, art and religion.

· **Topics in Forest Management (3)**

In this course, principles of forest management for sustained yield system are mainly dealt with. The methodologies of both stand-level management planning and forest-level management planning are presented. The stand-level management planning includes growth and yield modeling, management decisions, and decision criteria for managing future and current even- and uneven-aged forest stands. In the forest-level management planning, traditional forest regulation concepts, harvesting scheduling, and multiple-use management are discussed.

· **Tree Physiology (3)**

This course includes the anatomy, nutrition, metabolism and growth regulation of wood plants. Major topics are woody plant meristems, structure and function, water relations, internal carbon cycle, and growth regulation.

· **Topics in Urban Environment Design (3)**

This course will discuss designs that can improve urban environmental functions for well-being of citizens in the era of the 4th Industrial Revolution. Students also discuss the effects of improvement of urban environmental function through design.

· **Topics in Wildlife Ecology (3)**

This course will discuss quantitative analysis and interpretation of wild life ecology and management and changes in wildlife populations, communities and habitats by human impact.

· **Ecoclimate Remote Sensing (3)**

Students will learn techniques to monitor the ecology, environment and climate change using various satellite image data and investigate effective environmental information management in connection with GIS.

· **Topics in Dendrology (3)**

To develop and maximize the potentials for using trees as resources, theories on the classification and identification of trees including the issues on distribution, ecological characteristics, and usages of them are taught. Emphasis is placed on specific usages of trees as medicines, foods, ornaments, and environmental resources for further discussion.

· **Landslide Recovery and Restoration (3)**

 After a landslide, which is a forest disaster, it is crucial to prevent secondary damage through swift recovery and restoration, and quickly restore the functions of the forest. This course aims to acquire theoretical knowledge on landslide recovery and restoration methodologies and understand the process of implementing landslide recovery and restoration through field practice. Additionally, it involves discussions on landslide recovery and restoration technologies tailored to the domestic situation.

· **Landscape Ecology (3)**

 Theories on the structure, function, and development of landscapes including diverse array of ecosystems are taught and practical examples in the preservation of natural ecosystems and conservation natural resources are introduced for further discussion in restoration and rehabilitation of degraded ecosystems in Korea.

· **Plant Information and Database (3)**

 To develop and maximize the potentials for using plants as resources, theories on the conservation, protection, utilization, and preservation of them including botanical and ecological issues on the classification, identification, distribution, habits, and usages of them are taught. This course also carries out a project to collect plant-related information and database it.

· **Management of Natural Environment (3)**

 Theories on the conservation, preservation, utilization, and restoration of natural environment including diverse array of practical application are taught. The ecology and practices in the preservation of natural ecosystems and conservation natural resources are introduced for further discussion in the management, restoration, and rehabilitation of degraded ecosystems and environment in Korea.

· **Urban Environmental Management (3)**

 This course discusses the critical issues and management of urban environment and also discusses ways to make efficient use of urban environmental resources.

· **Environmental Research Methodology (3)**

 This course emphasizes the statistical applications in the field of environmental studies. The course includes lectures on the theoretical background and applications of the most popular statistical methods, and hands-on application experience based on real environmental and forestry data.

· **Intelligent Forest Environment Monitoring (3)**

 This course will discuss the concept and application of advanced methodologies for forest and environment surveys using satellites, drones, and 3D-LiDAR. It is also

aimed to enhance the ability to analyze and interpret data collected.

· **Environmental Data and Artificial Intelligence (3)**

   This course will provide the concepts and theories on the definition, types, and scope of environmental data and artificial intelligence. A variety of AI methodologies and applications for environmental data will be presented. Students will experience practical AI application with real-world environmental data, including acquisition/collection, pre-processing, and analysis.

· **Seminar on Global Disaster Policy (3)**

   This course investigates global natural disaster cases and explores policies for prevention and management to discuss the strategic direction of disaster policy implementation in South Korea.

· **Topics in Forest Engineering (3)**

   This course deals with some big issues concerning forest road, tree harvesting, mountain erosion control. Especially, it focuses on relationship of forest road with tree harvesting and mechanization, forest labor and ergonomics, hydrological and civil engineering against erosion in mountain forest area.

· **Ecospace Planning (3)**

   Forest therapy is a activity physically and spiritually promoting the human health through physiological, sensory, and mental response between human organs and various natural factors (landscape, sound, aroma, phytoncide, negative ions, light, climate, topology, etc.) in forests. This course deals with healing mechanism and application methods of elements related to forest healing and therapy.

· **Forest Genetics and Pathology (3)**

   This course is designed to understand the ecological roles of biological and environmental factors that cause the disease in forests and develop approaches for predicting, preventing, and managing tree pathogens. Methods to identify forest pathogens and examine host-pathogen interactions will be reviewed for applications to maintain forest health, sustainability, and resilience of diverse forest ecosystems.

· **Ecosystem Service and Forest Management (3)**

   Forest ecosystem service and management refers to the definition and utilization of the various values that forests provide to humankind. For the sustainability of human society and forests, it is critical to understand ecosystem service and properly evaluate its values to assist decision making. This lecture provides the fundamentals of the concept of forest ecosystem service, tools to evaluate and case studies on how this approach is applied.

· **Seminar in Ecological and Environmental Informatics (3)**

This course is a student-centric seminar focusing on collecting, pre-processing, analyzing and discussing ecological data. This lecture aims to enhance students' research capacity through comprehensive approaches and interpretation of ecological data.

· **Topics in Environmental Big Data Processing (3)**

This course will provide the concepts and theories of pre-processing and analysis of environmental big data, and cultivate the ability to analyze various big data through environmental big data analysis practice.

· **Ecosystem Function and Biodiversity (3)**

This course learns concepts and theories about ecosystem structure, function, and process. This lecture also discusses the concepts of biodiversity and the relationship between ecosystem function and biodiversity.

· **Forest Health Management (3)**

Major topics covered by the course include forest pest (disease and insect) and fire, how these factors interact with each other and their environment within forest ecosystems, and how to manage healthy forests for sustaining resilient forest ecosystems.

· **Ecological Modeling (3)**

Forest ecology consists of various components and relationships among them, and its functional characteristics are determined by the complex interactions between such components. Modeling approach is a useful tool to understand such complex systems, and to predict and/or project system behaviors, and to facilitate planning for management. This lecture will provide theoretical background and practicum for various existing modeling platforms and modeling approaches in the field of forest ecology.

· **Topics in Urban Ecology (3)**

Ecosystem service indicates the totality of the various benefits ecosystem provides to humankind. For sustainable development and ecological conservation, it is critical to understand ecosystem service and properly evaluate its values to assist decision making. This lecture provides the fundamentals of the concept of ecosystem service, tools to evaluate and model ecosystem service, and real-world examples on how this approach is applied.

· **Climate Policy and Carbon Sink (3)**

Climate change is one of the major changes we face, now and in the future. It will influence not only the atmospheric condition of the Earth, but the entirely of the ecosystem and how humans live. Due to the complexity of the phenomenon, the

outcomes of climate change can be unpredictable and complicated. This lecture explores the current research trends related to climate change and discusses effective ways to adapt and mitigate climate change through forests.

· **Statistical Modeling of Environmental Data (3)**
This course will provide important theories on spatial analysis and statistics, along with practical training on statistical tools and programming in R.

· **Green Infrastructure Analytics (3)**
Green infrastructure (GI) and nature-based solutions are now widely introduced as an effective and essential components of climate adaptation strategies and urban resilience planning. The course provides an overview of GI: (1) the concept and component of GI, (2) how GI systems work, (3) the relevant ecosystem services, and (4) GI-related policy and cases. This course will also aim to develop students' capability to analyze, evaluate, and plan GI-networks.

· **Seminar in Biological Community Data Analysis (3)**
Biological community is an assembly of species in an ecosystem and is an important component of ecosystem diversity. This class develops the ability for data collection, pre-processing and analysis of the biological community unit to understand ecosystem dynamics, and interprets and discusses the results from the analysis.

· **Urban Environment Information Seminar (3)**
This seminar explores issues and trends of studies in urban environment information, and encourages students to discuss about their own research interests and develop critical viewpoints on relevant knowledge.

· **Forest Carbon Monitoring and AI (3)**
In this class, students discuss methodologies for measuring and monitoring forest carbon based on IPCC guidelines. In addition, students develop the ability to improve the accuracy and precision of forest carbon monitoring and analysis by using AI techniques.

· **Topics in Forest Dynamics (3)**
The focus of this course is on discussing the relationship between tree growth and yield. This course deals mainly with principles of growth and yield by species and locality. Based on statistical theory, also, the methodology of developing growth and yield models is lectured throughout actual research case studies. The application method of the models will be discussed for the rational forest management.

· **Forest Disturbance and Ecological Succession (3)**
This course discusses the recovery processes of forest ecosystems affected by disturbances such as wildfires and landslides, as well as methods and technologies

to promote recovery.

· **Seminar in Carbon Sink (3)**
This course will analyze the factors and processes affecting the growth and development of the forest stand, and also comprehensively discuss the issues related to the establishment, maintenance and regeneration of the stand.

· **Ecosystem Data Science (3)**
Recent advances of IoT technologies have expanded both the extent and resolution of spatio-temporal monitoring data at the same time. However, without a good systematic understanding of the system and proper data design and analysis, more data does not necessarily lead to better science. Students will learn the theory and practical methods for system analysis and modeling backed up by data science.

· **Forest Fire Ecology (3)**
This course helps to understand the history of forest fires, trends in their occurrences, and their impacts on forest ecosystems, and conduct study on methods to manage forest fires. In addition, students will learn the restoration methods of forest fire-damaged areas and discuss the applicability of restoration methods according to the types of forest fire damage.

· **Urban Environmental Modeling (3)**
This course suggests ways to solve urban environmental problems through monitoring and modeling of various urban environmental issues such as particulate matters, atmospheric circulation, and urban heat island.

· **Climate Network Analysis (3)**
Students will diagnose contemporary climate change issues through network analysis of major issues related to climate change, and relationships between stakeholders and countires, and predict global trends and directions related to climate change. In addition, they will study links among major activities to reduce the impact of climate change.

· **Forest Disaster Management (3)**
Forest disasters such as wildfires, landslides, and pests are highly significant issues directly linked to human sustainability. This course analyzes various cases of forest disasters worldwide and examines technologies for preventing and managing forest disasters. Additionally, it involves discussions on new technologies and policies for the prevention and management of future forest disasters.

· **Landslide Prediction Modeling (3)**
Landslides, a significant forest disaster, occur due to meteorological, environmental, and human-induced factors. Predicting such landslides is crucial for preventing damage to nature and humanity, as well as enhancing human safety. This course

utilizes various models to predict landslides and discusses methods to improve the accuracy and precision of landslide prediction models.

· **Satellite and Landslide Detection Technology (3)**
This course teaches methodologies for detecting and predicting landslides using satellites and AI techniques. It also discusses the application of landslide prediction models in the context of climate change.

· **Soil Restoration and Microorganisms (3)**
The course examines microbial soil restoration technologies to stabilize ecosystems damaged by natural disasters. It also discusses methodologies to accelerate soil restoration by promoting plant growth through microbial applications.

· **AI and Physical Models (3)**
This course discusses and practices the use of physical models and artificial intelligence techniques to predict the scope and scale of natural disasters such as landslides and wildfires, which are becoming more frequent and severe due to climate change.

· **Ecosystem Stability Assessment (3)**
Ecosystems are becoming increasingly unstable due to climate change and natural disasters. This course identifies the differences between healthy ecosystems and those degraded by disturbances, discusses methods for analyzing ecosystem stability, and explores technologies to restore stability.

· **Urban Disaster Management (3)**
The course examines the causes of landslides, a major natural disaster in urban areas increasingly occurring due to climate change, and discusses technologies for their prediction and management. It also explores and discusses methodologies and case studies for their recovery and restoration.

· **Seminar on Climate Change and Natural Hazards (3)**
Through seminars with external experts, the course explores domestic and international cases of natural disasters, such as wildfires, landslides, and pest outbreaks, which are becoming more frequent and severe due to climate change, and discusses related strategies.

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