German Jordanian University

School of Natural Resources Engineering and Management
Department of Civil and Environmental Engineering
Graduate Diploma in Civil Engineering Technologies

Study Plan 2023

I.   Program Objectives

Graduate Diploma in Civil Engineering Technologies program emphasizes on enhancing the students' capacities and skills in utilizing tools and technologies that would better prepare them for their jobs and give them the competitive advantage in their workplace and in the job market. It will also give them the ability to discover, acquire, and adapt new knowledge and skills in the long term, such that our graduates are prepared to:

A.   Provide the applied technical skills, solid academic material, and soft skills required to produce empowered graduates
B.   Empower graduates to contribute to society and their profession in new and productive ways.
C.   To be equipped with the problem-solving abilities, as well as fundamentals of critical analysis that are essential for success in the next generation civil and environmental engineering world.

II.   Learning Outcomes

Graduate Diploma in Civil Engineering Technologies program provides its students with an understanding of fundamental civil and environmental engineering and management concepts, methodologies, and technologies as demonstrated by:

a.   Conduct advanced research, critically analyze data, and present the results in a professional manner.

b.   Develop advanced skills in using tools and software for analyzing and designing complex structures.

c.   Develop the ability to innovate solutions for complex problems in the field of civil engineering.

d.   Provide creative solutions to complex problems.

e.   Apply the principles of project management, resource management, and sustainability in the engineering environment.

f.   Communicate effectively, both in writing and orally, and clearly present ideas and projects.

g.   Recognize the advanced ethical and legal responsibilities of civil engineers, especially in the field of research and consultancy.

h.   Understand and acknowledge the importance of social and environmental issues in designing and implementing civil projects.

i.   Work in multidisciplinary research teams and collaborate with experts from other fields.

j.   Engage in continuous learning, professional development, and staying up-to-date with the latest developments in the field of civil engineering.

Course Delivery Methods

Courses are in one of the following three methods:

- **Face-to-Face (F2F) Method**
  Courses that are taught through face-to-face learning and are delivered at the university campus.

- **Blended (BLD) Method**
  Courses in which teaching consists of face-to-face learning and asynchronous E-learning. The face-to-face learning takes place at the university campus. Asynchronous E-learning takes place through activities, tasks, educational duties, and assignments through the virtual E-learning platforms (Moodle and MyGJU) without direct meetings with course instructors.

- **Online (OL) Method**
  Courses in which teaching consists of synchronous E-learning and asynchronous E-learning. The synchronous E-learning takes place through interactive virtual meetings between instructors and students directly through the virtual E-learning platform (MS Teams). The asynchronous E-learning takes place through activities, tasks, educational duties, and assignments through the virtual E-learning platforms (Moodle and MyGJU) without

direct meetings with course instructors.

III.   Admission Requirements

To apply for admission, the student must have a B.Sc. in Civil Engineering, Construction Management, or Architectural Engineering

Placement Tests
None needed

IV.   Degree Requirements

The requirements to obtain a Higher Diploma degree in Advanced Skills in Civil and Environmental Engineering are the following:
   a.   The program consists of (24) credit hours, total of (8) courses
   b.   (15) Compulsory credit hours (five courses)
   c.   (9) Elective credit hours (three courses)
   d.   Two full semesters (12) credit hours each

V. Framework for Graduate Diploma Degree (24 Credit hours)

Classification	Credit Hours			ECTS		
	Compulsory	Elective	Total	Compulsory	Elective	Total
Program Requirements	15	9	24	25	15	40
Total	**15**	**9**	**24**	**25**	**15**	**40**

Course Delivery Method*	Credit Hours	Percentage
Online Courses	6	24 %
Blended Courses	9	38%
Face-to-Face Courses	9	38%
Total	**24**	**100%**

*Exact numbers may vary due to elective course choices

1. Program Requirements: (24 credit hours)

1.1. Compulsory: (15 credit hours)

Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
AES7001	Fundamentals of Building Information Modelling	3	5	2	2	BLD	
AES7002	Advanced Construction Technology	3	5	3	0	F2F	
AES7003	Application of GIS in Civil and Environmental Engineering	3	5	2	2	BLD	
AES7004	Sustainable Materials in Civil Engineering	3	5	3	0	F2F	
AES7005	Sustainability and Green Buildings	3	5	2	2	F2F	
	Total	**15**	**25**				

1.2. Elective: (9 credit hours) (Three courses out of the following)

Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
AES7101	Maintenance, repair, and supervision	3	5	3	0	F2F	
AES7102	Advanced skills in Excel and databases	3	5	2	2	BLD	
AES7103	Structural Design & Modelling in Civil Engineering	3	5	2	2	BLD	
AES7104	Computer Applications in Transportation and Highway Engineering	3	5	2	2	BLD	
AES7105	Computer Applications in Water and Environmental Engineering	3	5	2	2	BLD	
AES7106	Modern Management and Decision Making	3	5	3	0	F2F	
AES7107	Special Topics in Civil Engineering	3	5	3	0	OL	
AES7108	Design According to European and DIN Standards	3	5	2	2	OL	
	Minimum required	**9**	**15**				

F2F: Face-to-face   BLD: Blended   OL: Online   co: Corequisite

2. Study Plan[c] Guide for the Graduate Diploma in Civil Engineering Technologies

First Year							
First Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
AES7001	Fundamentals of Building Information Modelling	3	5	2	2	BLD	
AES7003	Applications of GIS in Civil and Environmental Engineering	3	5	2	2	BLD	
AES7005	Sustainability and Green Buildings	3	5	2	2	OL	
AESXXXX	Elective Course	3	5	2	2	BLD	
	Total	**12**	**20**	**8**	**8**		

First Year							
Second Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
AES7002	Advanced Construction Technology	3	5	3	0	F2F	
AES7004	Sustainable Materials in Civil Engineering	3	5	3	0	F2F	
AESXXXX	Elective Course	3	5	2	2	BLD	
AESXXXX	Elective Course	3	5	2	2	BLD	
	Total	**12**	**20**	**10**	**4**		

[c] The following study plan guide does not take into account possible remedial courses.

VI. Compulsory Courses Offered by Civil and Environmental Engineering Department

AES7001 Fundamentals of Building Information Modeling   **3 Cr Hr (2,2)**   **5 ECTS**

Fundamentals of Autodesk Revit in a lab format with hands-on learning essential skills to communicating ideas effectively in professional practice. Students will learn how to set up a new building information model; create a basic floor plan; work with basic building elements (walls, floors, ceilings, roofs, space frames, curtain walls, stairs and railings); create sections, elevations; add annotations including dimensions, text, tags, schedules and legends; and share designs by working in teams, creating architectural visualization renderings and plotting finished drawings. Students are also be introduced to the basics of quantity surveying, clashes, troubleshoot, design, and improvise within the program. Also, how to extract useful and elegant information from the model, and understanding how to manage 2D output to producing high-quality drawings, and to communicate ideas effectively.

Prerequisite: -

AES7002 Advanced Construction Technology   **3 Cr Hr (3,0)**   **5 ECTS**

Construction industry and the latest methods used in construction; Construction technology in civil engineering; Construction systems and their applications. Layouts, fabrications, assembly, and installation of structural units. How a building is constructed from the beginning planning to the completion of roof. Activities to be incorporated to reinforce the lessons. Construction of superstructures for temporary bridges, semi-permanent bridges,

submergible bridges, low-cost bridges, steel-arch bridges, RCC bridges and cable stayed bridges,

wearing course, expansion joint, approach road, approach slab, protection works for shallow foundation for minor bridges, special precautions during construction, failure and restoration of bridge super structure, sub-structure and its maintenance

Prerequisite: -

AES7003 Application of GIS in Civil and Environmental Engineering   **3 Cr Hr (2,2)**   **5 ECTS**

This course, "Application of GIS in Civil and Environmental Engineering," is designed for graduate diploma students in civil engineering seeking to develop the knowledge and skills necessary to use Geographic Information Systems (GIS) in civil and environmental engineering. The course covers the principles of GIS, including data management, spatial analysis, and mapping. Topics include the use of GIS for site selection, storm-water management, and environmental impact assessment. The course also covers the use of GIS in the management of infrastructure and natural resources, including the use of GIS for transportation planning, water resources management, and land use planning.

The course will provide students with a strong understanding of the principles of GIS and its applications in civil and environmental engineering. The course will also provide students with the knowledge and skills necessary to use GIS to analyze and solve real-world problems in civil and environmental engineering. The course will be hands-on and will involve many practical examples, case studies and projects. After completing the course, students will be able to effectively use GIS to analyze and solve problems in civil and environmental engineering, and will be prepared for careers in the field of GIS applications in civil and environmental engineering.

Prerequisite: -

AES7004 Sustainable Materials in Civil Engineering   3 Cr Hr (3,0)   5 ECTS

The overall goal of the course is to introduce the students to the properties and production, and environmental implications, of common materials, including biobased, metals, plastics and mineral based. The class will connect the structure and mechanical properties of these common materials with the technology used for producing the materials from raw ingredients, and also the processing of these materials into useful items. In addition to the material properties, the environmental impacts, e.g., emissions of carbon, water, and pollutants, will be discussed. The concepts of embodied energy, mass and energy balances, water and land use will all be considered. The concept of Life Cycle Analysis will be introduced and used to evaluate the production of different building materials. The Sustainable Materials & Technology course prepares students for 21st century jobs helping businesses and communities reduce their ecological footprint through efficient use of natural materials in the manufacture and use of value-added products. Students will gain a strong foundation in environmental science, economics, social sciences, and materials science which prepares them to design, manufacture and sell sustainable bio-based products.

Prerequisite: -

AES7005 Sustainability and Green Buildings   3 Cr Hr (2,2)   5 ECTS

Introduction to Sustainability, Resilience, and Climate Change, Moving Sustainability Forwards (Advocacy, awareness, stakeholder engagement, social inclusion, and equity), Resilient Urban Planning (Climate Mitigation, Climate Adaptation & Disaster Risk Planning), Integrative Design for Building Efficiency, Building Life Cycle Assessment Concepts (Embodied Carbon), Concepts and Strategies of Urban Green Infrastructure Design, Core Concepts and Strategies of Green Building Rating Systems, Different Sustainable Design, Prerequisites and Strategies: Connectivity and Smart Transportation, Sustainable Site Management, Water Efficiency (indoor & outdoor), Energy Efficiency in Buildings, Building Health and Wellness (Indoor Environment Quality), Material and Resources Efficiency, Green Materials Supply Chain.

Prerequisite: -

VII. Elective Course Offered by Civil and Environmental Engineering Department

AES7101 Maintenance Repair and Supervision	3 Cr Hr (3,0)	ECTS

Corrosion of embedded metal; Significance and fundamentals of corrosion; Carbonation-induced and chloride-induced corrosion; Types of reinforcement; Metallic and non metallic coating; ;Deterioration of cementitious systems- Introduction, sulphate attack, biofouling and acid attack; frost attack, freeze-thaw and alkali-silica reaction; Shrinkage and Creep. Condition assessment of concrete structures: Exposure conditions, visual inspection, on-site Concrete testing; Testing of concrete in laboratory; Strategies and materials for surface repair; Surface preparation and protective treatment; Coatings on concrete infrastructures ; Structural Strengthening & Stabilization; Injection Grouts for concrete repair; Cathodic Protection in Concrete Structures - Laboratory and field studies; Service life estimation.

Prerequisite: -

AES7102 Advanced skills in Excel and databases	3 Cr Hr (2,2)	5 ECTS

This course, "Advanced Skills in Excel and Databases," is designed for graduate diploma students seeking to develop advanced skills in Excel and databases. The course covers advanced features of Excel such as macros, pivot tables, and advanced formulas, as well as database management using Microsoft Access. Topics include advanced data analysis and data visualization techniques, database design and query writing, and automation of data management processes. The course also covers the integration of Excel and Access, allowing students to analyze and manage large data sets. The course will provide students with the skills necessary to effectively manage, analyze, and visualize large data sets. The course will also provide students with the knowledge and skills necessary to automate data management processes, which will increase their efficiency and productivity. The course will be hands-on and will involve many practical examples, case studies and projects. After completing the course, students will be able to effectively use Excel and Access to analyze and manage data, and will be prepared for careers in data analysis and management.

Prerequisite: -

AES7103 Structural Design & Modelling in Civil Engineering	3 Cr Hr (2,2)	ECTS

Using Structural Analysis and Design Software to perform modeling, analysis, and design structural systems : This course will provide the code provisions for the design of structure at all level starting by cross section, then member level and structure level. This will include Analysis of Beams, Analysis of 2D Trusses, Analysis of 2D Frames, Load combinations, Live Load cases, Deflections, Structural Elements and Load transfer, Analysis and Design of Continues Beams, Analysis of 3D structures and Design check, Wind and Earthquake Loadings, and Structural Detailing.

Prerequisite: -

AES7104 Computer Applications in Transportation and Highway Engineering	**3 Cr Hr (2,2)**	**5 ECTS**

This course, "Computer Applications in Transportation and Highway Engineering," is designed for graduate diploma students interested in the application of computer technology to highway engineering. The course covers the use of computer software and tools for the analysis, design, and management of highway systems. Topics include the use of computer-aided design (CAD) software for the creation of highway plans and models, the use of geographic information systems (GIS) for mapping and spatial analysis, and the use of simulation and optimization software for traffic analysis and design. The course also covers the use of project management software for the planning and execution of highway construction projects. The course is designed to provide students with a strong foundation in the use of computer technology in highway engineering and prepares them for careers in the field.

Prerequisite: -

AES7105 Computer Applications in Water and Environmental Engineering	**3 Cr Hr (2,2)**	**5 ECTS**

The course, "Computer Applications in Water and Environmental Engineering" is designed for graduate diploma students interested in utilizing modern computing platforms for addressing challenges related to water and the environment. Computer software includes solutions for pressurized pipe network modeling and analysis, open channel flow systems, hydrological software for surface water, rainfall- runoff analysis, and groundwater modeling packages, in addition to environmental software packages for plant design. Focus will be given to open-source software packages where possible.

Prerequisite: -

AES7106 Modern Management and Decision Making	**3 Cr Hr (3,0)**	**5 ECTS**

This course, "Modern Management and Decision Making," is designed for graduate diploma students seeking to develop the skills necessary for effective management and decision-making in today's fast-paced business environment. The course covers modern management concepts and tools, such as strategic management, business intelligence, and decision-making methods. Topics include identifying and analyzing business opportunities, formulating and implementing strategies, and using data and analytics to support decision-making. The course also covers the use of technology in management and decision-making, including the use of data visualization, collaboration, and project management tools. The course will provide students with the knowledge and skills necessary to be effective managers and leaders. The course will also provide students with the ability to make data-driven decisions, which will enable them to be more effective in their roles. The course will be hands-on and will involve many practical examples, case studies, and projects. After completing the course, students will be able to effectively use modern management concepts, tools, and techniques to make better decisions and achieve business objectives. This course will also help students to develop critical thinking, problem-solving, and communication skills which are essential for the modern business environment.

Prerequisite: -

AES7107 Special Topics in Civil Engineering	**3 Cr Hr (3,0)**	**5 ECTS**

This course allows specialized or in-depth study of a subject supplementing civil engineering. Student interest and instructor expertise help determine the topic, to be announced in the classroom. Students may take this course after obtaining the department's consent and only once. A topic for this course may cover any of the topics related to civil engineering and its applications.

Prerequisite: -

AES7108 Design According to European and DIN Standards   **3 Cr Hr (2,2)**   **5 ECTS**

The course covers principles and requirements for the safety, serviceability and durability of structures according to DIN or the European standards. It also describes the basis for structural design and verification. This will cover the design of all types of structures in steel, concrete, and timber.

Course Content:
- Densities, self-weights and imposed loads for buildings
- load cases, load combinations or result combinations.
- Design of Reinforced Concrete Members and Surfaces According to DIN 1045-1 or the equivalent European standards
- Steel Design According to DIN 18800 or the equivalent European standards
- Timber Design According to DIN 1052 or the equivalent European standards
- Seismic Design of Buildings

Prerequisite: -