Study Plan: Master, Higher Diploma, High specialization		
	Form Number	EXC-01-03-04A
	Issue Number and Date	2/3/24/2022/2963 2022/12/05
	Number and Date of Revision or Modification	15/10/2023
	Deans Council Approval Decision Number	265/2024/24/3/2
	The Date of the Deans Council Approval Decision	2024/1/23
	Number of Pages	9

1.	School	Engineering
2.	Department	Civil Engineering
3.	Degree title (Arabic)	ماجستير الهندسة المدنية- مياه وبيئة
4.	Degree title (English)	Master of Science in Civil Engineering – Water and Environment
5.	Track	Thesis

Plan Number	Specialization #	Degree	Department #	School #	Year	Track
2025	**12**	**8**	**01**	**09**	**2025**	Thesis

First: General Rules & Conditions:

1. This plan conforms to the valid regulations of the programs of graduate studies.

2. Specialties of Admission:

   - The First Priority: Bachelor of Civil Engineering in all its branches.

   - The Second Priority: Chemical Engineering and Environmental Engineering.

Second: Special Conditions: None

Third: Study Plan: Studying (33) Credit Hours as following:

1. Obligatory Courses (15) Credit Hours:

Course No.	Course Title	Credit Hrs	Theory	Practical	Pre/Co-requisite
0951755	Research Methodology	3	3	-	-
0901760	Engineering Hydraulics	3	3	-	-
0911707	Surface Water Hydrology and Modelling	3	3	-	-
0931775	Physicochemical Treatment	3	3	-	-
0941771	Biological Treatment of Wastewater	3	3	-	-

2. Elective Courses: Studying (9) Credit hours from the following:

Course No.	Course Title	Credit Hrs	Theory	Practical.	Pre/Co-requisite
0941762	Design of Hydraulic Structures	3	3	-	-
0911719	Groundwater Hydrology and Modelling	3	3	-	-
0951764	Sediment Transport	3	3	-	-
0911710	Flood Risk Management	3	3	-	-
0951765	Water Resources Engineering	3	3	-	-
0941772	Air Pollution	3	3	-	-
0941774	Solid Waste Management	3	3	-	-
0941773	Unit Operation in Water and Wastewater	3	3	-	-

Course No.	Course Title	Credit Hrs	Theory	Practical.	Pre/Co-requisite
0911717	Industrial Wastewater Treatment	3	3	-	-
0911713	Climate Change and Sustainability	3	3	-	-
0911714	Applied Statistics for Water and Environmental Engineering	3	3	-	-
0911716	Environmental Impact Assessment and Environmental Legislations	3	3		
0911709	Environmental Chemistry	3	3	-	-
0911712	Applied Hydraulic Systems	3	3		
0941731	Numerical Methods	3	3		
0911720	* Special Topics in Water and Environmental Engineering	3	3	-	-

3. Thesis: (9) Credit Hours (0901799)
4. Arabic Language Exam for Graduate Studies

Course Description

0951755 Research Methodology Blended (3 credit hours)
Skills required to conduct scientific research Data collection, resource survey, analysis and discussion of information and formulation of conclusions. Styles of technical writing with application to research papers and reports.

0901760 Engineering Hydraulics Face-to-Face (3 credit hours)
Steady incompressible flow in pressure conduits, flow in open channels, unsteady flow in open channels and closed conduits, flow measurements, hydraulic similitude and model techniques, channel transitions and controls, computer applications and case studies.

0941762 Design of Hydraulic Structures Face-to-Face (3 credit hours)
Design of channels, regulating structures and weirs, drop structures, outlet structures, drainage structures, crossing structures and culverts, dams and spillways, scour protection and energy dissipater, computer applications and case.

0951764 Sediment Transport Face-to-Face (3 credit hours)
Sediment properties, threshold of particle movement, transport of sand by air, sediment movement by water, bed features and channels resistance, sediment transport as bed load, suspended load, estimation of total load, stable channel design, regime approach, tractive force method. Sediment control in dams and lakes.

0951765 Water Resources Engineering online (3 credit hours)
Introduction to quantitative hydrology, probability concepts in planning, impact of climate change on water resources, integrated water resources management (IWRM): supply, capacity and demand management, social, legal, economic and institutional aspects in IWRM, virtual water, case studies and applications.

0911707 Surface Water Hydrology and Modelling Face-to-Face (3 credit hours)
Introduction to surface water hydrology, rainfall and hydrological losses, rainfall-runoff analysis, design flood estimations, watershed modelling, floodplain management and mitigation strategies. Computer applications and case studies.

0911709 Environmental Chemistry Face-to-Face (3 credit hours)
Fundamental concepts of physical chemistry, equilibrium chemistry, organic chemistry, biochemistry, colloid chemistry, quantitative chemistry, instrumental methods of analysis, and statistical analysis of analytical data.

0911710 Flood Risk Management Face-to-Face (3 credit hours)
The analysis and design of flood drainage systems in urban and rural areas. Development of design criteria, design floods and elements of stormwater drainage systems. Flood modelling and Management, Flood risk mitigation and control, Case studies and computer applications.

0911712 Applied Hydraulic Systems Face-to-Face (3 credit hours)
laws; concept of specific speed and unit quantities; selection of turbines; operational characteristics. centrifugal pumps manometric head; losses and efficiencies; work done; working principle; priming; velocity triangles; performance and characteristic curves; cavitation effects; similarity considerations. Dimensional analysis and similitude models.

0911713 Climate Change and Sustainability Face-to-Face (3 credit hours)
Background and basic definitions of weather, climate and atmospheric processes, climate change models and scenarios in relation to future climate change projections, including Global Climate Models (GCMs); regional downscaling and regional climate models (RCM); statistical downscaling, concepts and assessment methods of vulnerability, mitigation and adaptation to climate change at community, national and global level in different sectors. Case studies and applications.

0911714 Applied Statistics for Water and Environmental Engineering Face-to-Face (3 credit hours)
This course covers a variety of aspects in theoretical and applied statistics including the theory of statistical inference, advanced analytical statistical methods, hypotheses testing, correlation, linear and non-linear regression analysis, multiple regression, time-series, T and F distributions, analysis of variance and post hoc comparisons, analysis of covariance, nonparametric techniques, experiment design, and computer applications.

0911716 Environmental Impact Assessment and Environmental Legislations Face-to-Face (3 credit hours)
Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA): Rationale and approaches of EIA and SEA with a focus on recent and best practices for development proposals, programs and policies, aspects of tendering for and budgeting of EIAs and SEAs, Environmental Management Systems (EMS). Jordan environmental legislations and international environmental guidelines and standards: compliance and gap analysis. Case studies and applications.

0911717 Industrial Wastewater Treatment Face-to-Face (3 credit hours)
Treatment standards and regulations, Sources, quantities, and characteristics of industrial wastewaters. Treatment and handling of industrial wastewater (Wastewater reduction alternatives, pre-treatment, pH adjustment, equalization, evaporation, disinfection and oxidation processes). Treatment and disposal of sludge solids.

0911719 Groundwater Hydrology and Modelling **Face-to-Face** **(3 credit hours)**

Definitions and types of aquifers, physical properties of aquifers. Darcy's law and hydraulic conductivity, steady and unsteady radial flow in confined, unconfined and leaky aquifers, well flow near aquifer boundaries, multiple well systems. Partially penetrating wells and well losses, testing wells for yield, computer applications and case studies.

0911720 Special Topics in Water and Environmental Engineering **Blended** **(3 credit hours)**

Structured presentation of new and developing areas of knowledge in water and environmental engineering offered by the faculty in their specialized areas of expertise to augment the formal courses available with computer applications and case studies.

0941731 Numerical Methods **Blended** **(3 credit hours)**

Solution of linear and nonlinear systems, approximation theory and interpolation, numerical differentiation and integration, numerical solution of ordinary differential equations (ODE), initial and boundary values, numerical solution of partial- differential equations (PDE). Finite differences characteristics, Boundary value problem and Eigenvalue problem, Finite Element method, Fourier approximation, computer applications and case studies.

0941771 Biological Treatment of Wastewater **Face-to-Face** **(3 credit hours)**

This course will focus on the biological wastewater treatment processes including: fundamentals of biological treatment, suspended growth processes, Attached growth biological treatment processes, anaerobic treatment processes, processing and treatment of sludge.

0941772 Air Pollution **Face-to-Face** **(3 credit hours)**

Background and basic definitions, ambient and indoor air quality, main atmospheric pollutants and transformations, national and international legislations of air protection, sources of air pollution, properties of gaseous and particulate matter, sampling and measurement, physical analysis of particles and specific tests, atmospheric dispersion modelling, global air pollution problems, particulate and gases control methods and their design, mobile sources emissions and modelling, and noise pollution.

0941773 Unit Operations in Water and Wastewater **Face-to-Face** **(3 credit hours)**

Physical, chemical and biological analysis of water and wastewater, operating and simulating lab scale models on the application and the theory of biological and physicochemical treatment processes, processes to include sedimentation, water softening, coagulation flocculation, ion exchange, adsorption and aeration, determination of biological constants, activated sludge, and others.

0941774 Solid Waste Management Face-to-Face (3 credit hours)

Strategies, policies, legislations, and hierarchy of integrated solid waste management, characterization and properties of municipal solid waste, waste generation, collection, transfer and transport. Waste recycling, reuse, recovery, treatment and disposal and life cycle analysis. Landfill siting, design, operation and closure. Hazardous waste management and transformation. Waste-to-energy concepts and transformations.

0931775 Physicochemical Treatment Face-to-Face (3 credit hours)

This course will focus on the physicochemical treatment processes including: gas transfer, mixing, coagulation and flocculation, sedimentation, filtration, adsorption, and disinfection.

Inclusion rates in the program:

A. Courses that will be taught on the principle of full online:

Total hours that will be taught on the principle of full online in this program: (3 hour).

The percentage achieved for the subjects that will be taught on the principle of full online in this program: (12.5 %)

B. Subjects to be taught on the blended learning principle:

The total number of hours that will be taught on the principle of blended learning in this program (9 hours)

Percentage achieved for subjects that will be taught on the principle of blended learning in this program: (37.5 %)

C. Face-to-face learning courses:

Number of hours of face-to-face education: (21 hour).

Equivalency Table

	Old Plan (2005)		New Plan 2021		
Course #	**Course Title**	**Credit Hrs**	**Course #**	**Course Title**	**Credit Hrs**
0941731	Numerical Methods	3	0941731	Numerical Methods	3
0901760	Engineering Hydraulics	3	0901760	Engineering Hydraulics	3
0921761	Surface Water Hydrology	3	0911707	Surface Water Hydrology and Modelling	3
0941771	Biological Treatment of Wastewater	3	0941771	Biological Treatment of Wastewater	3
0941773	Unit Operation in Water and Wastewater	3	0941773	Unit Operations in Water and Wastewater	3
0931775	Physicochemical Treatment	3	0931775	Physicochemical Treatment	
	-	-	0951755	Research Methodology	3
0941762	Design of Hydraulic Structures	3	0941762	Design of Hydraulic Structures	3
0911763	Groundwater Hydrology	3	0911719	Groundwater Hydrology and Modelling	3
0951764	Sediment Transport	3	0951764	Sediment Transport	3
0951765	Water Resources Engineering	3	0951765	Water Resources Engineering	3
0941772	Air Pollution	3	0941772	Air Pollution	3
0941774	Solid Waste Management	3	0941774	Solid Waste Management	3

Equivalency Table

	Old Plan (2005)		New Plan 2021		
Course #	**Course Title**	**Credit Hrs**	**Course #**	**Course Title**	**Credit Hrs**
0941791	Special Topics in Civil Engineering	3	0911720	Special Topics in Water and Environmental Engineering	3
	-		0911717	Industrial Wastewater Treatment	3
	-		0911713	Climate Change and Sustainability	3
	-		0911714	Applied Statistics for Water and Environmental Engineering	3
	-		0911716	Environmental Impact Assessment and Environmental Legislations	3
	-		0911712	Applied Hydraulic Systems	3
	-		0911710	Flood Risk Management	3
	-		0911709	Environmental Chemistry	3