Al al-Bayt University

Faculty of Earth and Environmental Sciences

Master Study Plan Template of
M.Sc. in Water Resources and the Environment
(Thesis Track)

2022 - 2023

Department: Applied Earth and Environmental Sciences

Faculty: Earth and Environmental Sciences
Al al-Bayt University

Master Study Plan of Water Resources and the Environment (Thesis Track)

Program Title (Arabic): الماجستير في موارد المياه والبيئة

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

A. General terms and conditions:

1- This plan shall adhere to the instructions of granting master degree at Al al-Bayt University.
2- The educational qualification accepted in this program shall be Bachelor degree in:

a. B.Sc. Degree in Earth sciences or Geology
b. B.Sc. Degree in Environmental Engineering and Environmental Sciences
c. B.Sc. Degree in Chemistry
d. B.Sc. Degree in Chemical Engineering
e. B.Sc. Degree in Land and Water Management
f. B.Sc. Degree in Agricultural Engineering and all Branches of Agriculture.
g. B.Sc. Degree in Biology
h. B.Sc. Degree in Civil Engineering, physics, Industrial Engineering

B. Components of the Plan:

The master's degree study plan of Water Resources and the Environment consists of (33) credit hours distributed as follows:

Requirement Type	Credits
Specialty Requirements:	
a. Compulsory Requirements	18
b. Elective Requirements	6
c. Comprehensive Exam	9
Total	**33**

C. Numbering System

1- Code of the Faculty

Code	Faculty
08	Earth and Environmental Sciences

2- Codes of Department/Specialty

Code	Department/Specialty

01	Applied Earth and Environmental Sciences
02	Geographic Information System and Remote Sensing/Geographic Information Sciences
03	Water resources and Environment/Applied Geology

3- Codes of Courses

0-9	0-9	7	03	08
Serial	**Field**	**Level**	**Department**	**Faculty**

The Significance of the Ten Rank (Field) in the Course Numbers

Field Code	Specialty Field Title	Field Code	Specialty Field Title
0	Geology	5	-
1	Water resources	6	-
2	Environment	7	-
3	Assistant techniques	8	-
4	-	9	-

D. Remedial Courses:
Shall be determined in accordance with the instructions of graduate studies at Al al-Bayt University.

First: Specialty Requirements: (33) credits distributed as follows:

A. Compulsory Courses: (18) credits include the following courses:

No.	Course No.	Course Title	Credits	Learning Type
1	803700	Advanced General Geology for Water Resources and Environment Students	3	Face to face
2	803711	Applied Hydrology	3	Face to face
3	803712	Applied Hydrogeology	3	Face to face
4	803713	Hydrochemistry	3	Face to face
5	803720	Ecosystems and Environmental Impact Assessment	3	Face to face
6	803736	Scientific Research Methodology	3	Face to face
Total			**18**	

* Type of learning: indicates that the course will be educated by one of the following: (face-to-face, blended, online)

B. **Elective Courses**: (6) credits include the following courses:

No.	Course No.	Course Title	Credits	Learning Type
1	803714	Sediments Transport	3	Blended
2	803715	Water Desalination	3	Blended
3	803721	Environmental Elements and their Interaction	3	Blended
4	803730	Wastewater Treatment	3	Blended
5	803731	Applications of Remote Sensing and Geographic Information Systems	3	Blended
6	803742	Soil Science	3	Blended
7	803743	Environmental Statistical Analysis	3	Blended
8	803744	Environmental Hazards	3	Blended
9	803745	Fundamentals of Climatology	3	Blended

C. M.Sc. Thesis: (9) Credits divides as follow:

No.	Course No.	Course Title	Credits	Learning Type
1	0803799	M.Sc. Thesis	9	Blended (6) and Online (3)
2	9010797	M.Sc. Thesis	3	Online
3	9010798	M.Sc. Thesis	6	Blended

Courses offered by the department of Applied Earth and Environmental Sciences/Master Degree in Water Resources and the Environment:

No.	Course No.	Course Name	Credit Hours	Learning Type
1	0803700	Advanced General Geology for Water Resources and Environment Students	3	Face to Face
2	0803711	Applied Hydrology	3	Face to Face
3	0803712	Applied Hydrogeology	3	Face to Face
4	0803713	Hydrochemistry	3	Face to Face
5	0803714	Sediments Transport	3	Blended
6	0803715	Water Desalination	3	Blended
7	0803720	Ecosystems and Environmental Impact Assessment	3	Face to Face
8	0803721	Environmental Elements and their Interaction	3	Blended
9	0803730	Wastewater Treatment	3	Blended
10	0803731	Applications of Remote Sensing and Geographic Information Systems	3	Blended

11	0803736	Scientific Research Methodology	3	Face to Face
12	0803742	Soil Science	3	Blended
13	0803743	Environmental Statistical Analysis	3	Blended
14	0803744	Environmental Hazards	3	Blended
15	0803745	Fundamentals of Climatology	3	Blended

Second: Summary of Learning Types in the Study Plan

Learning Type	Online	Blended	Face-to-Face
No. of credit hours	3	12	18
Percentage	9.1%	36.4	54.5%

Guidance Plan for Master Students Specializing in Water Resources and the Environment (If any and in accordance with the decision of the department council)

First Year							
First Semester				Second Semester			
Course No.	Course Title	Credits	Learning Type	Course No.	Course Title	Credits	Learning Type
0803700	Advanced General Geology for Water Resources and Environment Students	3	Face to Face	0803720	Ecosystems and Environmental Impact Assessment	3	Face to Face
0803711	Applied Hydrology	3	Face to Face	0803712	Applied Hydrogeology	3	Face to Face
-	Elective Course			0803736	Scientific Research Methodology	3	Face to Face
Total		**9**		**Total**		**9**	

Second Year							
First Semester				Second Semester			
Course No.	Course Title	Credits	Learning Type	Course No.	Course Title	Credits	Learning Type
0803713	Hydrochemistry	3	Face to Face	0803799	M.Sc. Thesis	9	-
-	Elective Course	3	Blended	-	-	-	-
Total		**6**		**Total**		**9**	

Description of Courses offered by the Department of Applied earth and Environmental Sciences/ Master Degree in Water Resources and the Environment

Course No.	جيولوجيا عامة متقدمة لطلبة موارد المياه والبيئة	(3) Credits	Learning Type
0803700	**Advanced General Geology for Water Resources and Environment Students**	**Pre-requisite: -**	**Face to Face**
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 stereographic projection of planes and lines and structural analysis.			

Course No.	علم المياه السطحية التطبيقي	(3) Credits	Learning Type
0803711	**Applied Hydrology**	**Pre-requisite: -**	**Face to Face**
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			

Course No.	علم المياه الجوفية التطبيقي	(3) Credits	Learning Type
0803712	**Applied Hydrogeology**	**Pre-requisite: 0803711**	**Face to Face**
Introduction to groundwater, origin of groundwater, groundwater and the hydrologic cycle, vertical distribution of subsurface water, groundwater recharge and discharge, geological formations and aquifers, types of aquifers, groundwater levels in confined, unconfined and perched aquifers, groundwater contour maps, groundwater flow directions, determination of groundwater catchment area (groundwater contribution area), wells and springs, physical properties of aquifers (porosity, effective porosity, permeability, hydraulic conductivity, transmissivity, homogeneity, ...etc.), Darcy's law, Darcy velocity, karst aquifers, introduction to groundwater quality and main parameters affecting groundwater quality, groundwater protection against pollutants, wells pumping tests (concept and used methods), calculating the hydrogeological parameters using pumping tests analysis results, the hydrogeology of Jordan.			

Course No.	كيمياء المياه	(3) Credits	Learning Type
0803713	**Hydrochemistry**	**Pre-requisite: 0803711, 0803712**	**Face to Face**

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

Course No.	نقل الرسوبيات	(3) Credits	Learning Type
0803714	**Sediments Transport**	**Pre-requisite: 0803711, 0803712**	**Blended**
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.			

Course No.	تحلية المياه	(3) Credits	Learning Type
0803715	**Water Desalination**	**Pre-requisite: 0803711, 0803712**	**Blended**
The physical and chemical properties of salt water (seawater), sediment formation and control, desalination processes, membranes, energy consumption in desalination systems.			

Course No.	النظم البيئية و تقييم الأثر البيئي	(3) Credits	Learning Type
0803720	**Ecosystems and Environmental Impact Assessment**	**Pre-requisite: 0803711**	**Face to Face**
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.			

Course No.	عناصر البيئة وتفاعلاتها	(3) Credits	Learning Type
0803721	**Environmental Elements and their Interaction**	**Pre-requisite: -**	**Blended**
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.			

Course No.	معالجة المياه العادمة	(3) Credits	Learning Type
0803730	Wastewater Treatment	Pre-requisite: -	Blended
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.			

Course No.	تطبيقات الاستشعار عن بعد ونظام المعلومات الجغرافية	(3) Credits	Learning Type
0803731	Applications of Remote Sensing and Geographic Information Systems	Pre-requisite: 0803709, 0803712, 0803720	Blended
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.			

Course No.	منهجية البحث العلمي	(3) Credits	Learning Type
0803736	Scientific Research Methodology	Pre-requisite: -	Face to Face
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.			

Course No.	علم التربة	(3) Credits	Learning Type
0803742	Soil Science	Pre-requisite: -	Blended
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).

Course No.	التحليل الاحصائي البيئي	(3) Credits	Learning Type
0803743	**Environmental Statistical Analysis**	**Pre-requisite: -**	**Blended**
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			

Course No.	المخاطر البيئية	(3) Credits	Learning Type
0803744	**Environmental Hazards**	**Pre-requisite: -**	**Blended**
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.			

Course No.	أساسيات علم المناخ	(3) Credits	Learning Type
0803745	**Fundamentals of Climatology**	**Pre-requisite: -**	**Blended**
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.			