

MASTER OF SCIENCE IN NATURAL RESOURCES AND ENVIRONMENT

College of Education, Administrative & Technical Studies | Centre of Environmental & Biological Studies

An interdisciplinary program focusing on environmental management, water, and agriculture across the GCC region through scientific integration.

1. Specialization Overview

Specialization	Focus	Starting Page
Environmental Management	This specialization aims to meet GCC countries' needs for skilled human resources capable of managing environmental challenges. It equips students with the essential competencies to protect natural resources from exploitation and actively contribute to sustainable development across diverse organizational settings.	Page 2
Water Resources Management	This specialization addresses the sustainability and security challenges of the water sector in GCC countries using an integrated management approach—an approach that considers both physical (quantity and quality) aspects as well as the social, economic, environmental, and governance aspects of the water management system.	Page 5
Desert Farming Techniques and Soilless Agriculture	This specialization focuses on tackling GCC food security issues caused by water scarcity, poor soils, and a harsh, arid climate. Through innovations like desert farming and soilless agriculture, it trains students to handle the critical links between water, energy, and food to meet sustainable development goals.	Page 9

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Specialization 1: Environmental Management

Specialization Credit Hours: 38

1. Specialization Overview

Economic growth and social development are two intertwined objectives of all societies. Achieving these two objectives and sustaining the outcomes of invested funds and exerted efforts requires special attention to protecting natural resources from exploitative use and waste. The sole purpose of Environmental Management is to safeguard natural and environmental resources and ensure sustainable development at large. This specialization aims to meet the needs of GCC society for skilled human resources capable of dealing with the challenges of sound environmental management and actively contributing to sustainable development. Through its well-planned courses, the specialization is designed to provide its students with the skills, knowledge, and competencies in environmental management needed to function effectively in diverse organizational settings engaged in the field.

2. Study Plan

Course Code	Course Title	Credit Hours
Semester 1		
GSTS 510	Scientific Writing	1
NRE 521	Water Resources Development and Management in Arid Regions	2
NREEM 510	Global Environmental Issues	1
NREEM 521	Management of the Marine Environment	2
NREEM 522	Environmental Management Systems	2
NREEM 523	Project Management	2
NREEM 532	Environment and Sustainable Development	3
Total Credit Hours		13
Semester 2		
GSTS 520	Research Methods	2

Course Code	Course Title	Credit Hours
GSTS 521	Applied Statistics	2
NRE 520	Environmental Impact Assessment	2
NREEM 530	Waste Management and Pollution Abatement	3
NREEM 525	Environmental Economics	2
NREEM 526	Energy Resources Management	2
	Elective Course*	2
Total Credit Hours		13 or 15
Semester 3		
NREEM 524	Environmental Policy Making	2
	Elective Course*	2
NREEM 680	Master Thesis	8
* The elective course may be taken in Semester 2 or 3.		
Total Credit Hours		10 or 12
Semester 4		
NREEM 680	Master Thesis	8
Total Specialization Credit Hours		38

3. Course Descriptions

NREEM 510 - Global Environmental Issues - 1 CR

Seminar on the particular topic of contemporary global human-environment relationship.

NREEM 521 - Management of the Marine Environment - 2 CR

Terminology and concepts in marine ecology, groups of marine organisms, assessment of water and sediment quality, management of marine habitats, anthropogenic pollutants and their control, management of marine communities, sustainable development of the marine environment, marine environmental legislation and laws.

NREEM 522 - Environmental Management Systems - 2 CR

Concept of an Environmental Management Systems, the EMSs importance of firms and global level, recycling, clean production mechanism, life cycle assessment of a product, the role of EMS in environmental management, international environmental systems, Procedures to implement and operating EMS programs.

NREEM 523 - Project Management - 2 CR

Framework, quantitative methods, scope, time, cost, quality; human resources, communication, risk, procurement, integration, and professional responsibility.

NREEM 524 - Environmental Policy Making - 2 CR

The Political, legal, and social context of policy and policymaking, policy analysis, stakeholder identification and their role, policy instruments, implementation, and impacts of policies, decision-making process.

NREEM 525 - Environmental Economics - 2 CR

Microeconomic theory and analysis in resource management and use decisions, valuing environmental resource degradation.

NREEM 526 - Energy Resources Management - 2 CR

Energy and development, the environmental impact of energy generation and use, energy policies, fossil fuel energy, renewable energy resources, consumption and conservation of energy types; energy use and energy efficiency, calculation of national energy balance.

NREEM 530 - Waste Management and Pollution Abatement - 3 CR

Introduction to environmental pollution, environmental, socioeconomic and health impacts, management of pollution, the role of legislation and environmental conventions in pollution control, wastewater, and solid waste management, air quality management, the technology of pollution control.

NREEM 532 - Environment and Sustainable Development - 3 CR

Earth's ecosystems, issues, and topics related to relationships between human populations and natural resources, strategies for sustainable management of the environment and natural resources.

NREEM 680 - Master Thesis - 8 CR

A student is expected to provide satisfactory evidence indicating a good grasp of all the dimensions of the research problem, ability to identify, follow and utilize the relevant references in addition to clear contribution towards understanding and solution of a research problem with suggestions and recommendations. By the end of work, the student is expected to present a thesis that reflects a thorough understanding and analysis of the chosen topic using scientific methodologies.

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Specialization 2: Water Resources Management

Specialization Credit Hours: 37

1. Specialization Overview

The Water Resources Management specialization addresses the sustainability and security challenges of the water sector in GCC countries using an integrated management approach—an approach that considers physical (quantity and quality) aspects as well as the social, economic, environmental, and governance aspects of the water management system. It emphasizes the application of modern decision support and technological tools, including simulation modeling, geographic information systems, remote sensing, databases, and management information systems, in the assessment, development, management, and planning of water resources.

2. Study Plan

Course Code	Course Title	Credit Hours
Semester 1		
GSTS 510	Scientific Writing	1
NRE 521	Water Resources Development and Management in Arid Regions	2
NREWR 535	Integrated Water Resources Management	3
NREWR 520	Quantitative Analysis	2
Select 1 or 2	Specialized Elective Courses	3 or 4
Select 1	Supporting Courses	2 or 3
Total Credit Hours		13 or 14
Specialized Elective Courses		
NREHG 530	Quantitative Hydrogeology	3
NREES 534	Urban Environment System	3
NREWR 530	Design of Irrigation and Drainage Systems	3
NREES 631	Water, Environment and Ecosystem	3

Course Code	Course Title	Credit Hours
NREWR 510	Seminar	1
NREWR5*9	Lab, Field, and Case Studies	1-4
Supporting Courses		
GEOGR 531	Geographic Information Systems	3
GEOGR 532	Remote Sensing	3
GEOGR 521	Geostatistical Analysis	2
Semester 2		
GSTS 520	Research Methods	2
NRE 620	Natural Resources and Environmental Economics	2
NRE 520	Environmental Impact Assessment	2
NREWR 521	Project Management	2
Select 2	Specialized Elective Courses	5
Total Credit Hours		13
Specialized Elective Courses		
NREHG 531	Groundwater Flow and Contaminant Transport Modeling	3
NREHG 520	Integrated Groundwater Resources Management	2
NREWR 532	Urban Water Management	3
NREWR 533	Management of Irrigation and Drainage Systems	3
NRWR 534	Water Quality Management	3
NRWR6*9	Lab, Field and Case Studies	1-4
Semester 3		
NREWR 531	Water Resources Planning and Management	3
NREWR 680	Master Thesis	8
Note: Minimum graduation requirement is 28 credit hours; however, student can take any course from other departments with the approval /recommendation of the supervisor.		
Total Credit Hours		11

Course Code	Course Title	Credit Hours
Semester 4		
NREEM 680	Master Thesis	8
Total Specialization Credit Hours		37

3. Course Descriptions

NREWR 5*9 - Lab, Field, and Case Studies - 1 to 4 CR

Students may work on specific environmental problems/issues of particular interest to him/her, or in a specific field not covered by existing courses.

NREWR 510 – Seminar - 1 CR

A student may research or investigate a topic and exchange results with other students through the presentations, reports, and discussions under the supervision of a faculty member.

NREWR 520 - Environmental Impact Assessment - 2 CR

Overview of EIA, legal and institutional arrangements, public participation, screening, scoping, impact analysis, mitigation and impact assessment, reporting, review of EIA quality, decision-making, implementation, and follow-up.

NREWR 521 - Project Management - 2 CR

Framework, quantitative methods, scope, time, cost, and quality; human resources, communication, risk, procurement, integration, and professional responsibility.

NREWR 530 - Design of Irrigation and Drainage Systems - 3 CR

Design and implementation of irrigation schemes, Application of operation and management models for irrigation water management, optimization of productivity, and environmental protection, Design of horizontal and vertical drainage and water collection systems.

NREWR 531 - Water Resources Planning and Management - 3 CR

Water Resources Systems Analysis, planning concepts within the framework of IWRM, Consideration of social, economic, financial, and environmental aspects, the planning process, situation analysis and modeling, Decision Support Systems.

NREWR 532 - Urban Water Management - 3 CR

Urbanization, water-related SDGs; urban water supply and wastewater systems, WSS and health, Integrated Urban Water Management, urban water demands analyses, modeling, and management;

artificial recharge of groundwater using urban treated wastewater; application of management models for the urban water system.

NREWR 533 - Management of Irrigation and Drainage Systems - 3 CR

Plant-soil-water relation under arid environment, Analytical and empirical methods for estimating soil moisture distribution under unsaturated and saturated zones, Integrated irrigation demand management measures, Simulation modeling, management of subsurface drainage system, Drainage water impact on the public health and the environment and monitoring measures. Reuse of drainage water in the irrigation sector, Stakeholder participation in the management of drainage system, Operation, and management of drainage systems through the application of drainage models.

NREWR 534 - Water Quality Management - 3 CR

Types and sources of pollution, Physical/chemical and biological/bacteriological water characteristics and physicochemical processes, monitoring; measurement methods and data quality assurance represent, Water legislation, Risk assessment of anthropogenic pressures and impacts, Water quality monitoring, Water cleanup and treatment, Pollution risk assessment, monitoring strategy, Integrated basin management concepts; modeling water quality.

NREWR 535 - Integrated Water Resources Management - 3 CR

Introduction to IWRM, water transfer, terrestrial ecosystem, aquatic ecosystem, aquatic ecosystem health and impact assessment, water use, wastewater, governance and community-based approach, organizational infrastructure and management, applying IWRM principles.

NREWR 6*9 - Lab, Field, and Case Studies - 1 to 4 CR

Students may work on specific environmental problems/issues of particular interest to him/her, or in a specific field not covered by existing courses.

NREWR 680 - Master Thesis - 8 CR

A student is expected to spend a total of 128 hours engaged in specified learning and assessment activities in the field of water resources. By the end of work, the student is expected to present a thesis that reflects a thorough understanding and analysis of the chosen topic using scientific methodologies.

MASTER OF SCIENCE IN NATURAL RESOURCES AND ENVIRONMENT

Specialization 3: Desert Farming Techniques and Soilless Agriculture

Specialization Credit Hours: 36

1. Specialization Overview

The combination of water scarcity, poor soils, a hyper-arid environment, and the projected impact of climate change in the Gulf Cooperation Council countries (GCC) constrains local agricultural production in meeting the food demand of the current and growing population. This has raised serious concerns and made food security a primary goal for most GCC countries. There are various options to achieve food security, including, but not limited to, local agricultural intensification using technological innovations. Food, energy, and water are strongly linked, especially in this region. Therefore, GCC countries have placed water, energy, food, environmental sustainability, and climate change at the top of their priorities for achieving sustainable development goals. This specialization focuses on these issues by making them core areas of teaching and research to train students to face these challenges. The specialization is strongly linked to other specializations in the center through an interdisciplinary educational and research track. The high number of specialized courses and electives in the curriculum allows students the flexibility to develop an academic program compatible with their interests.

2. Study Plan

Course Code	Course Title	Credit Hours
Semester 1		
GSTS 510	Scientific Writing	1
NREES 620	Climatology & Climate Change	2
	Specialized Courses	11*
	Elective Courses	
* Students may take a combination of specialized and elective courses with a minimum of 16 credit hours of specialized courses and a maximum of 7 credit hours of elective courses over the study period		
Total Credit Hours		14
Specialized Courses		
NREDF 533	Soil Science	3

Course Code	Course Title	Credit Hours
NREDF 631	Agroclimatology & Crop Water Requirements	3
NREDF 620	Greenhouses Design & Management	2
NREDF 5*9	Lab and Field Case Studies	1-4
NREDF 521	Crop Production	2
NREDF 510	Seminar	1
NREDF 531	Organic Farming	3
NREDF 524	Integrated Pest Management	2
NREDF 525	Waste Water Use in Agriculture	2
NREDF 632	Integrated Land Management	3
Elective Courses		
GEOGR 532	Remote Sensing	3
GEOGR 531	Geographic Information Systems	3
NREWR 534	Water Quality Management	3
NREES 535	Analytical Techniques	3
NREWR 532	Urban Water Management	2
NREES 533	Environmental Pollution	3
NRE 523	Water Resources Development & Management in Arid Regions	2
NREWR 530	Design of Irrigation & Drainage System	3
NREWR 533	Management of Irrigation & Drainage Systems	2
NREHG 520	Integrated Groundwater Resources Management	3
Course Code	Course Title	Credit Hours
Semester 2		
GSTS 520	Research Methods	2
	Specialized Courses	12*
	Elective Courses	

Course Code	Course Title	Credit Hours
* Students may take a combination of specialized and elective courses with a minimum of 16 credit hours of specialized courses and a maximum of 7 credit hours of elective courses over the study period.		
Total Credit Hours		14
Specialized Courses		
NREDF 530	Management of Saline & Sodic Soils	3
NREDF 527	Water Saving Techniques in Agriculture	2
NREDF 523	Design & Analysis of Experiments	2
NREDF 6*9	Lab and Field Case Studies	1-4
NREDF 534	Soil-less & Hydroponics Agriculture	3
NREDF 610	Seminar	1
NREDF 532	Soil Fertility & Fertilizers	3
NREDF 633	Plant Ecophysiology	3
NREDF 630	Agricultural Landscape	3
Elective Courses		
GEOGR 532	Remote Sensing	3
GEOGR 531	Geographic Information Systems	3
NREWR 534	Water Quality Management	3
NREES 535	Analytical Techniques	3
NREWR 532	Urban Water Management	2
NREES 533	Environmental Pollution	3
NRE 523	Water Resources Development & Management in Arid Regions	2
NREWR 530	Design of Irrigation & Drainage System	3
NREWR 533	Management of Irrigation & Drainage Systems	2
NREHG 520	Integrated Groundwater Resources Management	3
Semester 3		
NREDF 685	Master Thesis	8

Course Code	Course Title	Credit Hours
Note: Minimum graduation requirement is 28 credit hours; however, student can take any course from other departments with the approval /recommendation of the supervisor.		
Total Credit Hours		8
Semester 4		
NREDF 685	Master Thesis	8
Total Specialization Credit Hours		36

3. Course Descriptions

NREDF 5*9/6*9 - Lab, Field Case Studies - 1 to 4 CR

These are special cases relevant to the student area of research or specialization that are not covered by courses. It is mainly directed to allow the supervisor to develop certain experiences and computational skills towards fulfilling the main study objectives. It can be assigned to an individual or a group of students. It shall not exceed 4 Cr. Hr of total hours taken towards a degree.

NREDF 510 – Seminar - 1 CR

A student may research or investigate a topic, and exchange results with other students through the presentation, reports, and discussions under the supervision of a faculty member.

NREDF 520 - Agricultural Economics and Agribusiness - 2 CR

Elements of agricultural production and distribution, the interdependence of various sectors within the production chain, production costs, supply and price determination; competition, and marketing and innovation.

NREDF 521 - Crop Production - 2 CR

Basic knowledge for the production of different crops with emphasis on vegetable, ornamental medicinal and forage crops. Methods of land preparation, application of fertilizers and irrigation water and selection of suitable varieties in addition to crop harvesting and post-harvesting treatments.

NREDF 523 - Design & Analysis of Experiments - 2 CR

Student learns the basic concepts of experimental design with emphasis on the significant designs: completely randomized designs, randomized block designs, factorial design and correlation and regression. Hands-on statistical software applications with emphasis on JMP software. A student should be able to choose the appropriate design statistically analyze the data using JMP software.

NREDF 524 - Integrated Pest Management - 2 CR

Definition of integrated pest management, major insect pests in GCC region, biological control methods, pesticide types, mode of action and control rates, resistant plant varieties, role of crop rotation and soil management.

NREDF 525 - Waste Water Reuse in Agriculture - 2 CR

Builds critical understanding of equality and justice in inclusive special education. Examines diversity and equity in disability, applies the Capability Approach, explores the nature of dyslexia, autism, and ADHD, and addresses the multidimensional issues of inclusion and SEN.

NREDF 527 - Water Saving Techniques in Agriculture - 2 CR

Improvement of irrigation methods under desert soils and climate and the determination of irrigation efficiencies using deficit irrigation and the effects of water deficit at different growth stages in addition to the relationship between the evapotranspiration deficit and yields with methods of reducing water conveyance losses at farm level.

NREDF 530 - Management of Saline/Sodic Soils - 3 CR

Saline soils, sodic soils, their definition and extent, the effect of salinity and sodicity on plants, salinity tolerance in plants, reclamation of saline and sodic soils.

NREDF 531 - Organic Farming - 3 CR

Understanding soil fertility, essential nutrients for plant growth, diagnoses of nutrient deficiencies in plants, organic fertilizers and application methods, nutrient use efficiency in dry environments. Introduction to Organic Farming, Integrated Farm Management Systems, Organic Soil Management, and Crop Nutrition, Selection and application of appropriate pest and disease management practices for both animal and plant production on an organic farm, Design an appropriate system for organic production of cattle and sheep, certification of organic farms.

NREDF 532 - Soil Fertility & Fertilizers - 3 CR

Understanding soil fertility, essential nutrients for plant growth, diagnoses of nutrient deficiencies in plants, fertilizers, fertilizer application methods, nutrient use efficiency in dry environments.

NREDF 533 - Soil Science - 3 CR

Definition of soils, soil-forming factors, factors affecting soil formation. Soil physical and chemical properties, desert soils with special reference to GCC soils. Management of soils. In addition to hazards of soil pollution and management for sustainable production as well as its importance in supporting biological diversity.

NREDF 534 - Soil-less & Hydroponics Agriculture - 3 CR

Definition of soilless culture, systems of hydroponic production, nutrient solutions, management of crops in the greenhouse, greenhouse structures, management of irrigation and nutrient systems.

NREDF 610 - Seminar - 1 CR

A student may research or investigate a topic, and exchange results with other students through the presentation, reports, and discussions under the supervision of a faculty member.

NREDF 620 - Greenhouse Design and Management - 2 CR

Types of greenhouses and its management. Main features and considerations for greenhouse design. The scientific basis of evaporative cooling systems and its suitability under desert climate. Automation of internal temperature, light, irrigation water, and Fertigation.

NREDF 630 - Agricultural Landscape - 3 CR

Landscaping classes introduce students to landscaping terminology, garden design, horticultural skills, and landscape construction. Students learn about plant selection for different conditions, soil preparation, irrigation systems, and landscape drawing and design.

NREDF 631 - Agro-climatology and Crop Water Requirements - 3 CR

Basic concepts about the main weather parameters that affect crop production. Reliability of climatic data. CropWat and ClimWat programs for the estimation of reference crop evapotranspiration. Methods and instruments for the measurement of the main weather parameters. Determination of the length of the season and effective rainfall. Evaporation from a free water surface, wet soil, and evapotranspiration as affected by weather parameters.

NREDF 632 - Integrated Land Management - 3 CR

Strategically planned approach to managing and reducing the human-caused footprint on the public land. Managing public lands and associated natural resources, reclamation of disturbed lands.

NREDF 633 - Plant Ecophysiology - 3 CR

This course is concerned largely with mechanisms of how plants sense and respond to environmental change and how the responses to highly variable conditions are coordinated with one another, and how their collective effect on plant growth and gas exchange can be understood.

NREDF 680 - Master Thesis - 8 CR

After successful completion of at least 28 credit hours the student is expected to prepare and present a Thesis that reflects his understanding of the subject matter, competence in theoretical and practical knowledge, utilization of scientific references, application of available technologies, scientific contribution to the subject matter in terms of analysis understanding and development. The ability to scientifically present his findings formulates conclusions and recommendations.