



Dams & Water Resources eng.



College of Engineering / Dams & Water Resources Dept. / First Year

Course No.	Subject	First term			Second term			Units
		Theo.	Prac.	Appl.	Theo.	Prac.	Appl.	
DWE 101	Mathematics	3	-	1	3	-	1	6
DWE 102	Principles of Computers and programming	2	2	-	2	2	-	6
DWE 103	Human rights and general freedom	1	-	1	1	-	1	2
DWE 104	Engineering Mechanics	3	-	1	3	-	1	6
DWE 105	Engineering Drawing & Descriptive Geometry	-	6	-	-	6	-	6
DWE 106	Engineering Statistics	2	-	1	2	-	1	4
DWE 107	Engineering Geology	1	-	2	1	-	2	2
DWE 108	Introduction to water Resources Engineering	2	-	-	2	-	-	4
DWE 109	Water quality and pollution(S2)	-	-	-	1	2	-	2
DWE 110	Arabic Language				1			1
	Total	14	8	6	16	10	6	39
	Total weakly hours	28			32			

DWE 101 : Mathematics (3,-,1)

An Overview of the derivatives

- Integration
- The 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
- Area of a surface of revolution

Transdental Functions

- Inverse Functions
- Exponential and logarithmic functions
- Derivatives and integrals involving logarithmic and exponential functions
- Graphs and applications involving logarithmic and exponential functions
- Derivatives and integral of inverse trigonometric functions
- Hyperbolic functions
- Hopital's Rule.

An overview of integration methods

- Integration by parts
- Trigonometric integral
- Trigonometric substitutions
- Integrating rational functions by partial fractions
- Numerical integration ; Simpson's rule
- Improper integrals

DWE 102 : Fundamentals for Computer and programming (2,2,-)

- General introduction about computers and their types
- Window system
- Microsoft office (word, power point)
- Internet and E-mail
- AUTOCAD

DWE 103 : Human rights and general Freedom (1,-,1)

Human rights; its evolution, different schools of thoughts about it, personal and public freedoms, national and international organizations to assure its implementation. Human rights between theories and practice.

DWE 104 : Engineering Mechanics (3,-,1)

STATICS ; Basic Principles, Units Dimensions , Force Resolution and Resultant, Moments & Couples. Equilibrium, Trusses & Frames, Friction , Moment of Inertia. Mass Moment of Inertia.
DYNAMIC: Basic principles, Newton laws, Kinematics, Curvilinear Motion & Projectiles, Kinetics work and energy.

DWE 105 : Engineering Drawing (-,6,-)

Engineering Drawing, Graphic Instruments and their use, Graphic Geometry, Lettering, orthographic Drawing, Pictorial Drawing , Sectional Views. Descriptive Geometry, Theory of Projection,

Projection of a point & Straight Line, The Plane surface, Projection of Bodies, Sections of Bodies.

DWE 106 : Engineering Statistics (2,-,1)

- Introduction: the importance of statistics in water resources Engineering.
- Viewing the data: the table method, the drawing method.
- Measures of central tendency (the arithmetic mean, geometric, harmonic, quadratic mean, median, and mode).
- Measures of dispersion and variation (mean, range, variance and standard deviation).
- Measures of skewness and kurtosis.
- Principles of probability theory, conditional probability, the probability of the independent tree, Baye's theory .
- Discrete probability distributions (Binomial distribution. Poisson distribution).
- Continuous probability distribution. Normal distribution.
- Sampling theory.
- Test of hypothesis(Z- test, Chi square test, T-test, and F-test) .
- Regression and correlation , the drawing method, the least squares method , all kinds of correlation , the linear correlation.
- Time series approach.

DWE 107 : Engineering Geology (1,-,2 S1)

Internal structure of the Earth, Minerals, Igneous Rocks, Metamorphic Rocks, Structural Geology, Weathering and soil, Denudation and deposition, Geology of Dams and Tunnels, Rock Mechanics, Topographic and Geological Maps, Surface water and Ground water Tunnels and dams Geology.

DWE 108 : Introduction to water Resources Engineering (2,-,-)

Definition of Irrigation, the importance of water for the life and development of the humankind, Drainage and reclamation and the relation to water resource of irrigation water . Water resources, Resource of irrigation water in Iraq. Method of irrigation, Irrigation structures. Basic relation between soil-water, plant. Irrigation and civilization. Global water resources , the reality and future horizons. Irrigation, conservation, and water control projects in Iraq. Drainage. Hydraulics of water flow in pipes, Rainfall and surface runoff. Flow measurements.

DWE 109 : Water quality and pollution (1,2,- S2)

Introduction to Environment and Environmental Pollution. Quantitative and Qualitative distribution of water in the world. 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, some of Units of sewage treatment plants in villages. Lab. Electrical Conductivity, Chlorides determination in water.

- Effect of rate constant (K) on bod.
- Effect in put rate on output rate in the take
in put out = output + KVC
- The study of deficit of oxygen in the water.
- The study of reaecartion and deoxygention in the water.
- Effect of waste water on the river (mixed water) on (kd, QR,UR,TR,BOD,DO mix).
- Effect of quality of the phosphorous on the pollution of the water.
- Source of natrition of organism of the water.
- Study the type of pollution on the river.
- Chemical composition of the water.

Arabic Language : هسمم ١١٠

- همزة الوصل .
- همزة القطع .
- انواع الخبر .
- المبتدأ .
- العدد .

College of Engineering / Dams & Water Resources Dept. / Second Year

Course No.	Subject	First term			Second term			Units
		Theo	Prac	Appl	Theo	Prac	Appl	
DWE 201	Mathematics	3	-	1	3	-	1	6
DWE 202	Computer programming	2	2	-	2	2	-	6
DWE 203	Physic & Soil management	2	2	-	2	2	-	6
DWE 204	Fluid Mechanics	3	-	1	3	2	1	7
DWE 205	Strength of Materials	2	-	1	2	-	1	4
DWE 206	Building and Concrete Technology	2	2	-	2	2	-	6
DWE 207	Surveying	2	2	1	2	2	1	6
	Total	16	8	4	16	10	4	41
	Total weekly hours	28			30			

DWE 201: Mathematics (3,-,1)

- Vectors component and Units, Space coordinate and Space Vector , Scalar Product and Vector Product , Equations of Lines and Plane , Product of Three Vectors .Applications .
- Vector Functions and Their Derivatives , Velocity and Acceleration , Curvature and Normal Tangent Vectors , Applications .
- Partial Differentiation , The Directional Derivatives , The Chain Rule and Total Derivative , Maximum and Minimum Functions , Method of Lagrange Multipliers , The Least Square methods , Applications .
- Multiple Integrals , Area by Double Intrgrals Physical Applications , Area in Polar coordinates , Applications .
- Complex Numbers and Functions , The Argand Diagram , Applications .
- Sequences & series.

DWE 202: Programming with Matlab (2,2,-)

- Introduction to Matlab language
- Input and output
- Control statements
- Library functions
- Plots (2D + 3D)
- Engineering Applications
- Surveying Applications
- Application on Simulink.

DWE **203: Physics and Soil management (2,2,-)**

Introduction, Basic soil properties, soil water condition, Piezometers, water flow in saturated soil, water flow in unsaturated soil, Infiltration, Internal drainage and redistribution after infiltration, Evaporation from bare-surface soil, water and energy balance in the root zone, , saline balance. , Calculation of gypsum amounts for reclamation of alkaline soils .

DWE **204: Fluid Mechanics (3,-,1 S1) (3,2,1 S2)**

Physical properties of fluid, Density, Units and dimensions.

Fluid static's, pressure, height and density relationship manometers, force on submerged plane and curved surface Buoyancy forces. Kinematics of fluid motion, types of flow, equation, energy equation (Euler equation) Bernoulli's' equation, application of Bernoulli's' equation, fluid flow measurement. Momentum equation and control volume, application of Momentum equation .Pipes branches. Flow in pipes. Examples in pipes line. Discharge measurements, Dimensional analysis.

DWE **205: Strength of Materials (2,-,1)**

Simple stress , Thin walled cylinders, simple strain, Shearing strain, Torsion, Shear and Moment in Beams, Stresses in Beams, Beam Deflections, Area Moment method, Double Integration Method, Conjugate Beam Method , Combined Beams, Beams of Different Materials, Combined Stresses , kern of asection : Loods applid off axes of symmetry .

DWE **206 : Building and Concrete Technology (2,2,-)**

Theoretical Part: General Introduction, Earth Works, Footing and Foundation, Piles, Concrete Mix Design, Forms and Scaffoldings, Beams, Girders and Columns, Floors and Roofs, Damp proofing, Means of Moving between Levels and Thermal, Sound Isolation. Structural Engineering drawing for foundations and floors.

Practical Part: Properties and Specification of Concrete Mix Design. Hammer test of field comprehensive strength for pre-cast concrete.

DWE **207 : Surveying(2,2,1)**

Introductory and definitions, which are used in a plane surveying: Instruments for measuring distance obstacles in measurements Instruments for setting out right angles, Tape corrections.

Leveling. Areas and volumes. Computation of volumes. The Theodolite and Traverse surveying. Tachometry. Curves. Total instrument station, GPS field procedure.

College of Engineering / Dams & Water Resources Dept. / Third Year

Course No.	Subject	First term			Second term			Units
		Theo	Prac	Appl	Theo	Prac	Appl	
DWE 301	Hydrology	2	-	1	2	-	1	4
DWE 302	Soil Mechanics	2	2	2	2	2	2	6
DWE 303	Computer Applications	1	-	1	1	-	1	2
DWE 304	Irrigation Principle and Practices	2	-	1	2	-	1	4
DWE 305	Theory & Design of Structures	2	-	1	2	-	1	4
DWE 306	Hydraulics	3	-	1	3	-	1	6
DWE 307	Concrete Design	2	-	1	2	-	1	4
DWE 308	Drainage Engineering	2	-	-	2	-	-	4
DWE 309	Numerical Methods and Engineering Analysis	2	-	2	2	-	2	4
	Total	18	2	10	18	2	10	38
	Total weekly hours	30			30			

DWE 301: Hydrology (2,-,1)

Precipitation measurement, Analysis of rainfall data, measurement of rainfall stage, and discharge, Unit Hydrograph .Infiltration, Evaporation relation flood Routing, Wave movement storage equation, Reservoirs and channel routing. Probability, Flood and rainfall Probability, plotting position, distributions, Ground water, Ground water movement, steady and, Unsteady flow of wells in confined and unconfined aquifer, Effects of boundaries. The global warming role on hydrological time series. Sustainability of water resources and hydrology.

DWE 302: Soil Mechanics (2,2,2)

Theoretical Part

Introduction, Physical and Engineering Properties of Soil , Grain Size distribution and Soil Classification system, Permeability of Soil, Seepage of water through the Soil, Stresses in Soil, Consolidation and Settlement in Soils, Shear Strength of Soil, Soil Stabilization, Lateral Earth Pressure and Retaining Walls, Slope Stability, .

Practical Part

Introduction, Water Content and Physical properties, Specific Gravity test, Atterberg limits and Indices, Grain Size analysis, , Permeability test, Consolidation Test, Swelling Test, Collapse Test, Direct Shear test on Cohesion less soil and Cohesive Soil, Unconfined Compression test, Triaxial Compression test, Field Test for determine the Bearing Capacity of Soil (i.e. Vane Shear test, Standard Penetration

test (S.P.T.) , Cone Penetration test (C.P.T.) , Load Bearing Test) Chemical test, Compaction Test, Field density measurements, California Bearing Ratio(C.B.R.) Test, Pin-Hole Test.

DWE 303: Computer Application (2,-,2)

- Excel Program.
- SPSS Program.
- Google earth Program.
- Global Mapper Program.
- HEC-RAS Program.
- WMS Program.

DWE 304: Irrigation Principle and Practices (2,-,1)

Relation between consumptive use and irrigation intervals, Irrigation methods and relation to agriculture, surface irrigation methods , Mechanized irrigation methods, Determination of water flow, Conveyance of irrigation water, Canals and lining, Pumping of irrigation water, Introduction to irrigation networks, General irrigation structures in irrigation projects, General principles of studying, planning , installation and maintenance of irrigation projects. Water harvesting, Principles of subsurface drip irrigation.

DWE 305: Theory and Design of Structure (2,-,1)

Stability and determinacy of structures, Analysis of statically determinate rigid frame, Influence lines for statically determinate structures, Elastic deformation of structures, Analysis of statically indeterminate structures by the method of consistent deformations, The method of least work, the method of slop-deflection Moment distribution without joint translation, Moment distribution with joint translations, Analysis of statically indeterminate rigid frames with one degree of freedom of joint translation by moment distribution, Analysis of statically indeterminate rigid frames with two degrees of freedom of joint translation by moment distribution.

DWE 306: Hydraulics(3,-,1)

Dimensional and Model Analysis

Loss of Head Due to Friction in Pipe Flow

Laminar and Turbulent Flow in Smooth and Rough Pipes

Velocity Distribution and Shear Stresses in Turbulent Flow

Universal Velocity Distribution Equation

Velocity distribution for turbulent flow in smooth pipes

Velocity distribution for turbulent flow in rough pipes

Velocity Distribution for Turbulent Flow in Smooth Pipes by Power Law

Loss of Energy (or Head) in Pipes and Minor Energy Losses

Hydraulic Gradient and Total Energy Lines

Pipes in Series and Pipes in Parallel

Single and Manifold pipes, Tanks

Analysing the pipes Network

Comparison between open channel and pipe

Types of Flow in Channels Steady flow and unsteady flow, Uniform and non-uniform (or varied) flow, Subcritical flow, critical flow and supercritical flow

Hydraulic Radius, The best hydraulic section

Specific Energy

Varied Flow (Gradually and Sudden)

Hydraulic Jump

Model Testing and Geometrically Similar Pumps

Classification of pumps, Characteristics curves, Pumps in parallel and series

System Curves and the way to select a pump working point

DWE **307: Concrete Design (2,-,1)**

The properties of reinforced concrete materials , Bending stress analysis for beams and one- way slab by working and ultimate stress method , Shear and diagonal tension design for beams, Design of continuous beams and girders , Design of beams and one way slab , Design of two- way slabs, Analysis and design of columns , Design of reinforced concrete culverts.

DWE **308: Drainage Engineering (2,-,-)**

Definition of Drainage, purpose of drainage, , Darcy's law, , Deputy Forchheimer equation, soil Leaching, investigation of Drainage projects, Ground water, field hydraulic conductivity test, Drainage system, Depth of open drains, types of drain pipes systems, , filters, spacing between drains Hooghout's equation, Hooghout's equation for layered soils, Ernst equation for Drains spacing, Drainage equation for unsteady flow, Glover D. Equation, Design of Drains, vertical Drainage . Overlaps between wells, conservation, of drains .

DWE **309: Numerical Methods and Engineering Analysis (2,-,2)**

Numerical Methods

Introduction:

Numerical solution of the equations.

Numerical solution of the simultaneous linear equations, Numerical differentiation and integration, ,. Numerical solution of the first and second order differential equation, Finite Differences

Differences equations>Interpolation, Numerical difference, Numerical solution of differential equations with initial condition.

Engineering Analysis.

Introduction to differential equations,

First order and degree of D.E,

Applications of first order D.E

Higher order differential equations and its applications.

Simultaneous differential equations

and its applications

Special cases of D.E

Solution of differential equations, by method of variation of parameters.

Euler and Lagrange's differential equations

Laplace transform.

College of Engineering / Dams & Water Resources Dept. / Fourth Year

Course No.	Subject	First term			Second term			Units
		Theo	Prac	Appl	Theo	Prac	Appl	
DWE 401	Design of Hydraulic Structures	2	2	1	2	2	1	6
DWE 402	Design and Evaluation farm Irrigation systems On – farm Irrigation	2	2	1	2	2	1	6
DWE 403	Design of Irrigation and drainage networks	1	2	-	1	2	-	4
DWE 404	Estimation & specifications	1	2	-	1	2	-	4
DWE 405	Water Resources Management & Economics	2	-	2	2	-	2	4
DWE 406	Engineering of Dams	2	-	2	2	-	2	4
DWE 407	Engineering of Foundation	2	-	-	2	-	-	4
DWE 408	Engineering project	-	ξ	-	-	ξ	-	ξ
	Total	12	12	6	12	12	6	36
	Total weekly hours	30			30			

DWE 401: Design of Hydraulic Structures (2,2,1)

Introduction of hydraulic structures.

Types of hydraulic structures and their uses (definition, name, location and function).

Creep length and uplift pressure theories: Bligh's creep theory, Lane's theory, flow net analysis and Khosla's theory: exit gradient, cut off depths and floor thickness.

Protection work of approaches U/S and D/S of concrete floor.

Hydraulic jump (types, efficiency, length, position and tail water conditions).

Stilling basin and energy dissipators (chute block, sill ,baffle piers and types of stilling basins).

Canal Head works "barrage types" (design of undersluice, other barrage and main canal).

Head and cross regulator (functions and design criteria).

Transition (R.S chaturvedi's ,Mitra's and Hid's transition).

Types of cross drainage works (Design of syphon).

Protection work of approaches U/S and D/S of concrete floor.

Box culvert

DWE 402: Design and Evaluation of On-farm Irrigation systems (2,2,1)

Introduction , Basic design factors, land grading design, surface Irrigation system, graded border irrigation furrow irrigation, basin irrigation Sprinkler Irrigation system, Fundamental of sprinkler Irrigation, sprinkler lateral design, major pipes distribution system, Trickle Irrigation. Evaluation of on-farm Irrigation systems.

DWE 403: Design of Irrigation and drainage networks (1,2,-)

Introduction, Definition, Nomenclature a numbering of , Layout of Irrigation and drainage network. The synoptic diagram of water levels in canals and drains. Design discharge for canals and drains. hydraulic design of canals section using. Design the longitudinal section of the main canal. Hydraulic design of section for lined canals. Hydraulic design of drain cross-section. Design of main irrigation canals networks. Using Auto CAD as an auxiliary for drawing irrigation and drainage schemes as well as calculating the service areas of canals and drains, cutting and filling quantities.

DWE 404: Estimation and specifications (1,2,-)

Excavation

Foundations, stripe and raft

Cubed wall works and estimation of materials.

Block building, bricks building, stone building

Wood form works

Reinforced of slabs

Reinforced of beams

Draw (Map of house+ foundation map+ section in wall).

Draw (Reinforced of slab map)

Draw (Reinforced of beam map)

Draw (Electrical and sanitary maps).

Finishing works

Steel connection

Draw (types of steel connection)

Box Culvert

Water tank

Canals works

Cylindrical shells and Domes.

DWE **405: Water Resources Management and Economics (2,-,2)**

Introduction to water resources engineering (rivers, watersheds, water resources), Water resources in Iraq, Water rights, Water resources development, Water resources planning (irrigation, hydropower, flood mitigation), Water resources system analysis, optimization, Application of LP in water resources, Simulation, Urban storm water management. Effect of global warming on water resources, Integrated water resources management. Water resources economics : Introduction, Types of Interest, mathematics of finance Uniform Series of Annual worth, present worth and future worth of money methods of economic analysis methods of projects evaluation, hydrologic, hydraulic and economic relationships of flood damage evaluation. Sustainable water resources. General Formulation and prelude to Simplex Method in Linear Programming topic.

DWE **406: Dams Engineering (2,-,2)**

1. Specify the storage zones of a reservoir.
2. Draw the storage-surface area-elevation curve for a reservoir.
3. Estimate the reservoir storage capacity.
 - a. Estimate the live storage.
 - b. Estimate the dead storage.
 - c. Estimate the Flood storage.
4. Estimate the probable life of the reservoir.
5. Rout the outflow hydrograph if the inflow hydrograph was known using level pool routing.
6. Estimate the economical height of a dam.
7. Analysis the forces acting on the gravity dam.
8. Design of a gravity dams.
9. Design of the arch dams.
10. Learn the modes of failure in earth dams.
11. Design of the Earth Dams.
12. Control the seepage through the body of the earth dam and its foundation.
13. Estimate the Stability of Slopes in an earth dam.
14. Design of an ogee spillway.

DWE **407: Foundation Engineering (2,-,-)**

Introduction, Soil Exploration, Site investigation, Settlement and Stresses distribution under the Footing, Bearing Capacity of Soil, Type of footings (pread, combined, raft...), Footing Subjected to the moment, Foundation on Clay and Plastic

Silt, Foundations On Sand and non- plastic Silt, Foundation On Collapsible Soil, Swelling Soil and Rock, Design of the Retaining Walls, Structural Design for the Foundation, Footing and Raft foundation for hydraulic Structures, Pile Foundations, Pier Foundations.

DWE **408 : Engineering Project (-,3,-)**

Detailed Studies Concerning the subject of Irrigation Engineering and Water Resources in many Aspects.