Dept. of Forest Resources

Scientific research into forest resources is essential to the economy, environment, and socio-cultural well-being of Korea, where forests cover approximately 63% of the land area. The Graduate Program in Forest Resources offers an integrative curriculum to advance the understanding, management, and conservation of forest ecosystems and the ecosystem services they provide. The program equips graduate students with advanced professional skills and a strong scientific foundation for sustainable forest resource management. The curriculum is grounded in core forest sciences—such as forest ecology, biometrics, tree physiology and pathology, forest management, and forest policy—while integrating cutting-edge technologies, including Artificial Intelligence (AI), Big Data analytics, satellite remote sensing, and Geographic Information Systems (GIS). Through this balanced and data-driven approach, graduate students are prepared to address key challenges such as climate change adaptation and mitigation, forest disaster management, and carbon sink assessment, and to pursue successful academic and professional careers at national and global levels.

☐ 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. This course is an integrated undergraduate–graduate course.

· 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. This course is an integrated undergraduate–graduate course.

· Topics in Environmental GIS (3)

Students will learn advanced GIS analysis techniques and their applications to decision-making for sustainable forest management. This course is an integrated undergraduate–graduate course.

· **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.

· **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.

· **Climate-adaptive Forest Health Management (3)**

This course addresses theories and practical approaches for managing forest health under the increasing threats of climate-induced disturbances such as wildfires, pest outbreaks, and droughts. Students will learn concepts of climate-adaptive forest management, forest health assessment indicators, disturbance monitoring and prediction techniques, and restoration strategies to maintain sustainable and resilient forest ecosystems.

· **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.

· **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. This course is an integrated undergraduate–graduate course.

· **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.

· **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.

· **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.

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

This course examines global case studies of natural disasters and explores disaster prevention and management policies in Korea and other countries. Based on this analysis, students discuss strategic directions for developing and implementing effective disaster management policies at national and international levels.

· **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. This course is an integrated undergraduate–graduate course.

· **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. This course is an integrated undergraduate–graduate course.

· **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. This course is an integrated undergraduate–graduate course.

· **Landslide Prediction Modeling (3)**

Landslides are caused by meteorological, environmental, and anthropogenic factors. Accurate prediction of landslide occurrence is essential for preventing damage to natural and human systems and for enhancing public safety. This course introduces a range of models for landslide prediction and discusses approaches to improving the accuracy and precision of landslide prediction models. This course is an integrated undergraduate–graduate course.

· **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. This course is an integrated undergraduate–graduate course.

· **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. This course is an integrated undergraduate–graduate course.

· **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. This course is an integrated undergraduate–graduate course.

· **Restoration Plant Ecology (3)**

This course explores the ecological functions and roles of plants used in the restoration of areas affected by natural disturbances such as wildfires, landslides, and pest outbreaks. Students will learn about the functional traits, adaptive strategies, and application cases of restoration plants, and discuss sustainable approaches for effective vegetation recovery and management.

· **Environmental Data and AI Analysis Techniques (3)**

This course covers advanced AI and machine learning techniques for analyzing large-scale environmental data in forest management. Students will explore deep learning algorithms to model complex environmental variables and develop data-driven decision-making skills for climate change response. This course is an integrated undergraduate–graduate course. This course is an integrated undergraduate–graduate course.

· **Urban Hazards and Ecological Space Design (3)**

This course introduces design principles and planning techniques for ecological spaces that enhance resilience to climate-related disasters, including heatwaves, heavy rainfall, wildfires, and landslides. Topics include ecological space design concepts, disaster-mitigating blue–green infrastructure, nature-based solutions (NbS), and restorative and adaptive design approaches applied in urban and forest environments.

· **Soil Restoration and Bio-materials (3)**

This course focuses on bio-based materials and biological approaches for soil restoration. Students will study the principles and applications of natural amendments such as biopolymers, fungi, bacteria, biochar, biocrust and organic materials, and explore their effects on improving soil structure, enhancing microbial activity, reducing contamination, and promoting ecological recovery. This course is an integrated undergraduate–graduate course.

· **Ecosystem Functioning and Disturbance Resistance (3)**

Ecosystem multifunctionality is a key factor in maintaining the overall balance and stability of ecosystems. This course explores how such functional balance enhances ecosystem resistance and resilience to natural hazards. In addition, students will analyze and discuss the interactions among various ecosystem functions, the role of biodiversity in sustaining them, and the functional recovery mechanisms of ecosystems following disturbances or disasters. This course is an integrated undergraduate–graduate course.

· **AI and Application for Forest Disasters (3)**

This course provides foundational knowledge of artificial intelligence, including core

principles, model optimization, and validation methods. Students engage in two series of presentations: one examining the underlying mechanisms of advanced AI technologies, and another analyzing case studies that apply these techniques to forest disasters such as wildfires and landslides. Through this process, the course aims to develop practical competencies in applying AI to diagnose, mitigate, and analyze forest disaster challenges. This course is an integrated undergraduate–graduate course.

· **Forest Disaster Engineering (3)**

This course establishes the fundamental theories of geotechnical engineering, hydrology, and fluid mechanics required to analyze landslides and slope stability. Students will learn the classification and kinematic mechanisms of various landslide types and master quantitative methods for slope stability analysis (SSA), hazard and risk assessment, and mitigation engineering design. Ultimately, this course builds students' advanced engineering capacity to diagnose and solve complex, real-world landslide problems.

· **Forest Micrometeorology (3)**

This course explores the role of forest microclimates in driving the occurrence and impact of forest hazards like landslides and wildfires. Students will master the principles of microclimate formation—including energy balance, hydrology, and wind dynamics—along with their spatiotemporal characteristics and field measurement techniques. The course reviews microclimate-based science and technology for predicting and mitigating hazards, ultimately seeking to link these concepts with forest restoration, biodiversity management, and ecosystem modeling.

· **Innovative Forest Disaster Survey Technology (3)**

This course covers survey techniques that can respond to the increasing forest disasters caused by climate change, utilizing cutting-edge technologies such as artificial intelligence, satellite imaging, and LiDAR. Specifically, students will understand methodologies for integrating cutting-edge technologies into various survey processes to respond to landslides and forest fires, and learn about their principles and characteristics through data analysis.

· **Forest Disaster and Tree Responses (3)**

This course addresses how increasing forest disturbances driven by climate change and human activities (e.g., drought, heat, wildfire, landslides, diseases, and insect pests) affect tree physiological processes and responses at the individual and community levels. It explores mechanisms of key physiological processes—photosynthesis, respiration, water transport, and carbohydrate metabolism—and discusses how these processes are altered by disturbance events and their ecological consequences.

· **Urban Complex Infrastructure and AI-based Disaster Management (3)**

This course studies modeling and analyzing the interactions between complex components (green, blue, and grey infrastructure) of urban system and human activities (i.e., population and mobility) using AI-based techniques. Learning and developing modeling tools for responding to urban disasters in the face of climate change and smart management of related risks are the primary interest.

· **AI-based Multimodal Habitat and Restoration Analysis (3)**

This course studies advanced techniques for habitat analysis based on multisensing technolgoies, such as multi-spectral imagery from various platforms, LiDAR, and ground-based sensors. In particular, AI-based multimodel data fusion, quantification and modeling of habitat quality and species distribution, and recovery from disasters will be of primary interest.

☐ Faculty Members

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