Tikrit University
جامعة تكريت

Bachelor's Degree (B.Sc.) – Dams & Water Resources Engineering

بكالوريوس - هندسة السدود والموارد المائية

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1- Overview

This catalogue describes the courses offered by the Dams and Water Resources Engineering program for the Bachelor of Science degree. The program includes 48 courses with a total of 4500 study hours and 240 ECTS credits. The courses are organized according to the Bologna Process.

نظرة عامة

يقدّم هذا الدليل وصفاً للمقررات الدراسية التي يقدمها قسم السدود والموارد المائية للحصول على درجة البكالوريوس في العلوم. يتضمن البرنامج 48 مادة دراسية بمجموع 4500 ساعة دراسية و240 وحدة ECTS.يتم تنظيم المقررات وفق نظام بولونيا.

2. Undergraduate Courses 2025-2026

Module 1

Code	Course/Module Title	ECTS	Semester
MATH-101	Calculus I	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
4		63	87
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
ENG-101	Engineering Mechanics I	5	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	1	63	62
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
UOT-003	Computer I	3	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	12
Description			
This course offers students a comprehensive exploration of the fundamental concepts and principles that			

underpin the field of computer science. By delving into various subjects including the historical development of computing, data representation, computer components, algorithms, programming languages, operating systems, applications, internet and networking, and cyber-security, students will develop a well-rounded understanding of the discipline. By examining the evolution of computer science over time, students will acquire a broad perspective on the field and its significance in contemporary society. Through a combination of theoretical knowledge and practical applications, this module equips students with the necessary foundation to pursue further studies or careers in computer science.

Module 4

Code	Course/Module Title	ECTS	Semester
ENG-102	Engineering Drawing	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	4	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. 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 5

Code	Course/Module Title	ECTS	Semester
DWRE-101	Introduction to Water Resources Engineering	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	87
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
UOT-004	Human Rights and Democracy	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
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 7

Code	Course/Module Title	ECTS	Semester
UOT-001	Arabic Language I	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2		33	17
Description			
1- -تطوير المهارات اللغوية وحفظ بعض السور القرآنية وتعزيز حب اللغة لدى الطلبة 2- فهم كيفية تطبيق القواعد اللغوية في الحياة اليومية، ومعرفة المصطلحات اللغوية في مجالات الهندسة 3- أهمية اللغة العربية في مجالات الحياة اليومية 4- استخدام القواعد اللغوية في كتابة التقارير والأبحاث العلمية بشكل صحيح 5- تعزيز التعلم الذاتي والاستقلالية في التعلم وتشجيع الطلاب على أخذ مبادرة في تعلم اللغة العربية			

Module 8

Code	Course/Module Title	ECTS	Semester
MATH-102	Calculus II	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
4		63	87
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
ENG-103	Engineering Mechanics II	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	62
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
UOT-031	Computer II	3	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	12
Description			

This course introduces fundamental computing principles and programming concepts. Students use the high-level programming language, MATLAB to develop and implement programs to solve. Engineering problems. Basic programming concepts covered include algorithm design, data types, flow control, functions, sorting, plotting, simulation, and numerical methods. • Loops (for and while loops)

Module 11

Code	Course/Module Title	ECTS	Semester
DWRE-102	Construction Materials	4	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
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 12

Code	Course/Module Title	ECTS	Semester
DWRE-104	Analytical Chemistry	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	78	47
Description			
Analytical chemistry is the study of elements and compounds in materials in the three cases solid, liquid, and gas, and knowing its percentages and quantities in the materials and knowing acidity or alkalinity of solutions and methods of its calculations.			

Module 13

Code	Course/Module Title	ECTS	Semester
DWRE-103	Engineering Statistics	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	62
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. 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 14

Code	Course/Module Title	ECTS	Semester
UOT-002	English Language I	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
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
MATH-201	Calculus III	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
4		63	87
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. 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-201	Strength of Materials	4	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	37
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 17

Code	Course/Module Title	ECTS	Semester
DWRE-202	Fluid Mechanics I	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**

3	3	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 18

Code	Course/Module Title	ECTS	Semester
DWRE-203	Engineering Surveying I	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	78	72
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-204	Concrete Technology	4	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	37
Description			
The aim of this course is to enable the student to: - Describe factors that control the properties of concrete. - List methods of determining the properties of concrete.			

Module 20

Code	Course/Module Title	ECTS	Semester
UOT-005	The Crimes of the Baath Regime in Iraq	2	3

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/sem)
2		33	17
Description			
- التعرف على جرائم الحزب والانتهاكات التي قام بها خلال فترة الحكم - القدرة على فهم الاثار السلبية لهذا الحزب على الجانب النفسي والاجتماعي والثقافي لأفراد الشعب العراقي - التعرف على التأثير السلبي على واقع البيئة العراقية			

Module 21

Code	Course/Module Title	ECTS	Semester
UOT-011	Arabic Language II	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2		33	17
Description			
1- دراسة نصوص متقدمة لفهم الأساليب البلاغية واللغوية المختلفة وتفسير المعاني العميقة. 2- تعلُّم كتابة المقالات والبحوث الأكاديمية بشكل احترافي، مع التركيز على الربط بين الأفكار واستخدام أدوات الربط. 3- تطوير مهارات التحدث أمام الآخرين وعرض المواضيع بشكل منظم باستخدام لغة سليمة وواضحة. 4- تعلم أساسيات الترجمة بين العربية واللغات الأخرى (مثل الإنجليزية)، مع التركيز على المصطلحات العلمية والهندسية			

Module 22

Code	Course/Module Title	ECTS	Semester
MATH-202	Calculus IV	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
4		63	87
Description			
- Integration over 3D regions (cylindrical and spherical coordinates). - Applications in mass, center of mass, and volume of solids in engineering. - Understanding vector fields (e.g., velocity fields in fluid flow). - Line integrals and work done by a force field — essential in fluid and energy systems. - Surface area and flow across a surface — critical for water flow across surfaces in hydrology. - Solving physical problems involving heat, fluid, or electromagnetic fields using calculus.			

Module 23

Code	Course/Module Title	ECTS	Semester
DWRE-205	Fluid Mechanics II	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	3	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 24

Code	Course/Module Title	ECTS	Semester
DWRE-206	Engineering Surveying II	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	78	72
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-207	Water Quality and Pollution	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	78	47
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 26

Code	Course/Module Title	ECTS	Semester
DWRE-208	Engineering Geology	3	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	12
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. 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 27

Code	Course/Module Title	ECTS	Semester
UOT-011	Ethics and Leader Skills	2	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2		33	17
Description			
مادة "أسس علم المناخ" هي تخصص يهدف إلى فهم ودراسة المناخ وأساسيات للطلاب، وتعريفهم بالتغيرات الجوية والمناخية التي تحدث على مدى فترات زمنية طويلة وقصيرة، وكيفية قياسها ودراستها. وتسعى المادة إلى تزويد الطلاب بالمفاهيم والأدوات اللازمة لفهم العوامل التي تؤثر على المناخ وتغيراته، وكيفية تحليل البيانات والنماذج المناخية اضافة الى ذلك ويتم ذلك عن طريق دراسة مختلف العناصر المناخية مثل درجة الحرارة، الرطوبة، الضغط الجوي، سرعة الرياح، وتحليل كيفية تفاعل هذه العناصر وتأثيرها على المناخ. كما يتضمن المنهج دراسة تأثير الأنشطة البشرية على المناخ والتغيرات المناخية الحالية والمتوقعة في المستقبل. وتعلم الطلاب في مادة "أساس علم المناخ "إلى تمكينهم من فهم أهمية الحفاظ على البيئة والتحديات المناخية التي تواجه العالم، وكذلك تزويدهم بالمهارات اللازمة لتطوير الحلول .والإجراءات المناسبة لمواجهة هذه التحديات			

Module 28

Code	Course/Module Title	ECTS	Semester
UOT-021	English Language II	2	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	0	33	17
Description			
In the semester of the English course, students can build on their foundational grammar and vocabulary by focusing on more advanced language use in academic and professional contexts. The course may emphasize writing multi-paragraph essays, improving argumentative and descriptive writing skills, and expanding vocabulary for technical and field-specific topics. Listening and speaking activities can involve group discussions, presentations, and summarizing longer audio materials. Reading materials might include articles, reports, and opinion pieces to enhance critical thinking. Grammar instruction can shift toward more complex sentence structures, conditionals, and passive voice. Overall, the goal would be to prepare students to communicate more confidently and accurately in both academic and real-world settings.			

Module 29

Code	Course/Module Title	ECTS	Semester
MATH-301	Engineering Analysis	4	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	37
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 30

Code	Course/Module Title	ECTS	Semester

DWRE-301	Structural Analysis	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
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 31

Code	Course/Module Title	ECTS	Semester
DWRE-302	Soil Mechanics I	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	78	47
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-303	Engineering Hydrology I	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	87
Description			

hydrology is a scientific module with theoretical, Tutorial. 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 33

Code	Course/Module Title	ECTS	Semester
DWRE-304	Open Channels Hydraulics	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	87
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 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. 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 34

Code	Course/Module Title	ECTS	Semester
DWRE-305	Engineering Economy and Management	4	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	1	48	52
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 35

Code	Course/Module Title	ECTS	Semester
MATH-302	Numerical Analysis	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	37
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 36

Code	Course/Module Title	ECTS	Semester
DWRE-306	Concrete Designs	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
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 37

Code	Course/Module Title	ECTS	Semester

DWRE-307	Soil Mechanics II	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	3	78	47
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--308	Engineering Hydrology II	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	87
Description			
Hydrology II 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 39

Code	Course/Module Title	ECTS	Semester
DWRE-309	Irrigation Engineering and Practices	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**

3	1	63	62
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 40

Code	Course/Module Title	ECTS	Semester
DWRE-310	Hydraulics of Pipeline Systems	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	62
Description			
The class introduces the principles of fluid mechanics as applied to closed-conduit pipeline systems. - It covers head losses due to friction, minor losses, and methods of calculating pressure distribution along pipelines. Students learn about pump and turbine selection, efficiency, and integration with hydraulic networks. - The course includes the design and analysis of water transmission lines, branching systems, and pipe networks. - Practical applications, such as surge analysis, cavitation control, and maintenance of hydraulic systems, are also discussed.			

Module 41

Code	Course/Module Title	ECTS	Semester
DWRE-401	Hydraulic Structures I	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	87
Description			
The course would cover the aspects related to the design the hydraulic structures as follows: □ Introduction of the hydraulic structures.			

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). Protection works of approaches for the horizontal floor. Introduction of a hydraulic jump, its types, efficiency, length, position, and tailwater conditions. Introduction of stilling basins. Design of SAF stilling basin, and U.S.B.R II stilling basin. Introduction and design of cross regulator and Head regulator.

Module 42

Code	Course/Module Title	ECTS	Semester
DWRE-402	Foundations Engineering	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	62
Description			
Foundations engineering- is provided to deal with structural design of spread, combined and mat foundation. Estimating the load capacity of various type of single piles and group piles in different methods. Calculating the lateral earth pressure and design gravity and cantilever retaining walls. Finding the factor of safety for natural and artificial ground slopes.			

Module 43

Code	Course/Module Title	ECTS	Semester
DWRE-403	Methods of Construction and Estimation	4	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	1	48	52
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 establish basic knowledge of construction contracts and how to deal with equipment in terms of its cost and productivity, and to identify the most important factors that affect its selection and then use it in accomplishing the tasks required to achieve the highest productivity and the lowest cost.			

Module 44

Code	Course/Module Title	ECTS	Semester

DWRE-404	Drainage Engineering and Practices	4	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	1	48	52
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 45

Code	Course/Module Title	ECTS	Semester
DWRE-405	Graduation Project I	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
0	2	48	102
Description			
A group of students (2 – 4) will have a certain engineering project related to water resources topics.			

Module 46

Code	Course/Module Title	ECTS	Semester
DWRE-406	Hydraulic Structures II	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	87
Description			
The course would cover the design aspects of the following hydraulic structures:			

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.
2. Introduction of transitions (R.S Chaturvedi's, Mitra's, and Hind's transitions). Design of transitions (Hind's transitions).
3. Types of cross drainage works. Design example of syphon.
4. Introduction and design example of the culvert.
5. Design of canal falls (Sharda-type fall).

Module 47

Code	Course/Module Title	ECTS	Semester
DWRE-407	Rivers Engineering	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	62
Description			

The course focuses on the principles of river hydraulics and sediment transport.

- It covers river morphology, meandering processes, and channel stability analysis.
- Students learn methods of river training, bank protection, and erosion control.
- The class includes design considerations for flood control works, navigation, and river regulation structures.
- Case studies highlight the role of river engineering in sustainable water resources management.

Module 48

Code	Course/Module Title	ECTS	Semester
DWRE-408	Dams and Reservoirs Engineering	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
3	1	63	62
Description			

The course introduces the fundamental concepts of dam types, functions, and components.

- It covers hydrological analysis, reservoir capacity, and water storage management.
- Students study the structural design and stability of concrete, earth, and rockfill dams.
- The class emphasizes spillway design, outlet works, and safety considerations.
- Practical applications include flood control, irrigation, hydropower generation, and sediment management in reservoirs.

Module 49

Code	Course/Module Title	ECTS	Semester
DWRE-409	Sanitary Engineering	4	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	37
Description			
This course aims to form the basic knowledge for designing and evaluating infrastructure networks (sewage network system and storm network system). The presentation of the course begins with studying the methods of collecting water for the two networks, calculating their quantities, and then using the results in designing the network, in addition to studying the international standards for these networks. Networks evaluation (sewage network system and storm network system) and ways to fix it were also discussed.			

Module 50

Code	Course/Module Title	ECTS	Semester
DWRE-410	Graduation Project II	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
0	3	48	102
Description			
A group of students (2 – 4) will have a certain engineering project related to water resources topics.			

Module 51

Code	Course/Module Title	ECTS	Semester
DWRE-	Elective Course I	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	62
Description			
An elective course is a class that students can choose according to their personal interests or career goals, rather than being a mandatory requirement. It allows students to explore specialized topics, broaden their knowledge, and develop skills that complement their main field of study. Elective courses carry credits that contribute to the completion of degree program.			

Module 52

Code	Course/Module Title	ECTS	Semester
DWRE-	Elective Course II	4	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USSWL (hr/sem)**
2	2	63	37
Description			
An elective course is a class that students can choose according to their personal interests or career goals, rather than being a mandatory requirement. It allows students to explore specialized topics, broaden their knowledge, and develop skills that complement their main field of study. Elective courses carry credits that contribute to the completion of degree program.			

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