



**Al al-Bayt University**  
**Institute of Earth and Environmental**  
**Sciences**

**Academic Plan for M.Sc. in Water**  
**Resources and the Environment**

**(Exam Track)**

**2020 - 2021**

<b>Applied Geology and Environmental Sciences</b>
<b>Department</b>
<b>Institute of Earth and Environmental Sciences</b>
<b>Al-Bayt University</b>

2020/2021

## **Academic Plan for M.Sc. in Water Resources and the Environment (Exam Track)**

**Program Title (English): M.Sc. in Water resources and the Environment**

**Program Title (Arabic): الماجستير في موارد المياه والبيئة**

### **A-General Rules and Conditions:**

- 1- This plan matches the regulations of general frame of M.Sc. programs instructions at Al al-Bayt University.
- 2- Specialties that can be accepted in this program are:
- 3- B.Sc. degree in Earth sciences or geology, environmental engineering, environmental sciences, chemistry, biology, civil engineering, chemical engineering, physics, mathematics, industrial engineering, land and water management, agricultural engineering and all branches of agriculture.

### **B- The Components of Plan:**

The plan consists of (33) Credit Hours distributed as follows:

<b>Sequence</b>	<b>Type of Requirement</b>	<b>Credit Hours</b>
First	Specialty requirements:	
	a- Compulsory courses	21
	b- Elective Courses	6
	c- Graduation Project	6
<b>Total</b>		<b>33</b>

### **C- Numbering System:**

1- Faculty Code:

<b>No.</b>	<b>Institute</b>
08	Earth and Environmental Sciences

2- Department Codes:

No.	Section
01	Earth Sciences
02	General Science
03	Water resources and environment

3- Courses Codes:

<b>2</b>	<b>2</b>	<b>7</b>	<b>03</b>	<b>08</b>
↑	↑	↑	↑	↑
<b>Sequence</b>	<b>Field</b>	<b>Level</b>	<b>Department</b>	<b>Faculty</b>

**The significance of the tens place (field) in courses numbers**

Domain code	Title of specialization field	Domain code	Title of specialization field
0	Geology	5	-
1	Water resources	6	-
2	Environment	7	-
3	Assistant techniques	8	-

**d) Complementary Courses:**

Domain code	Title of specialization field	Domain code	Title of specialization field
0801312	Environmental geology		

**Specialty requirements: (33) Credit Hours distributed as follows:**

A- Compulsory Courses: (21) Credit Hours.

B- Elective Courses: (6) Credit Hours.

C- Graduation Project: (6) Credit Hours.

**A. Compulsory Courses: (18) Credit Hours comprises of the following courses:**

No .	Course No.	Course Name	Credit Hours
1	0803700	Advanced General Geology for Water and Environment Resources Students	3
2	0803711	Applied Hydrology	3
3	0803712	Applied Hydrogeology	3
4	0803713	Hydrochemistry	3
5	0803720	Ecosystems and Environmental Impact Assessment	3
6	0803730	Wastewater Treatment	3
7	0803731	Applications of Remote Sensing and Geographic Information Systems	3
<b>Total</b>			<b>21</b>

**B. Elective Courses: (6) Credit Hours to be chosen from the following courses:**

No.	Course No.	Course Name	Credit Hours
1	0803714	Sediments Transport	3
2	0803715	Water Desalination	3
3	0803721	Elements of the Environment and its Interactions	3
4	0803736	Scientific Research Methodology	3
5	0803742	Soil Science	3
6	0803743	Environmental Statistical Analysis	3
7	0803744	Environmental Hazards	3
8	0803745	Fundamentals of Climatology	3

**C. Graduation Project (0803900): (6) Credit Hours**

## Advisory Plan for the M.Sc. Program in Water Resources and the Environment

### First year

First Semester			Second Semester		
Course No.	Course name	Credit Hours	Course No.	Course name	Credit Hours
0803700	Advanced General Geology for Water and Environmental Resources Students	3	0803720	Ecosystems and Environmental Impact Assessment	3
0803711	Applied Hydrology	3	0803712	Applied Hydrogeology	3
0803730	Wastewater Treatment	3	-	Elective Course	3
<b>Total</b>		<b>9</b>	<b>Total</b>		<b>9</b>

### Second year

First Semester			Second Semester		
Course No.	Course Name	Credit Hours	Course No.	Course Name	Credit Hours
0803713	Hydrochemistry	3	0803900	Graduation Project	6
0803731	Applications of Remote Sensing and Geographic Information Systems	3	-	-	-
-	Elective Course	3			
<b>Total</b>		<b>9</b>	<b>Total</b>		<b>6</b>

### Courses offered by the Department

No.	Course No.	Course Name	Credit Hours
1	0803700	Advanced General Geology for Water and Environmental Resources Students	3
2	0803711	Applied Hydrology	3
3	0803712	Applied Hydrogeology	3
4	0803713	Hydrochemistry	3
5	0803714	Sediments Transport	3
6	0803715	Water Desalination	3
7	0803720	Ecosystems and Environmental Impact Assessment	3
8	0803721	Elements of the Environment and its Interactions	3
9	0803730	Wastewater Treatment	3
10	0803731	Applications of Remote Sensing and Geographic Information Systems	3
11	0803736	Scientific Research Methodology	3
12	0803742	Soil Science	3
13	0803743	Environmental Statistical Analysis	3
14	0803744	Environmental Hazards	3
15	0803745	Fundamentals of Climatology	3

## **Courses Description**

### **0803700    Advanced General Geology for Water and        Environmental        Resources Students**

**3 Credit Hours**

**Prerequisite: -**

Geology its importance and its development, identifying the main branches of geology and highlighting each branch and its importance and its fields, highlighting the sedimentology and sedimentary rocks and their types and importance in various geological fields, primary sedimentary structures and their importance, introduction to structural geology, its relevance and importance in the various fields of earth sciences and the environment, how it relates and its importance in engineering applications, water, oil, mineral resources as well as environmental applications and environmental risks, identifying different structural elements and their relationship to stress and strain in rocks, different field skills in the use of geological compass, methods drawing cross sections, reading and interpreting geological maps by different scales, representation and stereoscopic projection of levels and lines and structural analysis.

### **0803711    Applied Hydrology**

**3 Credit Hours**

**Prerequisite: -**

Introduction: Hydrological cycle, hydrological system concept, hydrosystem model, hydrological system divisions; hydrological cycle elements; unsaturated runoff and infiltration; rivers: hydrograph, water investment, water depth and speed, flow time; hydrometric measurements: its system and its physiography; hydrologic analysis: hydrograph unit, flood drainage system, hydrological statistics, frequency analysis (intensity and permanence; recurrence period); hydrology designs

### **0803712    Applied Hydrogeology**

**3 Credit Hours**

**Prerequisite: 0803711**

Geological layers such as aquifers; normal groundwater table and piezometric level; characteristics aquifers; groundwater movement; Darcy-law; fixed water movement of wells: confined and unconfined aquifers; liquidity coefficient using the constant run-off equation; loss in wells.

### **0803713    Hydrochemistry**

**3 Credit Hours**

**Prerequisite: 0803711,  
0803712**

Hydrological and hydrochemical cycle, chemical balance; oxidation and reduction reactions; water, mineral and rock interactions and their impact on surface and groundwater quality; the role of the soil profile in the disposal of pollutants; carbon system; basic and acidic rain; groundwater and surface water chemical modeling; applications in water purification technology; monitoring networks, sampling methods; views and interpretations of results

### **0803714    Sediments Transport**

**3 Credit Hours**

**Prerequisite: 0803711,  
0803712**

Sediment and water properties: terminology, water characteristics, sediment size, shape, density, intensity, specific weight and porosity; sediment movement theories: speed, probability of movement, discharge; erosion and maintenance of canals; river bottom shapes and resistance to runoff; bottom load; suspended load; total load; method of calculating sediment discharge: field and mathematical methods, sediments and dam reservoirs.

**0803715     Water Desalination****3 Credit Hours****Prerequisite: 0803711,  
0803712**

The physical and chemical properties of salt water (seawater), sediment formation and control, desalination processes, membranes, energy consumption in desalination systems.

**0803720     Ecosystems and Environmental  
Impact Assessment****3 Credit Hours****Prerequisite: 0803711**

Introduction: Ecosystems, definitions, importance, characteristics and various relationships, environmental impact assessment; evolution of environmental impact assessment such as "environmental assessment strategies" and "social impact assessment"; principles and administrative procedures; public participation; environmental impact assessment process (initial work; testing and examination; evaluation; mitigation and impact management; reporting; review; decision-making; monitoring; implementation); methodology (lists; matrices; expert systems and others); and the course also contains case studies.

**0803721     Elements of the Environment and its  
Interactions****3 Credit Hours****Prerequisite: -**

Natural cycles of materials; the nature and components of air; soil: soil; its composition; profile, types; water: its quality, physical and chemical properties; chemical, physical and biological weathering; environmental elements and their mutual effects (natural and artificial); impact on the environment: nature, humans, projects, environment, environment, environment, environment and settlement: its nature, needs, environmental assessment and development; and the strategic environmental planning.

**0803730     Wastewater Treatment****3 Credit Hours****Prerequisite: -**

Definition of wastewater, types, components, physical, chemical, and biological properties, sewage systems, factors affecting the design of the sewage systems, wastewater systems and their benefits depend, calculation of wastewater flow, wastewater treatment targets, types of wastewater treatment (physical, chemical and biological process)) Wastewater treatment stages (preprimary, primary, secondary and advanced), activated sludge and disposal methods, sterilization, factors on which the design of treatment plants and the choice of appropriate treatment methods depend, wastewater management in Jordan, treatment plants in Jordan and treatment methods, reuse treated wastewater in Jordan.

**0803736     Scientific Research Methodology****3 Credit Hours****Prerequisite: -**

The nature of the research projects required; research frameworks and overviews: management of development processes, focus on the study area, content, problem and objectives, problem selection and process; general framework for monitoring and evaluation of research projects and the selection of appropriate methods: definition, objectives, monitoring and evaluation projects, problems and challenges, realistic view, mechanical observation and evaluation methods, general indicators, evaluation system, reports, information retrieval, beneficiaries, project funding, capabilities and responsibilities.



**0803744 Natural Hazards****3 Credit Hours****Prerequisite: -**

This course aims to understand the nature, distribution and extent of the impact of environmental hazards and natural disasters, and to identify the impact of global changes in this area on human sensitivity and the surrounding environment of these changes, the study of climatic and hydrological hazards such as floods and droughts, in addition to investigating environmental hazards resulting from human activity and its impact on the environment and human health such as air and water pollution, addressing the methods used in assessing and analysing environmental hazards and responding to them and national policies to address environmental hazards and international cooperation in this area.

**0803743 Environmental Statistical Analysis****3 Credit Hours****Prerequisite: -**

This course deals with the different principles and methods of quantitative analysis and how to use them to study environmental relations, and provides an explanation of statistical concepts and how to collect and prepare data for quantitative analysis, the use of measures of centralization bias and measures of dispersion and the trend and form of the concentration of environmental data, as well as the course deals with the study of samples and how to analyze them, and the study of spatial statistical relations

**0803742 Soil Science****3 Credit Hours****Prerequisite: -**

The course includes the study of the composition of soil, its structures, the processes of formation and genesis. And a presentation of the most important modernist classifications of the soil. The study of chemical properties (acidity, colloids, ionic exchange, airy, soil gases, soil water, abundance of water, saturated and non-saturated flow, clay minerals, surface chemicals and organic materials). The study of the physical characteristics (Texture, composition, total soil density, granular, permeability and porosity of soil, soil temperature and color), biological composition of soil, plant nutrients, soil and plant relationship, soil erosion and compaction, soil contamination (agricultural chemicals and processing procedures).

**0803745 Fundamentals of Climatology****3 Credit Hours****Prerequisite: -**

This course deals with the concept of climate science and the relationship between it and meteorology, the composition of the atmosphere and its components, the study of the elements of climate (heat, precipitation, wind) and their differences in the layers of the gaseous atmosphere and how they are measured and represented on weather maps, factors affecting climate, the foundations of climate classifications, climatic regions, distribution and characteristics.

**(0803731) Applications of Remote Sensing and Geographic Information Systems****3 Credit Hours****Prerequisite: 0803709, 0803712, 0803720**

Aerial imagery: introduction, use, hardware, geological phenomena recognition; remote sensing: concept, basic definitions; geometric correction of space images; Data processing: classification, filtering; uses for the environment and water resources; computer applications; GIS: Principles, components and management; collection and organization of information and data; modeling; results and computer applications.

Remote sensing and GIS; applications in the environment and water resources; water surveys: Instruments, maps, interpretation; geophysical surveys: different methods, Hardware, interpretation.

