

## University Of Anbar جامعة الانبار



*First Cycle – Bachelor's Degree (B.Sc.) – Dams  
and Water Resources Engineering Department*

بكالوريوس هندسة - 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 Department to gain the Bachelor of Science degree. The program delivers (44) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظرة عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج هندسة السدود والموار المائية للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (44) مادة دراسية، مع (6000) إجمالي ساعات حمل الطالب و 240 إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

### 2. Undergraduate Courses 2023-2024

#### Module 1

Code	Course/Module Title	ECTS	Semester
DWE1201	Calculus-I	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
In this module, students will learn important principles of mathematics, including extensive review of their knowledge in middle school, in terms of Functions and models, Limits and continuity, Differentiation, Applications of derivatives, hyperbolic and Inverse functions. This course will provide information and lectures for mathematical models with old and new functions. Inverse functions and logarithms will be covered. Applications of differentiation in this course will contain maximum values, mean values of theory, how to derivative effect on shape of graph. Also, derivation of trigonometric functions and chain rule, implicit differentiation and hyperbolic functions will be studied in this entire class.			

**Module 2**

Code	Course/Module Title	ECTS	Semester
DWE1203	Physics	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	78	72
Description			
<p>This is the first course in the two-semester sequence of calculus-based introductory physics courses designed to meet the needs of students majoring in Engineering. The course is a survey of the concepts, principles, methods, and major findings of classical Physics. Primarily, it covers Newtonian mechanics, and thermal Physics, with topics include Physics and measurement, Vectors, kinematics, and dynamics of motion of a single particle in one and two dimensions, work and energy, system of particles, equilibrium of rigid bodies, temperature, and thermal equilibrium. Also, the course will cover the laws of motions, circular motion and applications of Newton's Law and energy transfer.</p>			

**Module 3**

Code	Course/Module Title	ECTS	Semester
DWE1205	Chemistry	5	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	78	47
Description			
<p>The course initially contains 9 chapters of the textbook. Chapters include Chemistry and Measurement and significant figures. Atoms, molecules, and ions. Formulas and names. Stoichiometry and chemical calculations. Chemical reactions. Thermochemistry and enthalpy changes. Quantum theory of the atom and electron configuration. Chemical bonding and molecular geometry. The Lab. Section presents Safety in the Lab. Measurement of mass, volume, and density. Identification of an unknown compound. Qualitative analysis of anions. Empirical formula of a compound. Thermal decomposition of hydrates. Stoichiometric determination. Acid-base and redox titrations. Enthalpy of reactions. The course tools included homework, Lab work, Quiz, Progress Exam, Midterm and Final exam. The homework serves to enhance students' ability to solve problems. The grades were distributed 5% for homework, 10% for Lab work, 10% for Quiz, 10% for Progress Exam, 15% for Midterm and 50% for Final exam are set by college regulation.</p>			

**Module 4**

Code	Course/Module Title	ECTS	Semester
DWE1212	<b>Fundamental of Electrical Engineering</b>	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>This course introduces the basics of electric circuits, series and parallel connection, and DC circuit analysis. Additionally, the course presents ohm's law, Kirchhoff laws for solving series parallel circuits. Furthermore, it introduces circuit theorem and their analysis, including mesh, nodal, and superposition theorems. Thevenin and Norton theorems are also included. Finally, the course introduces capacitors and inductors into the circuit and how to deal with it under dc conditions. The lab will contain experiment for Kirchhoff's current and voltage law, series-parallel network, Norton's theorem. Students will be able to understand the basic concept of electrical circuits and can solve series parallel circuits.</p>			

**Module 5**

Code	Course/Module Title	ECTS	Semester
DWE2213	<b>Engineering Statistics</b>	4	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	37
Description			
<p>Statistical Engineering models are based on mathematics and probability theory. This course provides students with a working knowledge of fundamental statistics principles and probability in addition to a preface to the regression and correlation analysis. By the end of the semester, students should be able to determine when each of the various topics we have covered is appropriate to use, and to apply them to practical engineering situations or problems. This course will cover techniques on data collection and presentation, descriptive statistics, basic elements of probability theory, sampling techniques and theory, statistical estimation, hypothesis testing and regression analysis. At the end of this course all students will be able to analysis of data and knowledge the relation between it.</p>			

**Module 6**

Code	Course/Module Title	ECTS	Semester
DWE2103	English Language	3	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	12
Description			
<p>Studying pre-intermediate English can significantly improve a student's English skills in various ways. In this course, the students are going to study 15 units which include different topics like: Question forms. Present continuous tense. Vocabulary. Reading. Social English. Speaking and listening. Present simple tense. Have/ Have got. Vocabulary. Everyday English. Numbers. Prices. Reading. Past Simple. Past Continues. Everyday English. Time Expressions. Expressions of quantity. Articles. Every day English. Requests and offers. Verb patterns. Like doing / would like to do. Will. Going to. What.....like? Comparative and superlative adjectives. Present perfect simple. Must. Must. Should.Will. First conditional. Time clauses. Used to. Question form (2). Question tags. the passive which includes present, Past, and Present perfect. Verb patterns. Infinitives. conditional. Might. present perfect. Past Perfect - Reported statements and questions.</p> <p>Studying pre-intermediate English not only improves students' English skills but also enhances their overall studying abilities. By engaging with the language at this level, students develop important cognitive and academic skills. They learn to analyze and comprehend texts more effectively, improving their reading comprehension skills. Moreover, pre-intermediate English courses require students to practice critical thinking and problem-solving through various language exercises and activities. This enhances their analytical skills and helps them approach academic tasks with a more structured and systematic approach. Additionally, studying pre-intermediate English cultivates discipline, perseverance, and time management skills, which are essential for successful studying in any subject</p>			

**Module 7**

Code	Course/Module Title	ECTS	Semester
DWE1202	Calculus-II	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
<p>This course includes techniques of different methods for integration: Integration by Parts. Trigonometric Integrals, Trigonometric Substitution, Integrating Rational Functions by Partial Fractions. Integrals involving roots Improper integrals: Types of Improper Integrals and Methods of valuation Comparison Test for Improper Integrals. Applications of Integrals: Applications of Integrals, Arc length, Surface Area, Parametric Equations and Curves. Tangents with Parametric Equations. Polar Coordinates Technique: Polar Coordinates, Common Polar Coordinate Graphs, Tangents with Polar Coordinates Curves defined by parametric equations. Arc Length with Polar coordinates, Area in Polar Coordinates. Sequences and Series: Infinite series. The comparison. Ratio and Root tests. Alternating series and Conditional convergence.</p>			

**Module 8**

Code	Course/Module Title	ECTS	Semester
DWE1213	Engineering Mechanics (Static)	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
<p>This course familiarizes students with the principles of static equilibrium by applying Newton's laws of motion to solve engineering problems. Emphasis is placed on drawing free body diagrams and self-checking strategies. Topics include introduction to forces; 2D equilibrium of particles and rigid bodies; center of gravity and centroids; distributed loading and hydrostatics; friction; analysis of truss structures; and shear force and bending moment diagrams. This course provides students with a working knowledge of fundamental statistics principles and probability in addition to a preface to the regression and correlation analysis. By the end of the semester, students should be able to determine when each of the various topics we have covered is appropriate to use, and to apply them to practical engineering situations or problems.</p>			

**Module 9**

Code	Course/Module Title	ECTS	Semester
DWE1209	Computer Science	4	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	22
Description			
<p>The most important aspect of computer science is problem solving, an essential skill for life. Students study the design, development and analysis of software and hardware. This course will include different topics related with basic principles of using computer with different languages and operation systems. Word document writing, begins and finishes in the same manner. beginning by generating a document, and you conclude by saving it. The items of classes will contain in addition to lab computer fundamentals and safety, computer parts, operation systems with applications of operations systems. Introduction to word and excel office application will be studied with their applications.</p>			

**Module 10**

Code	Course/Module Title	ECTS	Semester
DWE1210	Engineering Drawing	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	4	93	57
Description			
<p>This course discusses the fundamental concepts of engineering graphics. It also introduces computer graphics using CAD software. The following topics are covered: Drawing conventions such as standards, line types and dimensioning; drawing of inclined and curved surfaces; deducting the orthographic views from a pictorial; drawing full and half sections; deducting an orthographic view from given two views; pictorial sketching (isometric and oblique). The main goal that will be adopted in the delivery of engineering drawing courses is to encourage students to understand and draw the principles of engineering drawing and use basic tools, while improving and expanding their critical thinking skills at the same time. This will be achieved through classes and interactive tutorials and by looking at the types of simple experiments that involve investigating operations of engineering drawing.</p>			

**Module 11**

Code	Course/Module Title	ECTS	Semester
DWE1101	Arabic Language	2	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	-	33	17
Description			
<p>This course aims at building students' familiarity with and competence in Arabic literature in its various genres to increase their ability to appreciate literature and to develop their awareness of its concepts through the study of poetry, novel and the short story. In the applications of grammar and language- the actor and his deputy, Debutante and the news Acts missing, Equated with the letters already Byproducts, The case and exception, Ancient literary studies, Definition of literature and its importance, Ages historical Arabic literature – Modern Literary Studies, Study the texts of poetic eras (pre-Islamic, Islamic, Umayyad, Abbasid, Andalusia), Study of ancient prose texts (speeches, messages), examine the texts of modern poetry and contemporary, examine the texts of modern prose (drama, novel, article).</p>			

**Module 12**

Code	Course/Module Title	ECTS	Semester
DWE1303	<b>Engineering Geology</b>	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	78	72
Description			
<p>Interpretation of geology for the purpose of planning, siting, design, and construction of engineered facilities. Includes an overview of geology, engineering geologic mapping, and specific consideration of engineering applications such as dams, reservoirs, and tunnels. It will develop skills crucial in all the sciences and transferable to other fields such as problem-solving, observation, data collection, analysis, interpretation, and oral and written. This course will improve skills and problem-solving abilities which complement and build upon lectures and laboratory-based coursework, whilst being exposed to the true complexity of natural geological systems. The topics will cover mapping and contour lines with properties of natural rocks in nature.</p>			

**Module 13**

Code	Course/Module Title	ECTS	Semester
DWE2211	<b>Calculus-III</b>	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
<p>Advanced topics in calculus, including vectors and vector-valued functions, partial differentiation, Lagrange multipliers, multiple integrals, and Jacobians; application of the line integral, including Green's Theorem, the Divergence Theorem, and Stokes' Theorem. This course extends the theory of differential and integral calculus to functions of many variables. Topics include the study of vectors, quadric surfaces, vector functions, cylindrical and spherical coordinates, partial derivatives, multiple integrals, vector fields and line integrals; all with applications. This course is a continuation of Math 141. Topics for this course include vectors and solid analytic geometry, surfaces, partial and directional derivatives, Lagrange multipliers, multiple integrals, cylindrical and spherical coordinates, line and surface integrals, Green's Theorem, Stokes' Theorem, and the Divergence Theorem.</p>			



**Module 14**

Code	Course/Module Title	ECTS	Semester
DWE2305	Fluids Mechanics	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	4	93	57
Description			
<p>This course introductory concepts of the Fundamental concepts. Properties of fluids. Fluid Statics. Momentum and energy equations, applications. Bernoulli equation, applications. Dimensional analysis and similitude. Introduction to viscous flows. Internal flows, laminar and turbulent flows. Head loss and friction factor. Flow over immersed bodies (external flow), fluid static, and introduction to types of flow of fluids.</p>			

**Module 15**

Code	Course/Module Title	ECTS	Semester
DWE2306	Engineering Surveying- I	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>This course presents basic concepts and practical material in each of the areas fundamental to modern surveying (geomatics) practice. Topics include basic principle of surveying and theory of errors; methods of distance measurement; theory and methods for leveling; method of angle measurements; bearing and azimuth computation. Then this course ends with an introduction to traversing, traverse computations, and coordinate geometry.</p>			

**Module 16**

Code	Course/Module Title	ECTS	Semester
DWE2309	<b>Concrete Technology</b>	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>Concrete technology in dam and water resources engineering deals with concrete technology and all information related to concrete, its constituent materials, properties, applications, etc. Topics such as cement, fine aggregate, coarse aggregate, chemical mixtures, natural and chemical additives are discussed in this topic. Concrete composition, types, mix design, and various tests on concrete on site and in the laboratory are provided in Concrete Technology. It also explains workability, durability, flexibility, permeability, and related topics. A large part of it helps in designing the concrete mixture according to the symbols and engineering codes. The importance of concrete technology is the core of engineering related to concrete construction. If you are an engineer graduate of the Department of Dams and Water Resources Engineering, you must be familiar with all the topics of this subject to carry out works at the sites of dams and water resources projects such as bridges, irrigation systems, canals, irrigation stations, watering and purification of drinking water, heavy water treatment basins, polluted wastes of hospitals, factories and laboratories, and lining of culverts and shoulders Main and subsidiary effectively and maintain quality control of concrete construction. Where every part of this subject is used in the practical field of construction and design.</p>			

**Module 17**

Code	Course/Module Title	ECTS	Semester
DWE2304	<b>Engineering Mechanics (Dynamics)</b>	4	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	52
Description			
<p>This course teaches students how to apply Newtonian physics to relatively simple physical situations. It follows on from the Statics course, but considers systems that are not in equilibrium i.e. with velocity and acceleration. Some of the topics covered are pure kinematics (a mathematical description of motion only), while others are kinetic (determine motion in problems involving the concepts of force and energy). The course restricts itself to 2-D (planar) mechanisms.</p>			

**Module 18**

Code	Course/Module Title	ECTS	Semester
DWE1103	<b>Democracy And Human Rights</b>	2	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	-	33	17
Description			
<p>This course is designed to give the student the definition of freedom and the right language and idiomatically and legitimacy of the user, Origin of the right in the eyes of Islamic law, Elements of the right and types of, Personal freedom, Intellectual freedom, Rights and economic freedoms, Islam and Slavery, Human rights objectives, The use of freedom and the right general project, The right of a Muslim to his Muslim brother, Parental rights, Right neighbor, The right of women, Human rights in the heavenly religions, Religious tolerance in Islam. Also, this course is designed to give the student the definition of freedom democracy, the concept of democracy, history of democracy, the properties of democracy, traditional Greek democracy, its principles, modern democracy, and pressure groups.</p>			

**Module 19**

Code	Course/Module Title	ECTS	Semester
DWE2212	<b>Calculus-IV</b>	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
<p>Differential Equations, begins with some definitions and terminology and mathematical models used in a differential equations course. First-order and higher-order differential equations, along with the methods of solutions and their applications are introduced. Modeling with higher-order, Laplace transform, and systems of linear first-order differential equations are covered. At the end, students learn series solutions of linear equations. Numerical methods are covered throughout the course. This course focuses on differential equations and their applications in science and engineering.</p>			

**Module 20**

Code	Course/Module Title	ECTS	Semester
DWE2315	Open Channels	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	102
Description			
<p>This course introductory concepts of the Open channel flow and its classification., Properties of open channel flow, energy and momentum principals, critical flow with computation and applications, uniform flow with computation and applications, design of channel for uniform flow. Types of water surface profile, control sections. design of alluvial canal and critical flow in the trapezoidal and rectangular canal and design the best section.</p>			

**Module 21**

Code	Course/Module Title	ECTS	Semester
DWE2308	Building Construction	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0	33	117
Description			
<p>The students should have learnt about the various materials, both conventional and modern, that are commonly used in dams and water resources engineering construction. Further he should be able to identify the different equipment that it needed for construction of various types of structures from foundation to super structure. Students shall have a reasonable knowledge about the various construction procedures for buildings above and below ground level, apply engineering design to produce solutions and apply new knowledge. In addition to encourage students to think about the engineering problems that occur during work and the solutions that must be followed through on-site visits and scientific research by students.</p>			

**Module 22**

Code	Course/Module Title	ECTS	Semester
DWE2311	Engineering Surveying 2	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	4	93	57
Description			
<p>This course introduces knowledge about areas and volumes. Then, it moves to horizontal curves and types of horizontal curves. Also, this course presents astronomical surveying, GPS, type of measurements using GPS, and basic principles of remote sensing. Then this course ends with hydrographic surveying.</p>			

**Module 23**

Code	Course/Module Title	ECTS	Semester
DWE2314	Strength of Materials	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>In this module, students will learn important principles of internal materials behavior which include the stress and strain concepts, thermal effect, and beam bending and shear behavior under loading, how the bending and shear stresses distribute on the section of beam, and the applications of Mohr's</p>			

**Module 24**

Code	Course/Module Title	ECTS	Semester
DWE3318	Engineering Hydrology	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	102
Description			
<p>This area of study in the field of water resources is focused on the investigation and analysis of surface water, as well as various other aspects of the hydrological cycle. The goal of studying this topic is to prepare the student for further study by teaching and training them in the fundamentals of this field</p>			

of study as well as the concepts of analysis and design. In addition, it focuses on educating students in the fundamentals of assessing and studying the four stages of the natural water cycle (precipitation, runoff, evaporation, and storage) with the goal of determining the amount of water that is available and planning and managing water infrastructure. consumption, hydration, and the current drought.

#### Module 25

Code	Course/Module Title	ECTS	Semester
DWE3313	Water Quality	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>The student first learns about pollution, types and sources, water needs and water quality, natural water characteristics, physical, chemical, radiation and biological water quality parameters. then go into water pollution and its control, then learn about salinity in water and distillation processes, sediment and its control, finally present wastewater reuse for industrial, agricultural, municipal, and other uses. In addition to some important water lab. Tests. The student will need the following textbooks -The textbook: "Environmental Engineering", Peavy.H.S and et al ,International Ed. , 1985 and, -"Environmental Engineering" , Peavy.H.S and et al ,International Ed. , 1985</p>			

#### Module 26

Code	Course/Module Title	ECTS	Semester
DWE3319	Soil Mechanics	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	4	108	42
Description			
<p>This course provides an elementary introduction to Geotechnical Engineering and provides the basic mechanics necessary for the detailed study of Geotechnical Engineering. This course aims to provide an understanding of the nature of soils as engineering materials; common soil classification schemes; the importance of water in the soil and the effects of water movement; methods of predicting soil settlements, the stress-strain-strength response of soils, and earth pressures. By the end of this course students will be able to:</p> <ul style="list-style-type: none"> <li>▪ Give an engineering classification of any piece of soil, and on this basis predict how it will perform as an engineering material.</li> <li>▪ Understand the principle of effective stress and be able to apply this to calculate the stresses causing soil deformation.</li> <li>▪ Calculate quantities of water flowing through the ground and understand the effects that water flow has on the soil.</li> </ul>			

- Calculate the settlements, and rates of settlement, under structures of various shapes and sizes.
- Explain the advantages and limitations of the different methods of settlement calculation.
- Determine the strength parameters appropriate to a range of stability problems and understand the difference between total and effective stress approaches.
- Evaluate strength parameters from laboratory data.
- Use a spreadsheet to analyze a geotechnical design problem.

#### Module 27

Code	Course/Module Title	ECTS	Semester
DWE3322	<b>Theory of Structures</b>	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3		48	102
Description			
This course covers the outlines of general principles, indeterminacy and stability, shear and moment diagrams of structures, trusses, approximate analysis, influence lines and moving concentrated loads, analysis of statically determinate structures, analysis of statically indeterminate structures.			

#### Module 28

Code	Course/Module Title	ECTS	Semester
DWE3315	<b>Engineering Management</b>	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	87
Description			
This course inculcates the fundamental principles of construction planning, studies key project management skills. Critical path scheduling, durations, logic, resource allocation, and the calculation of costs. Typical contract formats: project planning with emphasis on legal aspects, cash flows, related costs, and agreements. Cost control. Linear programming as applicable in Civil Engineering Projects. And also, to enable students to learn how to effectively utilize technical, financial, and human resources in an engineering career, apply the knowledge of Engineering management basically, planning, organizing, directing, controlling related to the Dams and Water Resources Engineering program. By the end of successful completion of this course, the student will be able to: to introduce concepts of projects formulation, to impart the idea about planning and scheduling of activities, to introduce the concepts of resource planning, allocation, and control.			

**Module 29**

Code	Course/Module Title	ECTS	Semester
DWE3338	Ground Water Hydrology	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	102
Description			
<p>The study and analysis of groundwater, reservoirs, wells, the process of recharging groundwater, and other topics fall within the category of water resource's themes. The goal of this topic is to instruct and prepare the student for further study by teaching him the fundamentals of this field of study as well as the concepts of analysis and design. It focuses on introducing students to the fundamental concepts of groundwater hydrology analysis and study (runoff, wells, recharge, statistical analysis, etc.) with the goal of estimating the amount of available water and planning methods of extraction, treatment, or preserving and operating it, addressing issues with water balance, and developing methods of hydrological calculation and accuracy. Identify the water discharges, forecast the future water discharges, and quantify the magnitude of water reservoirs.</p>			

**Module 30**

Code	Course/Module Title	ECTS	Semester
DWE3331	Water Resources Planning and Management	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
<p>Planning and management issues; institutional objectives and constraints; identifying and evaluating design and management alternatives; role of modeling and its advantages and limitations. Economic Analysis: Examples illustrating how engineering and micro economic analysis are used in water resources infrastructure planning and management. Optimization Modeling: Examples illustrating various types of models, solution methods and applications to water resources infrastructure planning and management. Stochastic Optimization Methods applied to hydrologic and water resource systems. Methods for Multiple-purpose River Basin Planning.</p>			



**Module 31**

Code	Course/Module Title	ECTS	Semester
DWE3321	Hydraulic Structures	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>Hydraulic structures can be defined broadly as structures designed to handle water in any way – retention, conveyance, control, regulation, mixing and energy dissipation. Such structures are required in all facets of water engineering; the principal facets being water quantity management (flood control, water supply, hydropower, irrigation and drainage, navigation, environmental and recreation use), water-quality management, thermal-power generation, and aspects of road and rail transportation. To ensure that a hydraulic structure functions as required entails the design application of equations based on continuity, momentum and energy principles coupled with useful notions about the mechanical behavior of construction materials, notably concrete, various metals. Principles in this course are hydraulic Systems Analysis, Classification and Use of Structures for Flow Control, Channel Regulating Structures, Channel Intake and Outlet, Flow Measurement Structures, Dam Spillways and Outlet Works, Energy Dissipation Structures, Culverts.</p>			

**Module 32**

Code	Course/Module Title	ECTS	Semester
DWE3214	Engineering Numerical Methods	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	78	72
Description			
<p>The numerical methods course involves solving engineering problems drawn from all fields of engineering. The numerical methods include error analysis, roots of nonlinear algebraic equations, solution of linear and transcendental simultaneous equations, matrix and vector manipulation, curve fitting and interpolation, numerical integration and differentiation, solution of ordinary and partial differential equations.</p>			

**Module 33**

Code	Course/Module Title	ECTS	Semester
DWE3320	Sanitary Engineering	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	102
Description			
<p>The course is designed to be a survey of various areas that broadly fall under the umbrella of Sanitary engineering. Many of the topics taught are covered in much more detail in other courses, such as water quality control and fluid mechanics. For successful completion of this course, I expect the students to be able to understand persistent and emerging sanitary engineering issues and have a sound understanding of material balance including being able to solve problems that involve material balance. Further, students after completion of this course should be able to understand basic considerations in water resources management, water pollution control, water treatment and design considerations. The aim of the model of sanitary Engineering is to teach and train students to be engineers with a competent knowledge (theoretical and practical) of surveying, planning and design, consulting and operating in the following fields: 1. water supply and treatment 2. Pumps calculations 3. Environmental sanitation 3. Water pollution control and management</p>			

**Module 34**

Code	Course/Module Title	ECTS	Semester
DWE4326	Irrigation and Drainage Engineering	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
<p>Irrigation Engineering involves the management of water applied to agricultural and other developed lands for the growth of crops and other vegetation. This includes the design, operation, and management of on-farm irrigation systems and irrigation water distribution canal, pipeline, and pumping systems and their relationship to water resources quantity and quality. To develop understanding about water requirement of crops, irrigation methods, and irrigation engineering works like weir/barrage, storage and outlet works, distribution works, regulating and cross drainage works and importance of drainage in irrigated areas. Irrigation systems principles and design procedures for design and operation of sprinkler, trickle, and surface irrigation systems.</p>			

**Module 35**

Code	Course/Module Title	ECTS	Semester
DWE4327	Design of Dams	6.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
<p>The "Design of Dams" course provides a thorough examination of the concepts, theories, and procedures related to dam design and construction. Students who complete this course will have a thorough understanding of the engineering factors, and safety precautions necessary for the successful design and construction of various types of dams. Environmental and lifestyle factors, hydrology for design, choosing the type of the dam, such as concrete, rock, or earth dams, are all considered when designing dams. It considers knowledge of risk assessment, emergency response planning, and dam safety considerations. The course covers the fundamental ideas and engineering methods needed to create dams that are both safe and effective.</p>			

**Module 36**

Code	Course/Module Title	ECTS	Semester
DWE4106	Ethics and Leader Skills	2	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0	33	17
Description			
<p>This course is designed for engineering students who are interested in advancing into management and leadership roles. You will gain a perspective on what it is like to be an engineering leader. You will develop awareness of your own strengths and weaknesses as a leader when you are placed in charge of a project. You will learn how to leverage your strengths and control your weaknesses. You will also learn how to manage relationships with your team members and how to set up a creative environment for your team to motivate each team member to reach his or her potential. You will also learn how to deal with different ethical issues that are related to engineering field.</p>			

**Module 37**

Code	Course/Module Title	ECTS	Semester
DWE4323	Environmental Engineering	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	72	78
Description			
<p>The course is designed to be a survey of various areas that broadly fall under the umbrella of environmental engineering. Many of the topics taught are covered in much more detail in other courses, such as water quality control and sanitary engineering. For successful completion of this course, I expect the students to be able to understand persistent and emerging environmental issues and have a sound understanding of material balance including being able to solve problems that involve material balance. Further, students after completion of this course should be able to understand basic considerations in water resources management, water pollution control, wastewater treatment and reclamation. The aim of the module of Environmental Engineering is to teach and train students to be engineers with a competent knowledge (theoretical and practical) of surveying, planning and design, consulting and operating in the following fields:</p> <ul style="list-style-type: none"> <li>▪ Drainage system and wastewater treatment</li> <li>▪ Environmental sanitation</li> <li>▪ industrial environment</li> <li>▪ Water pollution control and management</li> </ul>			

**Module 38**

Code	Course/Module Title	ECTS	Semester
DWE4329	Senior Design Project- I	4	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	4	78	22
Description			
<p>Senior Design Project is a very distinctive subject, quite unlike any that students will have done previously, and it is an accomplishment of a quality Senior Design project is a requirement for a degree of Bachelor of Engineering Science from the College of Engineering at the University. It is undertaken in the final year of the program. It is a course in which students will have individual responsibility for the timely achievement of a significant engineering project under the guidance of a supervisor. Students will be expected to demonstrate a professional level of preparation, planning, accomplishment, testing, and documentation. Students will be expected to overcome obstacles and get the opportunity to do research and a scholarly literature review on a related area that is of specific interest to them, in addition to practicing the actual future practical aspect and Provides a learning experience that is individualized and supervised by a staff member of the department and Exam</p>			

committee which they have particular expertise and interest in the study area selected for research and supervisor and Provide the student with an opportunity to show their professionalism.

**Module 39**

Code	Course/Module Title	ECTS	Semester
DWE3324	<b>Reinforced Concrete Design</b>	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
Reinforced Concrete Design. Behavior of reinforced concrete elements under different natural and physical conditions and under normal force, shear, moment, and torsion. Ultimate Design of Reinforced Concrete, Working Strength Design used in this course to help the student develop an intuitive feeling about structural and material wise behavior and design of reinforced concrete systems. The codes related of the American Concrete Institute for reinforced concrete buildings			

**Module 40**

Code	Course/Module Title	ECTS	Semester
DWE4330	<b>Methods of Construction and Estimation</b>	6.00	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
It is an Introduction to the various construction methods and practices, and equipment needed for different types of construction activities. It also covers the various aspects of estimating of quantities of items of works involved in buildings, water supply and sanitary works, and irrigation works, the rate analysis, valuation of properties and preparation of reports for estimation of various items. Also learning the methods and concepts of calculating the different quantities of the construction items and how to analyze the quantities to their original resources and thus be able to convert the			

calculated quantities into tables of quantities according to the main paragraphs and calculate their costs.

#### Module 41

Code	Course/Module Title	ECTS	Semester
DWE4334	Safety and Operation of Dams	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
<p>In this course, the main dam structures such as spillways, outlet work, and energy dissipation that include the most important structures in operation of dams. The student will know the basics, and consideration of dam operation. He will develop an understanding of the principles of selection of reservoirs capacity. Also, he will gain tools for planning, and analysis reservoir storage and types of reservoirs, zones of storage: reservoir yield, selection of distribution-reservoir capacity for a given yield, selection of capacity for a river reservoir as well as tools for monitoring of dam operation. The student will know the main reasons of Dam failure and the basics tests for the maintenance of the dam.</p>			

#### Module 42

Code	Course/Module Title	ECTS	Semester
DWE3328	Foundation Engineering	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	48	102
Description			
<p>This course begins with review to soil mechanics and introduction to subsurface exploration. Then it covers bearing capacity of shallow foundation, stress distribution and foundation settlement. Then it moves to lateral earth pressure and retaining structures. This course ends with an introduction to the pile foundation system. It includes computer applications. objectives of this course is to teach the student how to:</p>			

1. understand site investigation report.
  2. evaluate the ultimate and allowable bearing capacity of different soil strata for shallow foundation.
  3. estimate the settlement for shallow foundation, including immediate and consolidation settlement.
  4. evaluate lateral earth pressures (at rest, active, passive) behind the retaining walls.
  5. evaluating allowable bearing capacity of single pile (deep foundation) and estimating its elastic settlement.
  6. do some computer applications.
- At the end of this course students should be able to:
- A. Apply knowledge of mathematics science and A mathematics, science, engineering.
  - B. Design a system, component, or process to meet desired needs.
  - C. Identify, formulates, and solves engineering problems.
  - D. Know up-to-date issues.
  - E. Use the techniques, skills, and modern engineering tools necessary for engineering practice.

#### Module 43

Code	Course/Module Title	ECTS	Semester
DWE4335	Senior Design Project- II	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	4	93	57
Description			
<p>Senior Design Project is a very distinctive subject, quite unlike any that students will have done previously, and it is an accomplishment of a quality Senior Design project is a requirement for a degree of Bachelor of Engineering Science from the College of Engineering at the University. It is undertaken in the final year of the program. It is a course in which students will have individual responsibility for the timely achievement of a significant engineering project under the guidance of a supervisor. Students will be expected to demonstrate a professional level of preparation, planning, accomplishment, testing, and documentation. Students will be expected to overcome obstacles and get the opportunity to do research and a scholarly literature review on a related area that is of specific interest to them, in addition to practicing the actual future practical aspect and Provides a learning experience that is individualized and supervised by a staff member of the department and Exam committee which they have particular expertise and interest in the study area selected for research and supervisor and Provide the student with an opportunity to show their professionalism.</p>			

**Module 44**

<b>Code</b>	<b>Course/Module Title</b>	<b>ECTS</b>	<b>Semester</b>
DWE4332	<b>Pipe Networks</b>	6	8
<b>Class (hr/w)</b>	<b>Lect/Lab./Prac./Tutor</b>	<b>SSWL (hr/sem)</b>	<b>USWL (hr/w)</b>
2	1	48	102
<b>Description</b>			
<p>Pipes network engineering is a specialized field of civil engineering that deals with the design, installation, operation, and maintenance of systems for the transport of fluids, such as water, gas, and oil, through a network of interconnected pipes. The topics covered in this course include Pipe network analysis which involves the use of mathematical models and computer simulations to predict the flow rates, pressures, and other parameters in a pipe network under different operating conditions, Pipe materials and construction which include the selection of appropriate materials for pipes and their proper installation is critical to ensure the durability and safety of the pipe network, and pipeline maintenance and repair. Overall, pipes network engineering course aim to provide students with a strong foundation in the principles and practical skills needed to design and operate complex pipe networks for a variety of applications.</p>			