# University of Mosul
# جامعة الموصل

*First Cycle – Bachelor's Degree (B.Sc.) – Dams & Water Resources Engineering*
بكالوريوس - هندسة السدود والموارد المائية


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# 1. Overview

This catalogue is about the courses (modules) given by the program of Dams and Water Resources Engineering to gain the Bachelor of Science degree. The program delivers (48) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

**نظره عامة**

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج هندسة السدود والموارد المائية للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (50) مادة دراسية، مع (6000) إجمالي ساعات حمل الطالب و240 إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

# 2. Undergraduate Courses 2024-2025

**Module 1**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 111 | Mathematics I | 7 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 3 | 93 | 82 |
| **Description** | | | |
| An Overview of the derivatives, Integration, Indefinite integral, Integration by substitution, The definite integral, Evaluating definite integrals by substitution, Applications of the definite integral, Area between two curves, Volumes by slicing; disks and washers, Volumes by cylindrical shells, Length of a plane curve, and Area of a surface of revolution. | | | |

**Module 2**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 112 | Engineering Mechanics I | 6 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 3 | 78 | 72 |
| **Description** | | | |
| After passing this course, the student should be able to understand the forces applied to a body and identify force directions in terms of vectors. The resultant of forces applied into a space can now be utilized in the practical life. For example, the analysis of forces in structural elements like frames and trusses can be identified using the section or joint method. | | | |

**Module 3**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 113 | Engineering Drawing | 6 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 0 | 6 | 93 | 57 |
| **Description** | | | |
| In DWRE 113, initially students will learn how to use the engineering instruments to draw many things by different styles. The students will learn how to use the drawing instruments perfectly.<br>Then, they will recognize the types of line and their uses. In addition, drawing various geometric shapes depending on geometrical constructions will be learned. Then, the theory of projection to draw the views of a certain body will also be learned. Drawing a 3D shape from given views will also be given. Finally, drawing sectional views to illustrate the hidden features will be explained. | | | |

**Module 4**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| UOM 101 | Arabic | 2 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0 | 33 | 17 |
| **Description** | | | |
| • Definition of the Arabic language and its features<br>• Grammatical rules including the present tense, past tense and the five verbs<br>• Dual, feminine plural and sound masculine plural<br>• Exclamation and indeclinable<br>• Subject and predicate<br>• Kana and its sisters, the direct object, the direct object, the abstract and the augmented<br>• Morphological scale<br>• Rhetoric<br>• Spelling rules | | | |

**Module 5**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 114 | Introduction to Water Resources Engineering | 3 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 1 | 48 | 27 |
| **Description** | | | |
| In this course, students are introduced to the importance of water resources for human life and what is the primary role of the dam and water resources engineer in managing and developing these resources and ways to preserve them. In addition, students are introduced to the basic principles of irrigation and drainage engineering, modern and ancient irrigation methods, and methods of preserving water resources. Familiarizing students with the basic principles of studying the flow of fluids in pipes and open channels and the most important methods used in measuring and controlling it. Familiarizing students with the concept of the hydrological cycle and the movement of water above and below the surface of the earth and studying evaporation from the soil surface and the surface of free water and the effect of weather factors on the evaporation process | | | |

**Module 6**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| UOM 103 | Computer | 3 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 1 | 2 | 48 | 27 |
| **Description** | | | |
| We will cover Computing Fundamentals and Office 2013 applications. The Computing Fundamentals module focuses on hardware, software and how they work together. The lesson activities include exercises that guide students to explore the Windows operating system, change settings, and customize the desktop. Students also learn how to manage files and folders, install and uninstall software, and solve computer problems. Hands-on exercises, lesson reviews, and end-of-lesson projects provide students with opportunities to practice and master computing fundamental skills. The Module 1 IC3 Pretest includes additional review questions and projects.<br>The Key Applications module focuses on two of the Microsoft Office 2013 applications: Word and Excel. The lessons explain the purpose of commonly used software features, and step-by-step exercises demonstrate how to use those features. The end-of-lesson projects provide additional practice to master using those features to complete typical day-to-day tasks at home, school, and work. The Module 2 IC3 Pretest includes review questions, projects, and an integrated project, which entails using word processing and spreadsheets. | | | |

**Module 7**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 117 | Hydrogeology | 3 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 1 | 48 | 27 |
| **Description** | | | |
| The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, by considering type of exercises involving some problems that are interesting to the students in Soil, Rocks and the water move underground scope in a field of dams and water resources engineering.<br>Topics included: Earth's crust and components of the earth's crust, minerals and crystals, types of rocks, Engineering and Mechanical properties of rocks, Introduction to hydrogeology, Types of aquifers, Porosity of rocks or soils in aquifers, groundwater movement, Permeability and Hydraulic Conductivity. | | | |

**Module 8**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 121 | Mathematics II | 7 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 3 | 93 | 82 |
| **Description** | | | |
| Matrices and determinants, Transcendental Functions, Inverse Functions, Derivatives and integral of inverse trigonometric functions, Exponential and logarithmic functions, Derivatives and integrals involving logarithmic and exponential functions, Graphs and applications involving logarithmic and exponential functions, Hyperbolic functions, Hopital's Rule, An overview of integration methods: Trigonometric substitutions, Trigonometric integral, Integration by parts, Integrating rational functions by partial fractions, Numerical integration; Simpson's rule. | | | |

**Module 9**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 122 | Engineering Mechanics II | 6 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 3 | 78 | 72 |
| **Description** | | | |
| After passing this course, the student should be able to understand friction forces applied to objects. The determination of center of gravity and moment of inertia are crucial in many engineering applications. Kinematics of Particles can be utilized in different applications such as rectilinear motion, plane curvilinear motion and circular motion. The design of power units in practical life is gains throughout the knowledge of power and energy subject. And much more. | | | |

**Module 10**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 123 | Computer Drawing | 6 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 0 | 6 | 93 | 57 |
| **Description** | | | |
| Computer Drawing is a scientific course with theoretical and practical parts, concerned with providing specialized information in the field of graphic computer software related to engineering drawings, specifically the AutoCAD software.<br>The approach of the course is based on explaining the details of the drawing process and the use of the program in sequential and interrelated stages. Enabling the student to use the commands gradually, according to the degree of importance of the order, its level of complexity, and the user's need for it according to the level of his capabilities and his ability of dealing with the details, orders and elements of the software. | | | |

**Module 11**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 124 | Engineering Statistics | 4 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 1 | 2 | 48 | 52 |
| **Description** | | | |
| Engineering statistics combines engineering and statistics using scientific methods to analyze data. This course will discuss some basic principles of engineering statistics, and introduces students to the fundamental concepts of Nature of statistical data and symbols, Viewing the data, Measures of central tendency, Measures of the mean, dispersion, and range. The average deviation, variance, coefficient of variation, binomial distribution, normal distribution, Principles of probability theory and hypothesis testing approach, Which is one of the most important topics in the field of making a decision to accept or reject the statistical hypothesis In addition to deal with the details of some statistical tests which include Chi square test, T-test and F-test, in addition to the Regression and correlation, the drawing method, the least squares method, the linear correlation.<br>At the end of the course, students will have the necessary knowledge to conduct statistical analysis using statistical tests, determine the extent of data correlation, and have the ability to make a decision to accept or reject a statistical hypothesis, , and have the skills of analytical skills (analyze data collected in the field and examine the results) and Communication skills (prepare detailed reports that document their research methods and findings). This will be achieved through descriptive lectures with Preparing engineering statistics reporting and supervised tutorials. | | | |

**Module 12**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 125 | Water Quality and Pollution | 3 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 1 | 2 | 48 | 27 |
| **Description** | | | |
| Introduction to Environment and Environmental Pollution, Quantitative and Qualitative distribution of water in the world and Hydrological Cycle of water from quantity sides. Properties of water sources, how water sources polluted. Effect of engineering project on water quality and self-purification. Effect of decomposition rate (decomposition constant) on the amount of oxygen required in the process of waste decomposition. Effect of the quality and quantity of wastewater entering and leaving the lake. Study of deficit of oxygen in the water. Study of reaeration and deoxygenation in the water. Effect of waste water on the river. Effect of detergents on the pollution of the water. Study the type of pollution on the river. | | | |

**Module 13**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| UOM 104 | Human Rights and Democracy | 2 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0 | 33 | 17 |
| **Description** | | | |
| Among the objectives of the human rights course is to raise awareness of the Iraqi woman (the mother) about her role in the field of exercising her role within her small family, which serves as a micro-community and to exercise her role towards her children by granting them (children's rights), which are included in the framework of (human rights) because the child is the most important pillar and infrastructure In the Iraqi society, which serves as the first nucleus for the establishment of a healthy and healthy society, free from psychological complexes and behavioral disorders, and raising the awareness of the mother about her duties towards her children, not to practice beating and psychological and physical violence, and to treat them in a sound and humane manner, and that the circumstances and daily hard work do not reflect on her behavior towards her children, and this in my opinion is one of the most important goals Which I seek to consolidate when teaching the subject (Human Rights), which considers the rights of the child as one of the most important points and pillars, In addition to directing the father to treat her children with dignity and produce a healthy child mentally, physically and psychologically. Introducing the Iraqi human rights stipulated in the Iraqi constitutions, especially the permanent Iraqi constitution of 2005. | | | |

**Module 14**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| UOM 102 | English | 2 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0 | 33 | 17 |
| **Description** | | | |
| This course develops further knowledge of the grammar and of essential vocabulary in order to lead the students to an advanced level of proficiency. Emphasis is placed on developing listening, speaking, reading and writing skills through an integrated approach. It focuses on grammar and fundamental writing skills. By the end of the course, students are expected to: 1. Understand the main ideas of a variety of written and spoken texts 2. Participate effectively in a short conversation using appropriate language 3. Produce a range of text types in the form of a logical and cohesive paragraph 4. Select appropriate vocabulary to talk about feelings, opinions and experiences. 5. Recognize, understand and use a number of phrasal verbs and collocations. 6. Use effective organizational strategies that include introductions, paragraphs, transitions, and conclusion | | | |

**Module 15**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 211 | Mathematics III | 5 | 3 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 2 | 63 | 62 |
| **Description** | | | |
| The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, by considering type of exercises involving some problems that are interesting to the students in mathematics scope in a field of dams and water resources engineering.<br>Topics included: Polar coordinates system, Graphing in polar coordinates system, Vectors and Geometry of Space, Space coordinate and space vector, Scalar Product (Dot Product) and Applications, Cross Product (Vector Product) and Applications, Partial Differentiation, Double Integrals and its applications, The methods of least squares, Infinite Sequences and Series. | | | |

**Module 16**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 212 | Fluid Mechanics I | 6 | 3 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 4 | 93 | 57 |
| **Description** | | | |
| The fluid mechanics is the basic subject for second-stage students in the dams and water resources engineering department that from this subject student will learn and practice to fluid properties (units and dimensions, Density, Specific weight. Viscosity, Surface tension, Capillarity. Fluid static (pressure–density–height relationships). Absolute pressure and gage pressure, types of pressure gages. Force on submerged plane surfaces. Force on submerged curved surfaces. Applied problem about gates, dams ……etc. Stability of submerged and floating bodies. This achieved by theoretical lecturers. | | | |

**Module 17**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 213 | Strength of Materials | 6 | 3 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 3 | 78 | 72 |
| **Description** | | | |
| This module is to Explain the relationship between forces and materials and the effect of forces on different materials and explain the types of forces acting on objects, insure that the structures used will be safe against the maximum internal effects that may be produced by any combination of loading. This module is to explain how to determine shear and moment equations for all types of beams and forces and how to draw shear and moment on beams, How to calculate stresses on beams and how to find value and location of maximum stress and how to determine the value of deformation in any point at beams due to effect of forces. | | | |

**Module 18**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 214 | Surveying I | 5 | 3 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 4 | 93 | 32 |
| **Description** | | | |
| Surveying I aims to teach students how to measure distances through obstacles, construction and adjustment of levels, Measurement a long straight line offset, Methods of locating a point or the types of coordinates, Systematic or accumulation errors for tape, Reciprocal leveling, Determine Contour Interval and Contour Line Values, determine the level of the sewer, and computation of area (regular and irregular figures) by using different methods. | | | |

**Module 19**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 215 | Computer programming (MatLab) | 4 | 3 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 2 | 63 | 37 |
| **Description** | | | |
| The computer programing (MATLAB) is the basic subject for second-stage students in the dams and water resources engineering department that from this subject student will learn and practice to computer programming by MATLAB language to be able program and solve question by programming it in MATLAB language. | | | |

**Module 20**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 216 | Building Construction | 4 | 3 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 2 | 63 | 37 |
| **Description** | | | |
| This scientific article provides a general overview of buildings and construction methods, as well as the procedures for project implementation. It covers the types of construction materials used, methods of testing these materials, and ensuring compliance with standard specifications. It also includes information about soil works, foundation types, concrete works, the materials used in concrete production, different types of concrete based on density, brick and block works, wall construction methods, stone works, roof types, lintels, columns, formwork, laboratory tests for aggregates and cement used in concrete, tests for fresh and hardened concrete, tests for bricks and concrete blocks, tiling, and reinforcement steel. | | | |

**Module 21**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 221 | Engineering Analysis | 5 | 4 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 2 | 63 | 62 |
| **Description** | | | |
| This course on Engineering Analysis provides an introduction to differential equations and their applications in various engineering and scientific fields. The course covers a range of topics, including first order differential equations, separation of variables, homogeneous and non-homogeneous equations, exact and non-exact equations, linear and non-linear equations, higher order differential equations, second and higher order linear differential equations, constant and variable coefficient equations, variation of parameters, simultaneous linear equations, physical and engineering applications of differential equations, and Laplace transforms. Throughout the course, students will develop the necessary skills to solve a variety of differential equations through both analytical and numerical methods. Practical applications of differential equations in engineering, physics, and other fields will be emphasized, helping students to understand their relevance and importance in real-world situations. By the end of this course, students will have a strong foundation in differential equations and be prepared to tackle more advanced topics in engineering and science. | | | |

**Module 22**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 222 | Fluid Mechanics II | 6 | 4 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 4 | 93 | 57 |
| **Description** | | | |
| The fluid mechanics is the basic subject for second-stage students in the dams and water resources engineering department that from this subject student will learn and practice to velocity and acceleration of water flow. Conservation of mass: the continuity equation. One two three-dimensional flow, steady and unsteady flow. One dimensional flow Euler's equation, Bernoulli's equation determination and Application of Bernoulli's equation (venturi meter, orifice and sluice gate). Momentum equation determination and application. | | | |

**Module 23**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 223 | Structures | 6 | 4 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 3 | 78 | 72 |
| **Description** | | | |
| Theory of structures is a field of knowledge that is concerned with the determination of the effect of loads (actions) on structures. A structure in this context is generally regarded to be a system of connected members that can resist a load. This module focuses on the fundamental analysis concepts and techniques required by engineers to study the behavior of common structures. The module will cover calculation methods necessary to describe and quantify member forces and deflections. The module will address stability and determinacy and include analysis techniques for determinate and indeterminate structures such as beams, frames, trusses. Emphasis is placed on developing the student's ability to analyze a structure using prescribed methods. | | | |

**Module 24**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 224 | Surveying II | 5 | 4 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 4 | 93 | 32 |
| **Description** | | | |
| Surveying II aims to teach students how to calculate the earthworks and reservoir volumes from contour maps, bearing of lines, designation of bearing, theodolite, construction and adjustment of the theodolite, measurement of angles, traverse surveys and their adjustment, tachometer, and total station. | | | |

**Module 25**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 225 | Soil Physics | 6 | 4 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 3 | 93 | 57 |
| **Description** | | | |
| Soil physics is a branch of soil science that deals with the physical properties and processes occurring within the soil environment. It focuses on understanding the behavior and characteristics of soil as a natural resource. Soil physics encompasses various aspects such as soil texture, structure, porosity, water movement, and the interaction between soil and plants.<br>One key area of study in soil physics is soil water dynamics. It investigates how water moves through the soil profile, including processes like infiltration, percolation, and evaporation. This knowledge is crucial for managing irrigation systems, optimizing water use efficiency, and preventing soil erosion.<br>Additionally, soil physics explores the mechanical properties of soil, including its strength, compaction, and deformation under different loads. These properties influence agricultural practices, engineering designs, and the stability of structures built on or with soil.<br>Understanding soil physics is vital for sustainable land management, agriculture, and environmental conservation. It provides insights into the physical processes that govern soil-water-plant interactions, nutrient cycling, and carbon sequestration, contributing to effective soil conservation and resource management strategies. | | | |

**Module 26**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| UOM 201 | Baath Crimes in Iraq | 2 | 4 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0 | 33 | 17 |
| **Description** | | | |
| Expanding the student's awareness of the concept of crime, its method, and ways to extract lessons and morals from the crimes and violations committed during the Baath Party's rule. | | | |

**Module 27**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 311 | Hydraulics | 5 | 5 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 3 | 78 | 47 |
| **Description** | | | |
| This subject covers Dimensionless analysis, Modelling in pipes and open channel, Flow in pipes, general equations, Laminar and turbulent flow in pipes, Distribution of velocities and shear stress in pipes, Flow in smooth pipes, seventh root law, Flow in rough pipes, Classification of rough and smooth flow in pipes, Flow in non-circular pipes, Minor losses of the fittings, connect pipes in parallel and series, Branched channel, connection with tanks, Hardy- cross method to measure discharge in each pipe of a networks, Pumps: introduction, connections and efficiency, Pumps in parallel and series.<br>This will be achieved through classes, interactive tutorials, class works and by considering type of simple experiments involving some sampling activities that are interesting to the students. | | | |

**Module 28**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 312 | Surface Water Hydrology | 5 | 5 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 3 | 78 | 47 |
| **Description** | | | |
| Surface water hydrology is a scientific module with theoretical, Tutorial & Lab parts. The module serves as an introduction to the field of engineering hydrology. It covers fundamentals such as the hydrological cycle, catchment, losses, hydrographs, and hyetographs. Design topics covered will be selected from: flood frequency analysis, determination of design rainfall intensity and hyetographs, peak flow estimation, design hydrograph estimation, flood routing, and applying programs related to these topics like delineate actual watershed and computing peak surface discharge. | | | |

**Module 29**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 313 | Irrigation Principles and Practices | 4 | 5 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 2 | 63 | 37 |
| **Description** | | | |
| Through this course, we try to help the student to understand the foundations of the irrigation process by learning everything related to irrigation water sources, and methods of ancient and modern irrigation, as well as linking the relationship between soil and water, and how water moves over and through the soil, while giving the student examples of all this from reality, with reference to The major irrigation projects in the city and the country and the irrigation methods used in each of them. | | | |

**Module 30**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 314 | Concrete Design | 7 | 5 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 3 | 93 | 82 |
| **Description** | | | |
| An introduction to composite element (Reinforced concrete structure), Characteristics of reinforced concrete elements, Concrete Grades, Steel Grades, Loading types. Design of different structural elements subjected to flexural bending using Working Stress Method. Design of different structural elements subjected to flexural bending using load and resistance factor design method (LRFD method). Shear design for beams and columns. Design of Axially Loaded Columns, Design of Short Columns Subject to Axial Load and Bending, Footings Analysis, Wall, continuous and Mat footing, Design of one way and two-way slabs. Design of Reinforced Concrete Wall, Introduction to seismic design. | | | |

**Module 31**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 315 | Principles of Soil Mechanics | 7 | 5 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 5 | 108 | 67 |
| **Description** | | | |
| The course aims to provide students with the necessary background information about soil mechanics. The course provides students with a fundamental understanding of the principle of soil mechanics, soils' properties, states, behavior, and mechanics. Also, give students training on solving problems by applying the theories and principles in soil mechanics. The course includes solving problems based on phase relationships, and soil classification according to various international classification systems and determining the suitability of soils for engineering purposes. In addition, the students will understand the principles of soil mechanics and it is application: Flow of water through the soil, permeability, and seepage. The principle of effective stress and its implications. Consolidation and calculate elastic and consolidation settlements. Finally, the students will be familiar with soil improvement and stabilization techniques. | | | |

**Module 32**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 316 | Statistical methods in hydrology | 2 | 5 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0 | 33 | 17 |
| **Description** | | | |
| The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, by considering type of exercises involving some problems that are interesting to the students in mathematics scope in a field of dams and water resources engineering. | | | |

**Module 33**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 321 | Numerical Analysis | 6 | 6 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 2 | 78 | 72 |
| **Description** | | | |
| This course on Numerical Methods provides an in-depth understanding of the core concepts and methods used in numerical analysis. The course covers various numerical methods, including iteration and graphical methods, Newton-Raphson's method, false position method, Taylor's series, and Euler's method. Additionally, students will learn about interpolation techniques such as Gregory Newton's forward interpolation method and Gauss method. Difference equations will also be covered, including the definition, forming, order, and degree of difference equations and their solutions. Students will explore methods such as central differences, derivative of Newton forward and backward differences, and Gauss-Jacobi's and Gauss-Seidel methods. By the end of the course, students will have developed analytical and numerical skills and a solid foundation in numerical methods. They will be prepared to apply these concepts in the fields of engineering and science. | | | |

**Module 34**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 322 | Open Channels | 5 | 6 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 3 | 78 | 47 |
| **Description** | | | |
| This subject covers Open channel, types and classifications, Uniform flow, Chezy and Manning equations, Best hydraulic cross section, Consecration of hydraulic radius and Manning coefficient<br>Specific energy and critical depth, Critical depth with humps or contractions, Hydraulic jump, Varied flow, water surface profile, Weirs and notches, Empirical Formulae for Discharge Over Rectangular Weir Time Required to empty a Reservoir or a Tank with Rectangular and Triangular, Weirs or Notches, Measurement of Flow of Irregular Channels, Software: HEC-RAS in steady flow in channels and unsteady flow.<br>This will be achieved through classes, interactive tutorials, class works and by considering type of simple experiments involving some sampling activities that are interesting to the students. | | | |

**Module 35**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 323 | Groundwater Hydrology | 4 | 6 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 3 | 78 | 22 |
| Description | | | |
| *Groundwater Hydrology* is a theoretical and lab module that develops a basic understanding of physical processes and properties that control the occurrence and movement of groundwater in the subsurface. The module has two main parts; the first part (*Groundwater Hydrology module*) focuses on aquifers and their properties(types of aquifers, aquifer rock properties including porosity and permeability) ), with a series of case studies illustrating examples of highly used regional aquifers. The second part focuses on the dynamics of aquifers and groundwater flow-notably the concept of hydraulic head, recharge, and water budgets. The acquired knowledge will apply to software related to the module. | | | |

**Module 36**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 324 | Drainage Engineering | 6 | 6 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 3 | 78 | 72 |
| **Description** | | | |
| The aim of this course is to introduce students to the agricultural drainage required to enhance the field production, and to create a balance among water, air, and salts contents in the soil. The students will learn the purpose of drainage, benefits of drainage, history of drainage in Iraq. Then, general principles of groundwater hydraulics will also be given to the students such as Darcy's law, Dupuit-Forchheimer method, and groundwater flow in layered soils. Furthermore, the students will learn leaching requirements to for saline lands reclamations. Drainage projects' investigations, drainage systems (surface and subsurface), design of drainage sections, design of field drainage spacing, drainage wells (vertical drainage), drainage maintenance, and drainage and environmental pollution will be also given to the students in details. At the end of the course the students will have a working knowledge of the drainage networks and have the skills to design drainage projects. This will be achieved through descriptive lectures with design projects and supervised tutorials. | | | |

**Module 37**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 325 | Soil Mechanics and Foundations | 5 | 6 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 4 | 93 | 32 |
| **Description** | | | |
| The course aims to give students the knowledge to understand the theory of shear strength of the soil. Also, to give the students the issue of engineering soil problems and how to improve the soil to raise its bearing capacity, reduce subsidence, and avoid the problems of swelling and fallout. Furthermore, to understand the concept of lateral earth pressures of soils and retaining walls. In addition, to develop problem-solving skills and understanding of foundation engineering theory through the application of techniques, and to discuss and evaluate the feasibility of foundation solutions to different types of soil conditions considering the time effect on soil behavior. The student will understand the structural design of different types of shallow foundations. Also, to give the students the methods of ultimate pile capacity estimation in the sand and in clay, to calculate the ultimate pile capacity of group piles and assess pile group efficiency, and to estimate settlement of single and group piles. | | | |

**Module 38**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 326 | Consumptive Use and Water Duty | 4 | 6 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 2 | 63 | 37 |
| **Description** | | | |
| Through this semester we will try to teach the student how to calculate the value of the reference water Consumptive use of the plant and then learn how to draw the crop coefficient curve and thus how to calculate the water Consumptive use of the crop using more than one method in the calculations and compare them and choose the best according to the weather data available to us and then the student will be able to choose Crops suitable for cultivation, defining the agricultural plan in the field or project, and calculating the water standard that will enable the student to determine the seasonal amount of water needed for the field or project. The student will also learn how to calculate the different irrigation efficiencies for the purpose of choosing the appropriate irrigation method for the field, which will be determined by the topography and the physical properties of the soil. | | | |

**Module 39**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 411 | Design of Hydraulic Structures I | 6 | 7 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 1 | 4 | 78 | 72 |
| **Description** | | | |
| The course would cover the aspects related to the design the hydraulic structures as follows:<br>□ Introduction of the hydraulic structures.<br>□ Some theories for estimating the uplift pressure and piping phenomena in hydraulic structures (Bligh's theory, Lane's theory, Khosla's theory, and flow net analysis).<br>□ Protection works of approaches for the horizontal floor.<br>□ Introduction of a hydraulic jump, its types, efficiency, length, position, and tailwater conditions.<br>□ Introduction of stilling basins. Design of SAF stilling basin, and U.S.B.R II stilling basin.<br>□ Introduction and design of cross regulator and Head regulator. | | | |

**Module 40**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 412 | Design of Gravity Irrigation Systems | 6 | 7 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 3 | 78 | 72 |
| **Description** | | | |
| This course provides a comprehensive overview of various types of irrigation systems in term of description and design. This course is one of the essential courses for students of the Department of Dams and Water Resources Engineering, through which students are identified and trained in collecting basic data required to design surface irrigation systems using the most effective design procedure. | | | |

**Module 41**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 413 | Design of Earth and Earth Rock Fill Dams | 6 | 7 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 3 | 78 | 72 |
| **Description** | | | |
| In ENDWR 406, the fourth class students should be awareness about the hydrological aspects which related to the hydraulic designs of dams. The objectives of dams and reservoirs construction are explained in detail. In addition to give the students the knowledge about the most suitable sites for dams construction with specify the suitable type of dams. All of these are done according to the hydrological and geological aspects for the region. Design of earth dams typs are given in detail, in addition to the analyses all of the forces that effected to the body of earth dams with taking into consideration the specificity of each type of dams. | | | |

**Module 42**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 414 | Engineering Management and Economics | 5 | 7 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 2 | 63 | 62 |
| **Description** | | | |
| Engineering Management and Economics is a scientific module with Class Lecture &Tutorial parts. The module serves as an introduction to engineering and business economics investment alternatives and to project management. Intended to give students a working knowledge of money management and how to make economic comparisons of alternatives involving future benefits and cost. The impact of inflation, taxation, depreciation, financial planning, economic optimization, project scheduling, and legal and regulatory issues are introduced and applied to economic investment and planning and project-management problems. | | | |

**Module 43**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 415 | Design of Irrigation and Drainage Networks | 5 | 7 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 1 | 3 | 63 | 62 |
| **Description** | | | |
| The design of irrigation and drainage network is the basic subject for fourth-stage students in the dams and water resources engineering department that from this subject students will learn and practice to compute how to design irrigation and drainage network for deferent irrigation projects with different dimensions consider standard designs for water resources ministry in Iraq. this can be done by Layout the network on a contour map, calculate served area and discharge according to water supply system, Design earth canals, lined canals and drains according to the design criteria for Iraq. also draw the synoptic diagram for canals and drains. Calculate the seepage loss and decided if the canal needed to line or not. Draw the longitudinal section which shows the dimensions for canals and drains and the cross sections show the amount of cutting and filling. | | | |

**Module 44**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 416 | Engineering Project I | 2 | 7 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 0 | 2 | 33 | 17 |
| **Description** | | | |
| A group of students (2 – 4) will have a certain engineering project related to water resources topics. | | | |

**Module 45**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 421 | Design of Hydraulic Structures II | 6 | 8 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 1 | 4 | 78 | 72 |
| **Description** | | | |
| The course would cover the design aspects of the following hydraulic structures:<br>1. Design of canal structures (canal head work). The design includes an introduction, defining the components of the barrage, and design steps of the undersluice, other barrage, and side main canal.<br>2. Introduction of transitions (R.S Chaturvedi's, Mitra's, and Hind's transitions). Design of transitions (Hind's transitions).<br>3. Types of cross drainage works. Design example of syphon.<br>4. Introduction and design example of the culvert.<br>5. Design of canal falls (Sharda-type fall). | | | |

**Module 46**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 422 | Design of Sprinkler and Drip Irrigation Systems | 7 | 8 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 3 | 93 | 82 |
| **Description** | | | |
| This course provides a comprehensive overview of various types of pressurized irrigation systems in term of description and design. This course is one of the essential courses for students of the Department of Dams and Water Resources Engineering, through which students are identified and trained in collecting basic data required to design sprinkler and drip irrigation systems using the most effective design procedure. | | | |

**Module 47**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 423 | Design of Gravity and Arch Dams | 6 | 8 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 3 | 78 | 72 |
| **Description** | | | |
| During the first semester in forth class, students should be awareness about designing of gravity and arch in addition to the ogee spillway detail. The forces analyses which effected to the body of gravity dam should learn by the students, as well as to the desining of gravity and arch dams. So, according to the successful completion of this course, the student shall be able to design of a gravity dams, design of the arch dams, control the seepage through the body of the earth dam and its foundation and design of ogee spillway. | | | |

**Module 48**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 424 | Estimation and Specifications | 7 | 8 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 4 | 93 | 82 |
| **Description** | | | |
| This course is designed for Dams and Water Resources Engineering students in their Fourth year. It intends to give students a comprehensive idea about the estimation of materials ( excavation volumes, steel, cement, sand, gravel and plaster). Addition to walls materials estimation (Block building, bricks building and stone building).also estimation wood form. Then the course transferred the students to the Draw (Map of house, foundation map, section in wall, slab reinforced, bridges reinforced map, sewer network, Water Supply network and electrical network ), Gradually Finishing electrical network, Earth works and volumes calculations for irregular cross-sections, Finishing works. | | | |

**Module 49**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 425 | Water supply engineering | 2 | 8 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0 | 33 | 17 |
| **Description** | | | |
| The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. | | | |

**Module 50**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| DWRE 426 | Engineering Project II | 2 | 8 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 0 | 2 | 33 | 17 |
| **Description** | | | |
| A group of students (2 – 4) will have a certain engineering project related to water resources topics. | | | |

# Contact

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