University of Derna
Faculty of Natural Resources and Environmental Sciences
Department of General Orientation
Study Plan

The Courses for the Department of Environmental Sciences
First Year

Autumn Semester

No	Course Title	Units
AR 103	Arabic Language	2(0-2)
ZO 021	General Zoology	3(3-2)
CH 011	General Chemistry	3(3-2)
MA 011	General Mathematics	3(3-2)
EL 011	English Language 1	2(0-2)
64105	Introduction To Natural Resources	3(3-2)
EC 110	Principles of Economics	3(0-3)
Total Units		19

Spring Semester

No	Course Title	Units
PH 011	General Physics	3(3-2)
CH 351	Analytical Chemistry	3(3-2)
BO 021	General Botany	3(3-2)
62152	General Ecology	3(3-2)
ET 011	Environmental terms	2(0-2)
ST 011	Principles Statistics	3(3-2)
CS 011	Computer Science	2(0-2)
Total Units		19

Syllabus of General Orientation Department Courses

Arabic Language	2 (0-2)- AR103

Arabic Grammar and Morphology. Rhetorical Styles. Written Expression Skills. Analytical Reading of Literary Texts. Linguistic Applications in Scientific Writing

General Zoology	3 (3-2) ZO 021

Classification of the Animal Kingdom. Internal and External Anatomy. Major Body Systems. Reproduction. Animal Diversity. Ecological and Economic Significance

General Chemistry	3 (3-2) - CH 011

Atoms and Elements. Chemical Bonds. Reactions and Equations. Solutions. Acids and Bases. Thermodynamics. Introduction to Organic Chemistry

General Mathematics	3 (3-2) - MA 011

Algebra. Equations. Functions. Differential and Integral Calculus. Matrices. Basic Statistics. Mathematical Applications in Environmental Sciences

English Language 1	2(0-2) 1 - EL 011

Basic Scientific Vocabulary. Reading and Comprehension. Grammar. Academic Writing Skills. Conversation and Listening within Scientific Contexts

Introduction To Natural Resources	3(3-2) -64105

Introduction. General concepts and definitions. Classification of natural resources. Importance and future of resources. Water and its sources. Marine resources, wildlife, and overfishing. Forests. Rangelands. Agricultural lands. Soil, its importance, and classifications. Study of oil and natural gas. Study of coal. Study of important mineral ores. The importance of oil, natural gas, coal, and mineral ores in the economy. Natural resources and the environment.

Principles of Economics	3 (0-3) - EC 110

General Economic Concepts. Supply and Demand. Production. Consumption. Market and Prices. Economic Policies and Their Relationship to the Environment

General Physics	3 (3-2) - PH 011

Mechanics. Energy. Heat. Electricity and Magnetism. Light. Sound. Applications in Resources and the Environment

Analytical Chemistry	3 (3-2) - CH 351

Gravimetric and Volumetric Analysis. Qualitative and Descriptive Analysis. Titration Techniques. Use of Analytical Instruments in the Laboratory

General Botany	3 (3-2) - BO 021

Plant Anatomy. Plant Physiology. Classification. Reproduction. Relationship with the Environment. Importance of Plants in the Ecosystem

General Ecology	3 (3-2) -62152

General Concepts. Ecology and ecosystem models. Energy flow. Various cycles and their impact. Effects of the surrounding environment. Formation of ecosystems. Characteristics, growth, and composition of populations and the relationships between them. Different terrestrial and aquatic ecosystems. Individual behavior and the organization of ecosystems. Population dynamics and the organization of biological communities. General concepts on surveying and measuring different ecosystems. Ecosystems in Libya and the Green Mountain (Al Jabal al Akhdar).

Environmental terms	2 (0-2) - ET 011

Scientific Terminology in Arabic and English related to the Environment. Using Scientific Dictionaries. Translation of Scientific Terms. Environmental Translation Skills

Principles Statistics	3 (3-2) - ST 011

Data and its Types. Measures of Central Tendency. Dispersion. Probability Distributions. Correlation and Regression. Statistical Applications in Environmental Sciences

Computer Science	2 (0-2) - CS 011

Computer Components. Operating Systems. Word Processing and Spreadsheet Software. Internet and Scientific Research. Introduction to Programming

University of Derna
Faculty of Natural Resources and Environmental Sciences
Department of Forestry and Rangeland.
Study Plan

Courses of the Department of Forestry and Rangeland

Second year

Autumn semester

No	Course Title	Units
62251	Introduction to Climatology	3(0-3)
64108	General Geology	3(0-3)
62192	Environmental Pollution	3(3-2)
CH 231	Organic Chemistry	3(3-2)
61208	Introduction Entomology	3(3-2)
62248	Plant Classification and anatomy	3(3-2)
64345	Ground Survey and Photogrammetry	3(3-2)
61276	Principles of Forestry	3(0-3)
Total Units	24	

Spring semester

No	Course Title	Units
61322	Forest Entomology	3(3-2)
62273	General Microbiology	3(3-2)
CH 241	General Biochemistry	3(3-2)
	Genetics General	3(3-2)
62212	Principles of Soil Science	3(3-2)
61263	Principles of Range Science	3(0-3)
62271	Plant Ecology	3(3-2)
62610	Elements of Meteorology	3(3-2)
Total Units	24	

Third Year

Autumn semester

No	Course Title	Units
61312	Principles of Biodiversity	3(0-3)
61330	Forest Protection	3(3-2)
61334	Range Ecology	3(3-2)
62344	Principles of Sustainable Development	3(0-2)
61382	Range Measurements	3(3-2)
61302	Plant Physiology	3(3-2)
EC 217	Research Methodology	2(0-2)
Total Units	20	

Spring semester

No	Course Title	Units
61382	Forest Measurements	3(3-2)
61352	Parks and Recreation	3(0-3)
64391	Remote Sensing Fundamentals of	3(3-2)
AG 205	Experimental Design	3(3-2)
61389	Range Management	3(3-2)
61340	Forest Dendrology	3(3-2)
61391	Principles of Silviculture	3(3-2)
Total Units	21	

Fourth Year

Autumn semester

No		Course Title	Units
61402		Forest Management	3(3-2)
61411		Waters Resources Management	3(3-2)
61421		Forest Ecology	3(0-3)
61418		Tree Physiology	3(3-2)
61452		Technical Methods in Range Management	3(3-2)
61333		Range Land Sawing	2(4-1)
NL100		National Culture	2(0-2)
61492		Seminar	1(4-0)
Total Units		20	

Spring semester

No		Course Title	Units
61442		Agroforestry	3(0-3)
61426		Wood Technology	3(3-2)
61408		Wildlife Ecology Management	3(3-2)
61486		Forest Products	3(3-2)
64321		Geographical Information System	3(3-2)
61493		Forest Sampling	3(4-2)
61445		Independent Study	2 (0-2)
Total Units		20	

Syllabus of Forestry and Rangeland Department Courses

Introduction to Climatology — 3 (0-3) - 62251

Prerequisite: Elements of Meteorology.

Importance of Climatology and its Relation to Other Sciences. The Atmosphere: Components and Applications. Radiative and Thermal Balance. Calculation of Temperature Averages. Wind: Types and Characteristics. Various Wind Cycles. Precipitation. Climate Types and Characteristics. Local Climate. Climate Classifications and Changes.

General Geology — 3 (3-2) - 64108

Prerequisite: General Environment.

General Introduction. Importance of Geology and various Geological Sciences. The Earth's main Spheres and the Solar System. Plate Tectonics Theory. Origin of Continents and Oceans. Introduction to Minerals, Crystals, and the Physical Properties of Minerals. Volcanoes and Earthquakes. Study of Different Rock Types (Igneous, Sedimentary, and Metamorphic). Evolution of Life. Study of Fossils. The Geological Time Scale (Geologic Column).

Practical: Includes the identification of minerals and different types of rocks

Environmental Pollution — 3 (0-3) - 62292

Prerequisite: General Ecology or Fundamentals of Environmental Science.

Principles of Environmental Pollution: General Definitions. Types of Pollution. Causes. Sources. Gases and Compounds Causing Pollution. Acid Rain. Agricultural Land Pollution. Food Contamination. Waste and its Categories. Noise Pollution. Effects of Pollution. Marine Pollution. Different Measurements. Resistance to Pollution. Economics of Pollution. Specialized Organizations. Local Laws.

Organic Chemistry — 3 (3-2) - CH 231

Prerequisite:

Introduction and definition of biochemistry - aliphatic hydrocarbons - aromatic hydrocarbons and their derivatives - alcohols, phenols, and ethers - aldehydes and quinones - carboxylic acids - amines - carbohydrates.

Introduction Entomology 3 (3-2) - 61208

Prerequisite: General Zoology

General Introduction. Description and internal anatomy of the insect. Functions of different organs. Body appendages, their functions, and modifications. Insect life cycle. Insect orders. Insects and other organisms. Important insect pests and their control. Beneficial insects. Weekly Applications.

Plant Classification and Taxonomy 3 (3-2) - 62248

Prerequisites: General Botany

Scientific Description of Plants and Terminology Used: Orders and Families. Gymnosperms and Angiosperms. Characterization of Flowering Plant Families. Principles of Classification of Families and Species. The Relationship Between Classification and the Environment. Scientific Nomenclature. Methods of Specimen Collection and Preservation, with Emphasis on Important Species. Anatomical Structure of Different Plant Parts. Monocots and Dicots. Study of Structural Evolution. Emphasis on Microscopic Study, and the Collection and Identification of Species.

Ground Survey and Photogrammetry 3 (3-2) - 64345

Prerequisite: Geographic Information Systems.

General Introduction. Plane Surveying. Measurements of Distances, Directions, and Bearings. Vertical Distance Measurement. Instrumentation and its Applications. Aerial Photography and Aerial Image Production. Classification of Aerial Photographs and their Geometric Characteristics. Plotting Survey Information, Map Representation, and Map Handling. Applications of Instrumentation. Satellite Imagery and Geographic Information Systems and their Importance for Natural Resource Studies (Primarily offered to other departments).

Principles of Forestry 3 (0-3) - 61276

Prerequisite: General Botany.

General Introduction**.** Classification and division of microorganisms. Distribution and importance. Fungi. Algae. Protozoa. Viruses. Bacteria. Bacterial morphology and internal anatomy. Bacterial division, cultivation, and types of media. Reproduction and nutrition. Soil microbiology and its role in chemical transformations. Carbon, nitrogen, and sulfur cycles. Importance of mycorrhizae and bacteria for trees. Economic importance of microorganisms. Environmental microbiology, applications.

Forest Entomology — 3(3-2) - 61322

Prerequisites: General Entomology
Introduction to Entomology, the importance of tree pests, oak pests, pine pests, cypress pests, terebinth pests, fruit tree pests, and insect pests of manufactured wood.

General Microbiology — 3 (3-2) - 62273

Prerequisite: General Botany.

General Introduction. Classification and division of microorganisms. Distribution and importance. Fungi. Algae. Protozoa. Viruses. Bacteria. Bacterial morphology and internal anatomy. Bacterial division, cultivation, and types of media. Reproduction and nutrition. Soil microbiology and its role in chemical transformations. Carbon, nitrogen, and sulfur cycles. Importance of mycorrhizae and bacteria for trees. Economic importance of microorganisms. Environmental microbiology, applications.

Biochemistry — 3(3-2) - CH 241

Prerequisites: General Chemistry
Introduction and definition of biochemistry - Carbohydrates - Lipids - Amino acids - Peptides, proteins, and enzymes - Introduction to nucleic acids - Introduction to vitamins - Introduction to hormones - Definition of metabolism, its types, and pathways in animals and plants - Carbohydrate digestion and metabolism and glycolysis - Krebs cycle - Glucose synthesis from non-carbohydrate sources - Glycogen synthesis and breakdown - Oxidation of fatty acids and energy production - Cori cycle and oxidation of individual fatty acids - Digestion and metabolism of proteins.

Genetics General — 3(3-2)

Prerequisites:

Introduction to the fundamentals of genetics, Mendelian inheritance, deviations from Mendel's laws, lethal genes and multiple alleles, quantitative genetics, sex determination and sex-linked traits, linkage and genetic crossover and genetic maps, cytoplasmic inheritance, population genetics, deoxyribonucleic acid (DNA), ribonucleic acid (RNA), mutations, biotechnology and genetic engineering.

Principles of Soil Science — 3 (3-2) - 62212

Prerequisite: General Chemistry. General Geology.

General Introduction. Various Soil Sciences. Importance of Soil as a Natural Resource. Definition of Soil. Physical Properties of Soil. Mineral and Chemical Properties. Principles of Different Soil Measurements. The Role of Soil in Plant Nutrition. Soil Microorganisms and Their Importance. Soil Division and Classification. The Relationship Between Human Activities and Soil. The practical component includes various soil measurements, such as soil water, air, and organic matter. It also covers the instruments used for measuring soil water.

Principles of Range Science — 3 (0-3) - 61201

Prerequisite: General botany. General ecology.

Ranges and their relationship to other sciences. Objectives and importance of rangeland science. Classifications and characteristics of grazing lands. Types of natural rangelands. Rangelands and the environment. Species and forms of the most important grazing plants. Principles of grazing land management and use. Establishment, renewal, and maintenance. Palatability. Grazing load. Rangelands in Libya.

Plant Ecology — 3 (3-2) - 62271

Prerequisite: General Ecology. General Botany. Principles of Statistics.

General Introduction: Plant communities: their distribution, variation, and relationship to environmental conditions. Study and analysis of plant communities: sampling and transects. Competition and succession. Nutrient and water cycles in ecosystems. Energy flow. Plant communities as a reflection of environmental conditions. Divisions of different habitats for local plant communities. Applications of analyzing and measuring plant communities.

Elements of Meteorology — 3 (3-2) - 62610

Prerequisites: General Physics. General Mathematics.

General Concepts: Air Masses. Fronts. Clouds. Fog. Atmospheric Humidity. Cyclone Waves. Thunderstorms. Precipitation. Air Pollution. Weather Forecasting.

Practical component: Includes training on various meteorological instruments.

Principles of Biodiversity — 3 (3-2) - 61312

Prerequisites: Plant environment.

Patterns of biodiversity and associated factors. Its genetic basis. Speciation. Its relationship to time and space. Assessment of species diversity. Theories of species diversity. Mechanisms controlling diversity at spatial and temporal scales. Endemism and species invasion. Origination and extinction. Diversity in marine systems. Diversity and fires. Diversity in tropical and other ecosystems. Economics of biodiversity. Altruistic behavior and living in groups. Mating behavior. Estimation of biodiversity and different theories. Principles of biodiversity measurement methods.

Forest Protection — 3 (3-2) - 61330

Prerequisites: General Entomology. Plant Pathology. Forest Science Fundamentals.

Course Content: General Introduction. Diseases and Insects of Important Forest Trees. Biological and Chemical Control. Diseases and Insects of Economic Trees in Libya. Natural Environment Diseases. Forest Fires: Causes, Types, Control, and Impact Reduction. Natural Fires and Their Ecological Role. Pollution, Grazing, Negative Human Activities and Their Environmental Impact.

Practical Component: Includes forest surveys and the identification of burned areas, studying the impact of fires on vegetation cover. Surveying infested areas.

Princ. of Sustainable Development — 3 (0-3) - 61344

Prerequisites: Fundamentals of Forest Science. Plant Ecology.

General Introduction: Definition and Significance of Sustainable Development. Improvement of Living Conditions. Sustainability of Natural Resources and Environmental Conditions. Ecosystem Protection. Global Agreements on Sustainable Development. Development and Compliance with Agreement Terms. Methods of Applying Sustainable Development to Local Natural Resources.

Range Measurements — 3 (3-2) - 61381

Prerequisites: Natural Resource Measurements.

General Introduction: Significance. Mathematical Foundations of Range Measurement. Measurement of Diameter, Height, Form, and Volume. Range Measurement Laws. Yield Measurement, Including Age and Growth Potential. Volume and Yield Tables. Site Index. Application of Simple Regression with Range Data. Field Applications and Problems on Measurement Instruments.

Plant Physiology — 3 (3-2) - 61302

Prerequisite: General Botany.

General Introduction: Introduction to Tissue Structure. Cell Structure. Diffusion, Water Potential, and Osmosis. Transpiration and Ascent of Sap. Absorption and Translocation of Mineral Salts. Enzymes, Proteins, and Amino Acids. Photosynthesis. Carbon Dioxide Fixation and Hydrocarbon Synthesis. Photosynthesis, Environmental Factors, and Respiration. C3, C4, and CAM Plants and Their Physiological Processes. Measurement of Different Physiological Activities. Weekly Applications Using Various Experiments.

Research Methodology — 2 (0-2) - EC 217

this course includes an introduction to scientific research, its methodologies, and methods of preparing scientific research papers

Forest Mensuration — 3 (3-2) - 61382

Prerequisites: Natural Resource Measurements.

General Introduction: Significance. Mathematical Foundations of Tree Measurement. Measurement of Diameter, Height, Form, and Volume. Forest Mensuration Laws. Yield Measurement, Including Age, Growth Potential, Number of Trees, and Volume. Volume and Yield Tables. Site Index. Application of Simple Linear Regression with Forest Data. Field Applications and Problems on Instruments Used for Measuring Diameter, Length, Volume, and Others.

Parks and Recreation — 3 (0-3) - 61352

Prerequisites: General Ecology. Fundamentals of Forest Science.

Concept of Recreation: Natural Parks. Urban Parks. Impact of Recreation on Parks. Recreation Site Planning. Public Gardens and Nature Reserves. Importance of Recreation for Human Societies. Tangible and Intangible Values of Recreation. Tangible Returns of Recreation. Environmental, Economic, and Social Considerations for Park and Recreation Planning. Positive and Negative Impacts of Recreation and Parks.

Principles of Remote Sensing — 3 (3-2)64391-

Prerequisite: Geographic Information Systems.

General Introduction: Definition and Methods of Remote Sensing. Acoustic, Electromagnetic, and Stratified Configurations with their Various Wavelengths. Focus on its Application Methods in the Field of Environment and Various Natural Resources. Data Collection and Database Creation. Map Production.

Experimental Design — 3 (3-2) - AG 205

Prerequisite: Principles of Statistics.

General Introduction: General Definitions. Hypothesis Formulation and Testing (chi-square, $\chi 2$, t, F, and ANOVA). Sampling and Sample Collection. Experimental Designs (Completely Randomized Design, Randomized Complete Block Design, Latin Square Design, Factorial Designs). Comparisons Between Means (Least Significant Difference, Duncan's Multiple Range Test, Tukey's Honestly Significant Difference).

Range Management — 3 (3-2) - 61389

Prerequisites: Plant Ecology. Fundamentals of Range Science.

General Concepts: Rangelands as Renewable Natural Resources. Grazing Lands in Libya and Their Characteristics. Methods for Rangeland Assessment. Grazing Animals, Wildlife, and Water Resources in Natural Rangelands. Vegetation Cover. Rangeland Problems. Sustainable Development and Multi-Purpose Management in Natural Rangelands.

Forest Dendrology — 3 (3-2) - 61340

Prerequisites: Fundamentals of Forest Science. Plant Taxonomy and Anatomy.

General Introduction to Tree Evolution Through Geological History**.** Introduction to Plant Taxonomy and its Relation to Tree Classification. Tree Structure and Function: Reproduction; Growth; Anatomy; Morphology. Tree Physiology. Tree Ecology and Evolution. Life Cycle of Conifers and Broadleaf Trees. Important Species in Al Jabal Al Akhdar and How to Distinguish Between Them Morphologically and Anatomically. Growth Rings and Their Significance.

Practical component includes: Taxonomy and Species Identification, and the Study of Growth Rings.

Principles of Silviculture — 3 (3-2) - 61391

Prerequisites: Fundamentals of Forest Science. Forest Measurements.

General Introduction: Important Concepts Regarding the Establishment, Growth, and Quality of Forest Stands. Principles of Forest Tree Improvement. Methods of Seed Collection and Handling. Nursery Operations and Artificial Propagation. Natural Regeneration and Methods of Stand Management such as Thinning, Pruning, Fertilization, and Site Preparation for Afforestation. Different Forest Management Systems, such as Various Harvesting Methods and Their Rationales (e.g., Thinning, Clear-cutting, Seed Tree Cutting, etc.). The Relationship Between Forest Management Systems and Economic Aspects, Wildlife, Biodiversity, and Sustainable Development.

Practical Component: Includes Field Training in Natural Forest Stands. Identification of Various Operations in Forest Nurseries.

Forest Management — 3(3-2) - 61402

Prerequisites: Forest Measurements. Forest Development.

Benefits of Forests: Continuous Production. Forest Management Periods. Administrative Division of Forests. Site Quality. Annual Increment of Timber. Various Schedules. Timber Volumes. Stand Protection. Silvicultural Plan. Harvesting Plan. Evaluation of the Management Plan. Investment and Return. Management for Recreational Purposes and Wilderness Areas. Computer-based Exercises and Applications.

Watershed Management — 3 (3-2) - 61411

Prerequisites: Fundamentals of Soil Science. General Ecology. Principles of Meteorology.

General Introduction to the Hydrological Role of Soil and Vegetation Cover**.** The Role of Topography, Climate, and Vegetation Cover on the Functions of Catchments. Impact of Land Uses on Runoff Volumes. Water Storage and Movement in Soil. Evaporation. Transpiration. Erosion and Sedimentation. Confluences of Watercourses. Terraces, Dams, and Mountain Ridges. Water Balance. Catchment Planning. Hydrological Impacts of Fires. Management of Vegetation Cover and Water Yield. Forests and Their Impact. Management of River Basin Resources. River Basin Management Planning. Methods Used in Monitoring and Evaluating the Impact of Land Management on Water Resources.

Forest Ecology — 3 (0-3) - 61421

Prerequisites: Fundamentals of Soil Science. Principles of Meteorology. Plant Ecology.

Structure and Functions of Forest Ecosystems: Interaction of Different Factors. Ecosystem Change Over Time. Environmental Impact. Various Processes Affecting Forest Ecosystems. Spatial Variations in Forest Ecosystems and Methods of Description. Identification and Explanation of Indicator Terrestrial Plants and Their Relationship to Forest Ecosystems. Predicting Ecosystem Response to Natural and Anthropogenic Disturbances. Different Ecosystems in the Al Jabal al Akhdar Forests.

Tree Physiology — 3 (3-2) - 61418

Prerequisites: Fundamentals of Forest Science. Plant Physiology.

Importance and Role of Physiology: Parts of Woody Plants. Structure and Characteristics of Tree Growth. Different Types of Growth. Different Cell Types and How a Tree Grows. Photosynthesis, Respiration, and Associated Processes. Other Vital Processes. Mechanisms and Pathways of Water Transport. Physiology of Seeds, Seedlings, and Growth Stages. Conifers and Broadleaves: Their Growth and Life Cycles. Growth Regulators. Internal and External Factors Affecting Tree Growth and Forms.

Technical Methods in Range Management — 3(3-2) - 61452

Prerequisites: Range Management.

Methods for Studying Forage Plants: Descriptive and Quantitative Measurements of Forage Plants. Pasture Sampling. Pasture Analysis. Pasture Mapping. Utilization Rate Estimates. Use of Exclosures and Fixed Study Plots.

Range Land Sawing — 2(4-1) 61496

provides a comprehensive understanding of the principles and practices involved in successfully establishing seedlings on various land types. It delves into the ecological, physiological, and practical aspects of seed biology, germination, seedling development, and the environmental factors influencing establishment success. Students will gain knowledge of site assessment, seed selection, sowing techniques, post-planting care, and strategies for overcoming common challenges in seedling establishment for ecological restoration, forestry, agriculture, and land management purposes.

Seminar — 1(4 –0) - 61492

The student prepares a topic of interest for study under the supervision of a faculty member. This can constitute a special study course. The objective of this course is to train students in the preparation and presentation of seminars.

Agroforestry — 3 (0-3) - 61442

Prerequisites: Forest Development.

Introduction: General Concepts and Definitions, Initiation and Evolution of Agroforestry Systems. Characteristics and Features of Agroforestry. Production Assessment. The Reality of this System in Arid Regions and its Role in Rural Development, Food Security, and Environmental Protection. Its Importance in the Al Jabal Al Akhdar (Green Mountain) region.

Wood Technology — 3(3-2) - 61426

Introduction and definitions of scientific terms related to softwoods and hardwoods. General characteristics of wood. Physical characteristics of wood and their relationship to wood uses. Forest tree growth, physiology of wood formation, stages of wood formation, and the concept of wood quality. Anatomical structure of softwoods and hardwoods. Chemical composition of softwoods and hardwoods. Physical and mechanical properties of wood and their definition. Drying and preservation of wood.

Wild life Ecology and Management — 3 (3-2) - 64325

Prerequisite: General Environment.

General Introduction. The Interrelationship Between the Environment and Wildlife. Adaptation of Wildlife to Their Environments. The Impact of the Environment.

Conservation and Preservation of Wildlife. Natural Reserves and Their Importance for Wildlife. Methods of Wildlife Census and Survey. Wildlife and Its Various Types. The Role of Sustainable Development in Wildlife Management.

Forest Products — 3 (3-2) - 61486

Prerequisites: Wood Technology.

General Properties of Wood. Production of Wood and Other Traditional Products. Wood Extraction and Transportation. Sawn Timber and Round wood. Sawing Methods. Production and Drying. Wood as an Energy Source and Charcoal Production. Wood Chip and Plywood Industry. Composite Board Industry (Fiberboard and Particleboard). Pulp and Paper Industry. Non-Wood Forest Products. Forest Conservation Policy.

Geographical Information System — 3 (3-2) - 64321

Prerequisite: Meteorology.

General Introduction. Fundamentals of the Uses and Importance of Geographic Information Systems (GIS). Analysis Techniques. Methods of Computer-Based Utilization for the Purpose of Displaying and Analyzing Natural Resources Data. Sources of Spatial Information and Methods of Data Acquisition. Data Structure, Analysis, and Patterns. Applications in Natural Resources Management and Environmental Issues.

Forest Sampling — 3(3-2) - 61493

Prerequisite: Forest Measurements.

General Introduction. The Concept of Forest Inventory. Statistical Introduction. Types of Samples. Sampling Challenges in Natural Resource Populations. Types of Samples and Their Different Collection Methods and Calculations. Analysis and Interpretation of Samples. Principles of Using Samples in Forests and Stands. Growth and Yield Prediction. Application of Simple and Multiple Regression and Sampling Techniques. Natural Regeneration Survey. Principles of Resource Inventory. Field Applications.

Independent Study — 2 (4-0) - 61445

The student selects a research topic of interest for field or laboratory study under the supervision of a specialized faculty member. This research may extend until the end of the spring semester.