

*Republic of Iraq
Ministry of Higher Education and Scientific Research
Supervision and Scientific Evaluation Directorate
Quality Assurance and Academic Accreditation*

**Academic Program Specification Form for the Structures and Water
Resources Department
Faculty of Engineering – University of Kufa**

University: Kufa

Faculty: Engineering

Department: Structures and Water Resources

Date of Form Completion: June/03/2021

Asst. Prof. Dr. Fadhel Abdulabbas

Head of Department

Date: / / 2021

Signature:

Prof. Dr. Ragheed Fathi Mekki

Dean's Assistant for Scientific Affairs

Date: / / 2021

Signature:

Prof. Dr. Hassan Mahdi Al-Khateeb

The Dean

Date: / / 2021

Signature:

Quality Assurance and University Performance Manager

Date: / / 2021

Signature:

1. Teaching Institute	University of Kufa
2. University Department/ Centre	Structures and Water Resources Dept./ Faculty of Engineering
3. Program Title	Undergraduate study in Structures and Water Resources Sciences
4. Title of Final Award	B. Sc. in Structures and Water Resources Sciences
5. Modes of Attendance Offered	Accreditation Board for Engineering and Technology (ABET)
6. Accreditations	
7. Other External Influences	
8. Date of Production/ Revision of the Specifications	June, 03, 2021
9. Aims of the Program	
9.a. Develop the curricula and research plans necessary to achieve the vision and mission of the Department of Facilities and Water Resources Engineering and work on developing them so that the graduate engineer can effectively contribute to the process of sustainable development and the development of the country.	
9.b. Contribute to achieving the sustainable use of water resources, as the department aims to provide its graduates with skills and methods for water management and how to preserve it, and to contribute to the development of a comprehensive strategy for the integrated management of water resources in Iraq.	
9.c. Contribute to enhancing the status of the college and university in the community through active participation in continuing education programs, seminars and conferences and by providing engineering consultancy	
9.d. Improving the capabilities of the faculty, attracting good competencies to the department, and providing an appropriate work environment for teachers, staff and students.	
9.e. Opening up to the corresponding international educational institutions and benefiting from their capabilities and experiences through research cooperation programs and attending conferences, workshops and scientific seminars.	
10. Learning Outcomes, Teaching, Learning and Assessment Methods	
A. Knowledge and Understanding	
A1. Introducing the concept of water resources engineering and its importance in the sustainability of life elements.	
A2- Determining the problems of hydraulic installations, their causes and ways to reduce their effects.	
A3- Describe engineering and mathematical methods for analyzing and designing systems that help solve civil engineering problems.	
A4- Clarify the occupational safety regulations that are required to be provided during the implementation of engineering works and explain the impact of the damages resulting from the absence of integrated management of water resources sources.	
Teaching and learning methods: theoretical lectures, small discussion groups, presentation of scientific films, and writing reports.	
Evaluation methods: Written tests. Oral exams, homework, seminars	
b- Subject-specific skills:	
B1 - Choosing engineering decisions and explaining the factors affecting them.	
B2 - Analyzing the various water sources and evaluating their relationship to the conditions of climate indicators, drought and expected water demand in the short and long term.	
B3 - Design and analysis of hydraulic installations and the use of numerical methods and mathematical equations in hydraulic applications.	
B4 - Using engineering management methods to plan and implement projects for hydraulic installations and water	

resources.
Teaching and learning methods: theoretical lectures, small discussion groups, laboratory exercises.
Evaluation methods: Written tests. Oral tests. Homework. Practical laboratory tests.
<p>C- thinking skills:</p> <p>C1- Analyzing, evaluating and managing the engineering and operational problems of hydraulic installations.</p> <p>C2 - Forecasting the environmental impact of projects and how to prepare an environmental impact assessment report.</p> <p>C3 - Classify water and air pollutants, review their causes and sources, measure their effects, and choose appropriate methods for controlling them.</p> <p>C4- Predict the impact of qualitative and quantitative changes of water on the sustainability of water resources.</p>
Teaching and learning methods: problem solving method, report writing, field visits and scientific trips
Assessment methods: seminars, surprise tests, group reports, discussions during lectures.
<p>D - General and transferable skills (other skills related to employability and personal development).</p> <p>D1- Teamwork and the ability to effectively manage a team in order to reach consensual solutions among team members.</p> <p>D2- The ability to extract the necessary information for scientific research from multiple scientific sources.</p> <p>D3- Operate the laboratory equipment in the various scientific laboratories safely and efficiently.</p> <p>D4- Accept the need to adhere to professional ethical standards.</p>
Teaching and learning methods: problem solving method, small discussion groups, laboratory exercises, small discussion groups, report writing.
Evaluation methods: seminars, group reports, discussions during lectures. Homework, practical tests in the laboratory, oral tests, seminars.

11. Course Structure

Syllabus of Structures & Water Resources Engineering Department

First Year – First Semester

Hours per weeks			Units	Subject	Code
Tut.	Prac.	Th.			
1	---	3	3	Engineering Mechanics I	KHWE2301
1	---	3	3	Mathematics (1) I	KHWE2302
---	2	2	3	Computer Principles and Programming	KHWE1303
---	4	---	2	Engineering Drawing I	KHWE2204
---	---	2	2	Engineering Statistical	KHWE2205
1	---	2	2	Water Engineering and Irrigation Principles	KHWE3206
---	---	2	2	Human Rights and Democratic	KHWE1207
---	---	2	0	Arabic Language	KHWE1008
3	6	16	17	Total	

First Year – Second Semester

Hours per weeks			Units	Subject	Code
Tut.	Prac.	Th.			
1	---	3	3	Engineering Mechanics II	KHWE2309
1	---	3	3	Mathematics (1) II	KHWE2310
---	4	---	2	Engineering Drawing II	KHWE2211
---	---	2	2	Probability	KHWE3212
----	2	2	3	Engineering Geology and Soil Physics	KHWE3313
1	---	3	3	English Language (1)	KHWE1314
---	4	---	2	Workshops	KHWE2215
3	10	13	18	Total	

Second Year – First Semester					
Hours per weeks			Units	Subject	Code
Tut.	Prac.	Th.			
1	2	3	4	Fluid Mechanics I	KHWE3416
1	---	3	3	Mathematics (2) I	KHWE2317
1	3	2	3	Survey I Engineering	KHWE3318
---	2	2	3	Computer Applications (Mat Lab)	KHWE2319
1	---	3	3	Strength of Materials I	KHWE2320
1	---	2	2	Design of Irrigation and Drainage Systems	KHWE3221
1	---	2	2	Building Materials and Methods of Constructions	KHWE3222
6	7	17	20	Total	
Second Year – Second Semester					
Hours per weeks			Units	Subject	Code
Tut.	Prac.	Th.			
1	2	3	4	Fluid Mechanics II	KHWE3423
1	---	3	3	Mathematics (2) II	KHWE2324
1	3	2	3	Survey II Engineering	KHWE3325
1	2	2	3	Concrete Technology	KHWE3326
1	---	3	3	Strength of Materials II	KHWE2327
---	2	1	2	CAD Construction Drawing	KHWE3228
1	---	2	2	English Language II	KHWE1229
6	9	16	20	Total	

Third Year – First Semester					
Hours per weeks			الوحدات Units	Subject	Code
Tut.	Prac.	Th.			
1	2	3	4	Open Channel Hydraulics I	KHWE3430
1	---	3	3	Theory of Structures I	KHWE3331
1	---	3	3	Reinforced Concrete Design I	KHWE3332
1	2	2	3	Soil Mechanics and Foundations I	KHWE3333
1	2	2	3	Water Quality Control	KHWE3334
1	---	2	2	Engineering Hydrology	KHWE3235
1	---	2	2	Engineering Analysis	KHWE2236
7	6	17	20	Total	
Third Year – Second Semester					
Hours per weeks			Units	Subject	Code
Tut.	Prac.	Th.			
1	2	3	4	Open Channel Hydraulics II	KHWE3437
1	---	3	3	Theory of Structures II	KHWE3338
1	---	3	3	Design of Concrete II	KHWE3339
1	2	2	3	Soil Mechanics and Foundations II	KHWE3340
---	2	2	3	Numerical Analysis	KHWE2341
1	---	3	3	Engineering Economic and Management	KHWE3342
-----	---	2	3	GIS & Remote Sensing	KHWE3324
5	6	18	22	Total	

Fourth Year – First Semester						
Hours per weeks			Units	Subject	Code	
Tut.	Prac.	Th.				
1	---	3	3	Design of Hydraulics Structures I	KHWE3344	
1	---	3	3	Structural Design of Hydraulic Structures I	KHWE3345	
1	---	2	2	Earth Dams Engineering	KHWE3246	
1	---	2	2	Flow in Porous Media	KHWE3247	
----	----	2	2	Engineering Profession Ethics	KHWE3248	
1	---	3	3	Estimation and Specifications	KHWE3349	
---	4	---	2	Engineering Project	KHWE2250	
5	4	15	17	Total		
Fourth Year – Second Semester						
Hours per weeks			Units	Subject	Code	
Tut.	Prac.	Th.				
1	---	3	3	Design of Hydraulic Structures II	KHWE3351	
1	---	3	3	Structural Design of Hydraulic Structures II	KHWE3352	
1	---	3	3	Piles and Stability of Earth Structures	KHWE3353	
1	2	2	3	Sanitary Engineering	KHWE3354	
1	---	2	2	Ground Water Hydraulics	KHWE3255	
1	---	2	2	Water Resources Management	KHWE3256	
---	4	---	2	Engineering Project	KHWE2257	
6	6	15	18	Total		

Week	hours	Topics Covered
<i>Topic I: General Principals</i>		
1	4	General Principals, Newton's laws of motion and gravitation
<i>Topic II: - Units of measurement,</i>		
2	4	Units of measurement, examples of conversion of units
<i>Topic III: - Quantities</i>		
3	4	Scalars and vectors, vector operations
<i>Topic IV: - Force system</i>		
4	4	Force system, resultant of force system, examples
<i>Topic V: - Resultant</i>		
5	4	Resultant of several coplanar and non-coplanar forces
<i>Topic VI: - three dimensions</i>		
6	4	Rectangular component in space (in three dimensions)
<i>Topic VII: - Moment</i>		
7-9	12	Moment of a force and resultant moment, examples Moment about an axis, examples, Couples, equivalent couples, resultant couples, examples
<i>Topic VIII: - Equilibrium</i>		
10	10	Resultant of distributed normal loads (line loads) Equilibrium, free body diagram, examples
<i>Topic IX: - trusses</i>		
11-15	14	Analysis of plane trusses, simple truss Method of joints, examples Method of sections, examples
<i>Final Exam</i>		

Engineering Mechanics II

Week	hours	Topics Covered
<i>Topic I: centroid</i>		
1-2	8	Centroid and center of gravity, Centroid of composite bodies, examples
<i>Topic II: - Moment of inertia</i>		
3-4	8	Moment of inertia, polar moment of inertia, radius of gyration, examples
<i>Topic III: - Moment of inertia of composite areas</i>		
5	6	Moment of inertia of composite areas, examples
<i>Topic IV: - Product of inertia</i>		
6-7	6	Product of inertia of areas, examples
<i>Topic V: - Inclined axes</i>		
8-11	8	Moment of Inertia for an Area about Inclined Axes, Principal moments of Inertia, examples
<i>Topic VI: - Mohr's circle</i>		
12-13	6	Mohr's circle for moments and products of Inertia, examples
<i>Topic VII: - friction</i>		
14-15	8	Friction, Types of friction problems, examples
<i>Final Exam</i>		

Mathematics II

Week	hours	Topics Covered
Topic I		
1, 2	6	<i>Coordinates and Graphs in The Plane, Introduction ,Distance between Two Points, Symmetry & Intercepts</i>
Topic II		
3,4,5	9	<i>Slopes and Equations for Lines, Point Slope Equation, Slope – Intercept Equation , Distance between Point to a Line ,Slopes of Non – Vertical Lines General Equation for the Line</i>
Topic III		
6	3	<i>Functions and Their Graphs, Domain and Range, Even and Odd Functions</i>
Topic IV		
7,8	6	<i>Limits</i> <ul style="list-style-type: none"> • <i>Limit Combination Theorem</i> • <i>The Limit of Trigonometric Functions</i> • <i>Infinity as a Limit</i>
Topic V		
9	3	<i>Continuity</i>
Topic VI		
10,11,12	9	<i>Differentiation</i> <ul style="list-style-type: none"> • <i>Derivative Rules</i> • <i>Implicit Differentiation and Fractional Powers</i> • <i>Chain Rule</i>
Topic VII		
13	3	<i>Derivatives of Trigonometric Functions</i>
Topic VIII		
14	3	<i>Derivatives of Exponential & Logarithmic Functions</i>
Topic IX		
15	3	<i>Applications on Derivatives</i>
Final Exam		

Mathematics III

Week	hours	Topics Covered
Topic I		
1, 2,3	9	Integration: <ol style="list-style-type: none"> 1. Indefinite Integrals 2. Integration formulas for inverse 3. Integration formulas for logarithmic and exponential
Topic II		
4,5	6	Application of definite integral: a-Area between curves.

Topic III		
6	3	b-Volume of solids of revolution: 1-The disk method
Topic IV		
7	3	2-The washer method
Topic V		
8	3	c- Length of plane curve
Topic VI		
9	3	Techniques of Integration: 1-Techniques by parts
Topic VII		
10	3	2-Tabular Integration
Topic VIII		
11	3	3-Trigonometric substitution
Topic IX		
12	3	4-Integration rational function by partial fractions
Topic X		
13,14,15	9	Conic section
Final Exam		

Statistics

Week	hours	Topics Covered
<i>Topic I: Introduction</i>		
1-2	2	- introduction
	2	- Statistical expressions
<i>Topic II: Distributions</i>		
3-5	2	- Frequency tables and distributions
	4	- Drawing the Frequency distributions (Charts, Histograms, Curves)
<i>Topic III: Measures of central location</i>		
6-9	2	Measures of central tendency.
	2	Arithmetic Mean.
	2	Median.
	2	Mode
<i>Topic IV: Measures of variation or Dispersion</i>		
10-15	2	Dispersion measures,
	2	Range
	2	Standard deviation
	2	Variance
	2	Mean deviation
	2	Quartiles, Decimals, Percentiles
Final Exam		

Probability

Week	hours	Topics Covered
Topic I: Elementary Probability Theory		
1-2	4	- Probability Theory
3	2	- Intersection and Union
Topic II: Permutations and combinations		
4-5	4	- Permutations and combinations
Topic III: Special Distributions		
6-7	4	- Discrete probability distributions, Binomial distribution, Poisson distribution
8-11	4	- Continuous probability distributions,
	2	- Normal distribution,
	2	- Standard Normal distribution
12	2	- T distribution
13	2	- Chi distribution
14	2	- Correlation and Regression
15	2	- Hypothesis test
Final Exam		

Engineering Drawing I

Week	hours	Topics Covered
Topic I		
1	3+2	Introduction to Engineering Drawing. Use of drawing instruments. Standard layouts. + Introduction to CAD systems and AutoCAD
Topic II		
2	3+2	Lines, Types of lines. Title block. Drawing simple shapes using different types of lines. How to use drawing instruments. + Understanding the AutoCAD workspace and user interface
Topic III		
3	3+2	Lettering, Numbering (English and Arabic) + Working with Commands and types of coordinates
Topic IV		
4	3+2	Basics of geometric constructions. Types of conic sections. + Standard Tools: Open, Save, Cut, Paste,etc.
Topic V		
5,6	6+4	Application of the geometric constructions in drawing basic geometrical shapes. + Contents of Draw and Modify menus
Topic VI		
7	3+2	Projection, types and specifications + Starting with Draw commands.

		Polyline and Line command
Topic VII		
8	3+2	Orthographic Projections. Drawing orthographic projections of geometric solids and simple models using First angle projection. + Multiline command
Topic VIII		
9	3+2	Orthographic Projections. Drawing orthographic projections of geometric solids that do not have inclined or circular surfaces. + Rectangle and Polygon command
Topic IX		
10	3+2	Orthographic Projections. Drawing orthographic projections of geometric solids that have inclined surfaces. + Circle and Arc command
Topic X		
11	3+2	Orthographic Projections. Drawing orthographic projections of geometric solids that have circular surfaces. + Ellipse command. Make and insert Blocks
Topic XI		
12	3+2	Orthographic Projections. Drawing orthographic projections of geometric solids that have inclined and circular surfaces. + Point command and Hatching
Topic XII		
13,14	3+2	Principles and method of dimensioning and dimensioning practice + Texting and Method of selecting objects
Topic XIII		
15	3+2	Orthographic Projections. Drawing orthographic projections of geometric solids that have many details with dimensioning. + Starting with Modify commands. Erase command
Final Exam		

Engineering Drawing II

Week	hours	Topics Covered
Topic I		
1	3+2	Introduction to Engineering Drawing. Use of drawing instruments. Standard layouts. + Introduction to CAD systems and AutoCAD
Topic II		
2	3+2	Lines, Types of lines. Title block. Drawing simple shapes using different types of lines. How to use drawing instruments. + Understanding the AutoCAD workspace and user interface
Topic III		
3	3+2	Lettering, Numbering (English and Arabic) + Working with Commands and types of coordinates
Topic IV		
4	3+2	Open, Save, Cut, Paste,etc.

Topic V		
5,6	6+4	Application of the geometric constructions in drawing basic geometrical shapes. + Contents of Draw and Modify menus
Topic VI		
7	3+2	Projection, types and specifications + Starting with Draw commands. Polyline and Line command
Topic VII		
8	3+2	Orthographic Projections. Drawing orthographic projections of geometric solids and simple models using First angle projection. + Multiline command
Topic VIII		
9	3+2	Orthographic Projections. Drawing orthographic projections of geometric solids that do not have inclined or circular surfaces. + Rectangle and Polygon command
Topic IX		
10	3+2	Orthographic Projections. Drawing orthographic projections of geometric solids that have inclined surfaces. + Circle and Arc command
Topic X		
11	3+2	Orthographic Projections. Drawing orthographic projections of geometric solids that have circular surfaces. + Ellipse command. Make and insert Blocks
Topic XI		
12	3+2	Orthographic Projections. Drawing orthographic projections of geometric solids that have inclined and circular surfaces. + Point command and Hatching
Topic XII		
13,14	3+2	Principles and method of dimensioning and dimensioning practice + Texting and Method of selecting objects
Topic XIII		
15	3+2	Orthographic Projections. Drawing orthographic projections of geometric solids that have many details with dimensioning. + Starting with Modify commands. Erase command
Final Exam		

Engineering Geology and Soil Physics

Week	Hours	Topics Covered
1	2	Introduction, Soil formation, composition and Description of soil and rock. physical property of minerals.
2	2	The most important minerals and their properties, Types of rocks, Igneous rocks, sedimentary rocks.
3	2	Common Igneous rocks and their properties
4	2	Physical Relationships (Phase relationships),
5	2	Physical properties of rocks

6	2	Geological origin of the soil, weathering and erosion
7	2	Soils, depending on how their formation, soil classification according to the proportion of salt they contain.
8	2	Granular composition of the soil, soil classifications.
9	2	Geological water underground, importance of studying the effect of ground water, Permeability coefficient of the soil.
10	2	Types of aquifers and spring
11	2	Aquifers types, discharge and permeability ,examples
12	2	Dams and reservoirs: Types, methods of construction
13	2	Tunnels: Types , methods of construction
14	2	The important of Contour maps , keys, scale
15	2	drawing of map and sections, Faults
Final Exam		

Water Engineering and Irrigation Principles

Week	hours	Topics Covered
Topic I:		
1	3	Water Cycle in Nature
Topic II: -		
2	3	Water and Hydrologic Budget Equations
Topic III: -		
3	3	Water Movement in Soil
Topic IV: -		
4	3	Wells
Topic V: -		
5	3	Methods of Irrigation
Topic VI: -		
6	3	Drainage
Topic VII: -		
7	3	Desertification
Topic VIII: -		
8, 9	6	Introduction to Flow in Open Channels
Topic IX: -		
10	3	Water Requirement
Topic X: -		
11	3	Variety of Water, Water Resources in Iraq
Topic XI: -		
12	3	Storage Projects and Controlling Water Demand in Iraq
Topic XII: -		
13	3	Water Harvesting
Topic XIII: -		
14	3	Water Resources Planning
Topic XIV: -		
15	3	Hydrological engineers' duties
Final Exam		

Computer Principles and Programming

Week	hours	Topics Covered
Topic I: computer hardware		
1	2	components of the computer
Topic II: - windows 7		
2	4	user interface that the Windows 7 operating system use.
Topic III: - windows 7		
3	4	user interface that the Windows 7 operating system use.
Topic IV: - windows 7		
4	4	Control panel of W7
Topic V: - MS Word		
5	4	Introduction of the program - (the title bar, menus, standard toolbar, coordination ruler tools, status bar)
Topic VI: - MS word		
6	4	Dealing with the files already created (search for a file, copy the file, previewing a file before printing, print a file and explain ways to print)
Topic VII: - MS word		
7		Dealing with texts (Find the text or word within the document, dealing with fonts Document Format, Paragraphs editing, Numbering the document), and document editing.
Topic VIII: - MS Excel		
8	4	Introduction to Excel, (the title bar, menu bar, standard toolbar, or formatting toolbar, bar equation format, the worksheet, the slider, the working paper, the status bar).
Topic IX: - MS Excel		
9	4	Dealing with columns, rows and cells
Topic X: - MS Excel		
10	4	Equations and functions Graphs
Topic XI: - MS Power Point		
11	4	Introduction to power point, (the title bar, menu bar, standard toolbar, formatting toolbar, detailed scheme slides, status bar)
Topic XII: - MS Power Point		
12	4	Save Presentations, Open a presentation already created, Closing presentation, insert a slide into a presentation, change slide layout, Copy a slides, etc...
Topic XIII: - MS Power Point		
13	4	Add dynamic effects to objects, Applying slide transitions - Create Notes - slide show
Topic XIV: - Internet		
14	4	Basing Concepts , World Wide Web, Identify on the elements of a web page , Using Web Address

Topic XV: - Internet		
15	4	Email , Create e-mail, Send and receive messages, attach file.
Final Exam		

English Language I

week	Hours	Topics Covered
1	2	Introduction, Simple Present Tense Uses
2	2	Perfect Present and Continuous Present Tenses Uses
3	2	Stative and Dynamic Verbs
4	2	Simple Past Tense and Continuous Past Tense Uses
5	2	Perfect Past Tense and Simple Future Tense Uses
6	2	Perfect Future Tense and Continuous Future Tense Uses
7	2	Formulating Questions for All Tenses
8	2	Formulating Passive Voice for All Tenses
9	2	Formulating Passive Voice for All Tenses
10	2	link Words
11	2	link Words
12	2	link Words
13	2	Suffixes
14	2	Prefixes
15	2	Abbreviations
Final Exam		

Strength of Materials I

Week	hours	Topics Covered
Topic I: General concept of stress		
1	4	General concept of stress Analysis of axially loaded member, normal stress
2	4	Shear stress in bolted connections
3	4	Strength, allowable stress and design criteria
4	4	Pressure vessels
Topic II: - Axial strain		
5	4	Hook's law and stress strain relationship Poisson's ratio
6	4	Axial deformation
7	4	Thermal strain and statically indeterminate axial member
8	4	Shear strain and relation between E, G and ν Transformation of stresses and strain
Topic III: - Torsion		
9	4	circular shaft and shear stresses
10	4	Angle of twist and shaft coupling

11	4	Thin walled hollow section Solid non-circular sections
Topic IV: - Axial force, shear and bending moment diagrams		
12	4	Axial force, shear and bending moment diagrams (direct approach)
13	4	Load, shear and bending moment differential relations
14	4	Moment diagrams and elastic curve.
15	4	Singularity function for bending moment curve
Final Exam		

Strength of Materials II

Week	hours	Topics Covered
Topic I: - Bending stresses in beams		
1	4	Bending stresses in beams Compound stresses
2	4	Composite sections
3	4	Shear stress in beams
4	4	Shear flow and bolted connected sections
5	4	Shear center
Topic II: - Deflections of beams		
6	4	Direct integration method
7	4	Moment area method
8	4	Moment area method
Topic III: - Statically indeterminate beams		
9	4	Statically indeterminate beams
10	4	Statically indeterminate beams
11	4	Statically indeterminate beams
Topic IV: - Principal stress		
12	4	Mohr's circle of stress and strains rosette
13	4	Mohr's circle of stress and strains rosette

<i>Topic V: - Columns</i>		
<i>14</i>	4	Columns, Euler load and beam column member
<i>15</i>	4	Columns, Euler load and beam column member
<i>Final Exam</i>		

Fluid Mechanics I:

Week	hours	Topics Covered
1,2	8	Topic 1: Fluid Properties
3,4	8	Topic 2: Measurement Methods for Fluid Pressures
5-7	12	Topic 3: Hydrostatic Forces
8	4	Topic 4: Accelerated Fluids with Linear Acceleration
9	4	Topic 5: Accelerated Fluids with Angular Acceleration
10	4	Topic 6: Types of Flow
11	4	Topic 7: Fluid Flow
12	4	Topic 8: Continuity Equation (Mass Conservation)
13-15	16	Topic 9: Energy Conservation and Bernoulli's Equation
Final Exam		

Fluid Mechanics II:

Week	hours	Topics Covered
1-2	8	Topic 1: Momentum conservation in fluid
3-4	8	Topic 2: - Pumps with Pipeline
5-7	12	Topic 3: Pipes in Series and in parallel
8-10	12	Topic 4: Branching pipe systems
11-13	12	Topic 5: Fluid flow measurement instruments
14-15	8	Topic 6: Dimensional analysis
Final Exam		

Mathematics 2I:

Week	hours	Topics Covered
<i>Topic I:</i>		
<i>1-2</i>	6	<i>Matrix and Inverse matrix</i>

Topic II: -		
3-7	15	Series, tests of series, power series, Taylor and McLaurin series
Topic III: -		
8-12	15	Vector, space vector, vector calculus, plan an space ; Function of several variables
Topic IV: -		
13-15	9	Partial Differentiation, Continuity, Max. and Min. problems, La Grange Multiplier
Final Exam		

Mathematics 2II:

Topic I: -		
1-4	12	Polar coordinates, Double integral, Triple integral and Application of multiple integral
Topic II: -		
5-8	12	Differential equations (first order, second order)
Topic III: -		
9-12	12	Partial Differentiation
Topic IV: -		
13-15	9	Complex number
Final Exam		

Surveying I:

Week	Hours	Topics Covered
Topic I: Introduction		
1	1	Definitions
	2	fundamental principles for surveying
Topic II: Various field cases		
2	3	Various field cases
Topic III: measurement		
3	2	Units of measurement, types of measurements , drawing scale
	1	Corrections due to measurement tape
Topic IV: Leveling		
4-9	3	level instrument and it's components ,
	3	adjustment of level
	6	Leveling methods,
	3	Errors in leveling process, error sources in leveling, locks errors in leveling operation and accuracy of leveling

	3	Profiles
Topic V: Topographic surveying,		
10-11	3	Topographic survey
	3	methods of making contour maps and leveling of lands
Topic VI :Areas		
12-13	3	Calculation of areas in surveying ,
	3	mathematical, geometrical and mechanical methods for evaluating areas
Topic VII: Volumes		
14-15	3	finding volumes by leveling points,
	3	finding volumes by contour lines
Final Exam		

Surveying II:

Week	Hours	Topics Covered
Topic I: Directions and angles		
1-2	3	Definition
	3	Compass
Topic II: Polygons		
3-5	3	Locks errors in polygons and the methods to correct closed polygons
	3	declination angles
	3	using the coordinates to calculate areas
Topic III: Theodolite		
6-9	5	Theodolite and application
	4	errors sources for theodolite
Topic IV: Curves		
10-12	2	Geometrical works fixing,
	3	methods to calculate and project simple circular curve
	2	Compound circular curve element,
	2	vertical curve
Topic V: Total station		
13-14	6	Total station application
Topic VI: Computer in surveying		
15	3	Applications Computer in surveying

Final Exam

Concrete Technology:

Week	hours	Topics Covered
Topic I: Cement		
1-3	9	<i>Introduction, Manufacturing, chemical composition of cement, Hydration of cement and Cement tests</i>
Topic II: Aggregate		
4-6	9	<i>Classification and properties of aggregate, deleterious substances in aggregate and sieve analysis</i>
Topic III: Fresh concrete		
7-8	6	<i>Workability and factors affecting workability, Segregation, bleeding and mixing of concrete</i>
Topic IV: Hardened concrete		
9-10	6	<i>Concrete strength, types of concrete strength and factors affecting strength.</i>
Topic V: Concrete durability		
11-13	9	<i>Concrete permeability, sulfate and acid attack, effect of sea water and factors affecting durability</i>
Topic VI: Design of concrete mixtures		
14-15	6	<i>Design of concrete mixture, US method</i>
Final Exam		

Design of Irrigation and Drainage Systems

Week	hours	Topics Covered
Topic I		
1,2	4	<ol style="list-style-type: none"> 1. Introduction for irrigation and drainage systems 2. Basic design factors <ol style="list-style-type: none"> a. Consumptive use b. Irrigation interval and water application depth c. Efficiency, adequacy, and uniformity of irrigation d. Water infiltration into soil e. Effective rainfall in irrigation
Topic II		
3	2	Border irrigation design <ul style="list-style-type: none"> • Required design data • Design assumptions • Design consideration and limitations
Topic III		
4,5	4	Furrow irrigation design <ul style="list-style-type: none"> • Required design data

		<ul style="list-style-type: none"> • Design considerations, assumptions and limitations • Design equations • Runoff control techniques
Topic IV		
6,7,8	4	Sprinkler irrigation design <ul style="list-style-type: none"> • Layout of stationary system • Hydraulics and uniformity of sprinkler nozzle • Sprinkler spray losses • Sprinkler irrigation efficiency • Design of sprinkler major and lateral pipes
Topic V		
9,10	4	Trickle irrigation design <ul style="list-style-type: none"> • Trickle system basic components • Emitters and Emitter selection • Soil-water-crop factors • Hydraulics of trickle net work • Trickle lateral design • Manifold design
Topic VI		
11	2	Reclamation and drainage of soils affected by salts <ul style="list-style-type: none"> • Natures and classification of saline soils • Treatment of saline soils • Leaching and leaching requirement
Topic VII		
12	2	Investigations of drainage projects <ul style="list-style-type: none"> • Reconnaissance survey • Design survey
Topic VIII		
13	2	Drainage systems <ul style="list-style-type: none"> • Open drainage • Underground drainage • Filters
Topic IX		
14	2	Design of drainage sections <ul style="list-style-type: none"> • Drainage coefficient • Design of open drain sections • Design of underground drain diameters
Topic X		
15	4	Design of drains spacing

		<ul style="list-style-type: none"> • Design by Hooghoudt equation (steady drainage) • Design by Ernst equation (steady drainage) • Design by Glover equation (non-steady drainage)
Final Exam		

Building Materials and Methods of Constructions

Week	hours	Topics Covered
Topic I:		
1	3	Introduction to the history of construction materials and methods, classification of structures , main problems , and the engineering judgment .
Topic II: -		
2-3	6	Earth work: excavation , backfilling , dewatering, soil type and classification , main problem and solution
Topic III: -		
4-5	6	Foundation and piles
Topic IV: -		
6	3	Water proofing materials, specifications ,and work
Topic V: -		
7	3	Concrete materials, additives , specifications ,and works
Topic VI: -		
8-9	6	Construction or building units and mortars
Topic VII: -		
10-11	6	Load, stresses, and failure calculation and assessment
Topic VIII: -		
12-13	3	Construction details : stair case, beams and lintels, door and windows, safety requirements, finishing , selected topics by students , etc.....
Topic IX		
14-15	3	Hydraulic structures special materials , requirement , and details
Final Exam		

Computer Programming

Week	hours	Topics Covered
Topic 1:		
1	5	Introduction to Fortran and Component of Fortran language
Topic 2: -		

2	5	<i>Constant of Fortran and Variable of Fortran</i>	
<i>Topic 3: -</i>			
3	5	<i>Arithmetic statement and rule of precedence and Input statements</i>	
<i>Topic 4: -</i>			
4	5	<i>Output statements and Formatted input and output statements .</i>	
<i>Topic 5: -</i>			
5	5	<i>Formatted input and output statements And Control statements(go to)</i>	
<i>Topic 6: -</i>			
6	5	<i>Control statements(IF- MATH.) and Control statements(IF- Logical.)</i>	
<i>Topic 7: -</i>			
7	5	<i>BLOCK IF and Nested BLOCK IF</i>	
<i>Topic 8: -</i>			
8	5	<i>statement DO and Nested DO and Subscripted variable and arrays</i>	
<i>Topic 9: -</i>			
9	5	<i>One dimensional arrays and Dimension statement</i>	
<i>Topic 10: -</i>			
10	5	<i>Way to writing matrix and Writing parts of matrix</i>	
<i>Topic 11: -</i>			
11	5	<i>Writing parts of matrix and Square matrix</i>	
<i>Topic 12: -</i>			
12	5	<i>Square matrix and Symmetric matrix</i>	
<i>Topic 13: -</i>			
13	5	<i>Internal functions and External functions</i>	
<i>Topic 14: -</i>			
14	5	<i>External functions and Subroutines</i>	
<i>Topic 15: -</i>			
15	5	<i>Subroutines and Difference between Fortran 77 and Fortran90</i>	
<i>Final Exam</i>			

English Language II

week	Hours	Topics Covered
1	1	Introduction, Review for all Tenses
2	1	Review for all Tenses
3	1	Review for Passive Voice and Stative and Dynamic Verbs
4	1	Review for link Words
5	1	Academic Writing Strategies
6	1	Academic Writing Strategies
7	1	Academic Writing Strategies
8	1	Paraphrasing Texts Strategies
9	1	Paraphrasing Texts Strategies
10	1	Paraphrasing Texts Strategies
11	1	Paraphrasing Texts Strategies
12	1	Speaking Strategies
13	1	Speaking Strategies
14	1	Reading Strategies
15	1	Reading Strategies
Final Exam		

Open Channels Hydraulics I

Week	hours	Topics Covered
Topic I		
1	4	Definition and differences between pipe flow and open channel flow
Topic II		

2	4	<i>Types of flow</i>
Topic III		
3	4	<i>Properties of open channels</i>
Topic IV		
4	4	<i>Fundamental equations; Conservation of matter; Conservation of energy</i>
Topic V		
5	4	Conservation of momentum
Topic VI		
6	4	The momentum equation (momentum principle)
Topic VII		
7	4	Momentum equation for steady flow
Topic VIII		
8	4	The Continuity Equation (conservation of mass)
Topic IX		
9	4	The Energy equation (conservation of energy)
Topic X		
10	4	Velocity distribution in open channels
Topic XI		
11	4	Determination of energy and momentum coefficients
Topic XII		
12	4	<i>Laminar and Turbulent flow</i>
Topic XIII		
13	4	<i>Uniform flow and the Development of Friction formulae</i>
Topic XIV		
14	4	The Chezy equation
Topic XV		
15	4	The Manning equation
Final Exam		

Open Channels Hydraulics I

Week	hours	Topics Covered
Topic I		
1	4	Review of basic fluid mechanics and hydraulics: The purpose
Topic II		
2	4	Dimensionless Specific Energy Diagrams for Open Channel Flow
Topic III		
3	4	Energy conservation
Topic IV		
4	4	Choke conditions
Topic V		
5	4	Gradually-varied Flow Profiles in Open Channels
Topic VI		
6	4	The GVF equation for flow in Open Channels Momentum :-Introduction
Topic VII		
7	4	The GVF equation for flow in Open Channels Momentum
Topic VIII		
8	4	Basic backwater calculations
Topic IX		
9	4	Uniform flow
Topic X		
10	4	Non - Uniform flow
Topic XI		
11	4	Control sections
Topic XII		
12	4	Sub and supercritical conditions
Topic XIII		
13	4	Transitions
Topic XIV		
14	4	Bridges
Topic XV		
15	4	Hydraulic Jump
Final Exam		

Theory of Structures I

Week	hours	Topics Covered
Topic I		
1	3	Introduction , Classification of Structures, Types of supports and reactions
Topic II		
2	3	Stability and determinacy of Beams and Trusses
Topic III		
3	3	Stability and determinacy of Frames and Arches
Topic IV		
4,5	6	Axial force, shear force and bending moment diagrams of frames
Topic V		
6	3	Axial force, shear force and bending moment diagrams of Arches
Topic VI		
7	3	Trusses (Simple Trusses and Compound Trusses)
Topic VII		
8	3	Trusses (complex Trusses)
Topic VIII		
9	3	Influence Lines (Concepts and Fundamentals)
Topic IX		
10	3	Influence Lines for Beams (Muller Breslau's principle and its application)
Topic X		
11	3	Absolute Maximum Shear and Moment using Influence Lines
Topic XI		
12	3	Maximum Influence at a Point due to a Series of Concentrated Loads
Topic XII		
13,14	6	Elastic deformation of beams and frames (Unit-Load Method)
Topic XIII		
15	3	Elastic deformation of Trusses (Unit-Load Method)
Final Exam		

Theory of Structures II

Week	hours	Topics Covered
Topic I		
1	3	Introduction , Classification of Structures, Types of supports and reactions
Topic II		
2	3	Stability and determinacy of Beams and Trusses
Topic III		
3	3	Stability and determinacy of Frames and Arches
Topic IV		
4,5	6	Axial force, shear force and bending moment diagrams of frames
Topic V		
6	3	Axial force, shear force and bending moment diagrams of Arches
Topic VI		
7	3	Trusses (Simple Trusses and Compound Trusses)
Topic VII		
8	3	Trusses (complex Trusses)
Topic VIII		
9	3	Influence Lines (Concepts and Fundamentals)
Topic IX		
10	3	Influence Lines for Beams (Muller Breslau's principle and its application)
Topic X		
11	3	Absolute Maximum Shear and Moment using Influence Lines
Topic XI		
12	3	Maximum Influence at a Point due to a Series of Concentrated Loads
Topic XII		
13,14	6	Elastic deformation of beams and frames (Unit-Load Method)
Topic XIII		
15	3	Elastic deformation of Trusses (Unit-Load Method)
Final Exam		

Design of Reinforced Concrete I

week	hour	Topics Covered
<i>1</i>	4	Introduction.
<i>2</i>	4	Behavior of R.C. Beams Under Loading and Working Stress Method .
<i>3</i>	4	Flexural Design of Beams, Rectangular Section.
<i>4</i>	4	Serviceability of reinforced concrete structures
<i>5</i>	4	Control of Crack widths in beams.
<i>6-7</i>	8	Deflection in Beams and One-Way Slabs
<i>8</i>	4	Ultimate Strength Design Method
<i>9-10</i>	8	Flexural Analysis of Rectangular Beams
<i>11-12</i>	8	Flexural Analysis and Design of Doubly Reinforced Concrete Section
<i>13</i>	4	Flexural Analysis and Design of T-section Concrete Beams
<i>14-15</i>	8	Flexural Analysis and Design of Irregular Section
Final Exam		

Design of Reinforced Concrete II

week	hours	Topics Covered
<i>1</i>	4	Flexural Analysis and Design of Continuous Beams.
<i>2-3</i>	8	Analysis and Design of One-Way Slab.
<i>4</i>	4	Analysis and Design of Two-Way Slab by the coefficient Method (Method 3).
<i>5-6</i>	8	Shear Strength of Beams and Design of Shear Reinforcement
<i>7-8</i>	8	Torsion Strength of Beams and Design of Torsion Reinforcement
<i>9-10</i>	8	Development of Reinforcement
<i>11-12</i>	8	Analysis and Design of Short Reinforced Concrete Columns
<i>13-15</i>	12	Biaxial Bending of reinforced concrete Columns
Final Exam		

Soil Mechanics and Foundations I

week	Hours	Topics Covered
<i>1</i>	3	Nature of Water in Clay, Consistency and Atterberg Limits, Particle Size Distribution
<i>2</i>	3	Soil Classification (AASHTO and Unified).
<i>3</i>	3	Soil Compaction
<i>4</i>	3	Seepage, One Dimensional Flow, Permeability
<i>5</i>	3	Two Dimensional Flow, Flow net
<i>6</i>	3	Stresses within a Soil Mass

7	3	Total Stresses.
8	3	Effective Stresses
9	3	Compressibility of Soils, Theory of Consolidation
10	3	Oedometer Test
11	3	Consolidation Settlement
12	3	Time dependent Consolidation Settlement
13	3	Shear Strength of Soils
14	3	Coulomb Shear Strength Equation
15	3	Application of Mohr Circle
Final Exam		

Soil Mechanics and Foundations II

week	hours	Topics Covered
1	3	Site investigation: The purpose.
2	3	Methods of the exploration program
3	3	Bore holes: Number, depth, the distance between bore holes.
4	3	Disturbed and undisturbed sample and the reasons of disturbance.
5	3	Field test: Field van shear test of soil, standard penetration test (SPT), plate-load test, investigation record
6	3	Immediate settlement: Timmashenko and Goodier method and Skempton's method
7	3	Bearing capacity of soil: Terzaghi equation for evaluation bearing capacity of soil.
8	3	Meyerhof's method
9	3	Hansen's method
10	3	Vesic's method
11	3	Effects of water and moments on bearing capacity of soil
12	3	Footing design: Dimension of spread footing
13	3	Dimension of combined and wall footing
14	3	Structural design of spread footing
15	3	Structural design of Mat foundation
Final Exam		

Engineering Hydrology

Week	hours	Topics Covered
Topic I: Introduction		
1	3	Introduction to Hydrology and Hydrologic Cycle
Topic II: - Precipitation		
2-4	9	Forms of precipitation, Estimating missing precipitation data, Double mass curve analysis, Determining average precipitation, presentation of rainfall data
Topic III: - Abstraction from Precipitation		
5-6	6	Evaporation Equations, Evapotranspiration Equations, Infiltration capacity

Topic IV: - Run-off		
7-9	9	Natural flow, Yield estimation Methods, Flow-duration curve, Flow-Mass curve, calculation of storage volume
Topic V: - Hydrograph		
10-12	9	Components oh hydrograph, Factor affecting flood hydrograph, Recession curve equation, Base flow separation methods, Effective rainfall, Unit Hydrograph
Topic VI: - Floods		
13-15	9	Rational method, Time of concentration, Flood frequency studies, flood routing
Final Exam		

Engineering Analysis

Week	hours	Topics Covered
1	2	Review and general principles, classifications of differential equations
Solutions of first order deferential equations		
2	2	Separable variables method, Separable variables by using suitable assumption, Exact D.E. of first order
3	2	Partially exact D.E. of first order, Linear first order D.E.
4	2	Spatial case linear first order D.E., D.E. solvable for variable x or y
5	2	Method of grouping terms, Method of inspection
6	2	Method of integrating factor by group
7	2	Applications of first order ordinary D.E.
Second and higher order D.E., Partial D.E.		
8	2	Solution of homogeneous second order D.E. with constant coefficient
9	2	Solution of nonhomogeneous second order D.E. with constant coefficient, method of undeterminant coefficient, Solution of nonhomogeneous second order D.E. with constant coefficient, method of variation of parameters
10	2	Solution of higher order ordinary D.E. with constant coefficient
11	2	Solution of ordinary D.E. with variable coefficients using Euler-Cauchy method
12,13	4	Applications of second and higher order D.E.
14	2	Solution of Simultaneous ordinary linear D.E. with applications
15	2	Solution of partially D.E. with applications
Final Exam		

Numerical Analysis

Week	hours	Topics Covered
1	2	General Fourier series
2	2	Half-range expansions with applications
3	2	Roots of equations using bisection method and false position method
4	2	Roots of equations using Newton-Raphson method, Interpolation using Newton interpolation method
5	2	Interpolation using Lagrange interpolation method and its inverse, Curve fitting

6	2	Numerical integration by rectangles method, trapezoidal rule
7	2	Numerical integration by Gauss-quadrature method
8	2	Linear simulation equations, Gauss-elimination method
9	2	Linear simulation equations, Cholski method
10	2	Linear simulation equations, Gauss-Sidel method, Jacobi method
11	2	Numerical solution of ordinary D.E., Euler method, modified Euler method
12	2	Numerical solution of ordinary D.E., Runge-Kutta method, Higher order D.E.
13	2	Solution of ordinary D.E. using finite difference method
14	2	Applications of ordinary D.E. (Boundary value problems) using finite difference
15	2	Applications of ordinary D.E. (Boundary value problems) using finite difference
Final Exam		

Management and Engineering Economy

week	hours	Topics Covered
1	4	The basic elements of Construction Management
2	4	The functions of engineering management
3	4	Contract - the contract documents and engineering - Types of Contracts
4	4	Stages of the project
5	4	Methods of project execution
6	4	Duties of engineering management through the stages of realization of the project
7	4	Planning and follow-up completion of the project
8	4	Techniques and methods of planning - bar chart Method
9	4	Network Analysis Method (A.O.A), Network Analysis Method (A.O.N), Time Grid Method
10	4	Line of Balance (L.O.B), (PERT) Method
11	4	Engineering Economy : Feasibility study Elements
12	4	Cash Flow Diagram: Systematic series of payments
13	4	the gradient series of regular account
14	4	Depreciation, Value- types of Depreciation, Methods for calculating depreciation
15	4	Basic ways to make economic comparisons (comparison between the alternatives)
Final Exam		

Design of Hydraulic Structures I

Week	hours	Topics Covered
Topic I		
1	4	Introduction , Types of Hydraulic Structures
Topic II		
2	4	Steps for Design of Hydraulic Structures , Causes of Failure of Hydraulic Structures
Topic III		

3	4	Bligh's Creep Theory
Topic IV		
4	4	Lane's Weighted Creep Theory
Topic V		
5,6	8	Khosla's Theory
Topic VI		
7,8,9	12	Hydraulic Design of Regulators
Topic VII		
10	4	Hydraulic Jump
Topic VIII		
11	4	Vertical Drop
Topic IX		
12	4	Chutes
Topic X		
13, 14, 15	12	Design of Stilling Basins
Final Exam		

Design of Hydraulic Structures II

Week	hours	Topics Covered
Topic I		
1	4	Protection of Approaches of Hydraulic Structures
Topic II		
2	4	Hydraulic Design of Pipe Culverts
Topic III		
3	4	Hydraulic Design of Box Culverts
Topic IV		
4,5	8	Design of Aqueducts
Topic V		
6,7	8	Design of Invert Siphon
Topic VI		
8,9	8	Design of Weirs
Topic VII		
10,11	8	Design of Gates
Topic VIII		
12,13	8	Design of Dams
Topic IX		
14,15	8	Design of Spillway

Final Exam

Structural Design of Hydraulic Structures I

Week	hours	Topics Covered
Topic I: Introduction to Bridges		
1,2	8	Historical review, importance ,definition , supporting studies for planning, failure.
Topic II: -Types of bridges		
3	4	Classification of bridges according to materials, span, usage and configuration ;some innovative geometry
Topic III: - loading on bridges		
4	4	Types of loading on bridges including dead, live ,types of trucks, wind ,earth quake,
Topic IV: - Analysis and Design		
5	4	Review methods of analysis and design of bridges including codes used
Topic V: - One way solid slab		
6	4	Review characteristics of one way solid slab bridge and solve examples
Topic VI: - One way voided slab		
7,8	8	Review characteristics of one way voided slab bridge and solve examples
Topic VII: - deck-slab system		
9,10,11	12	Review characteristics of deck slab bridge and solve examples for live load arrangement (D.F), interior & exterior girders
Topic VIII: - Box Culvert		
12,13,14	12	Review box culvert structures in terms of : types, dimensions, loading, analysis and design with solved example
Final Exam		

Structural Design of Hydraulic Structures II

Week	hours	Topics Covered
Topic I: Introduction to liquid retaining structures		
1,2	8	Historical review, importance ,definition , supporting studies for planning, modeling.
Topic II: -Types of tanks		
3	4	Classification of tanks according to materials, span/depth ratio, usage and configuration ;structural behavior
Topic III: - loading on tanks		
4	4	Types of loading on tanks including dead, live ,uplifting and stability against floatation.
Topic IV: - Analysis and Design		
5	4	Review methods of analysis and design of tanks including codes ACI-350 used
Topic V: - Joints		

6	4	Review characteristics of joints as required by different codes
Topic VI: - Crack control		
7,8	8	Review code requirement for crack control with solved example
Topic VII: - Circular Tanks		
9,10,11	12	Review characteristics of circular tanks behavior and solve examples using PCA design tables.
Topic VIII: - rectangular Tanks		
12,13,14	12	Review rectangular tanks structures structural behavior and design with solved example
Final Exam		

Design of Earth Dams

Week	hours	Topics Covered
Topic I		
1	3	Introduction, Field Investigation and Laboratory Testing
Topic II		
2	3	General Design Considerations
Topic III		
3	3	Foundation and Abutment Preparation
Topic IV		
4	3	Seepage Control
Topic V		
5	3	Embankment Design
Topic VI		
6	3	Appurtenant Structures
Topic VII		
7	3	Stability of Slopes: Introduction, Factor causes failure of slopes
Topic VIII		
8,9	6	Stability Calculation for Granular Soils
Topic IX		
10	3	Total Stress Analysis for Cohesive – Frictional Soils
Topic X		
11	3	Factor of Safety for Soil both Cohesive and Friction
Topic XI		
12	3	Rapid Determination of Factor of Safety for a homogeneous regular slopes (Taylor Stability Number)
Topic XII		
13,14,15	9	Effective Stress Analysis Methods for Determination of Factor of Safety: <ul style="list-style-type: none"> • The Conventional Method • The Simplified Method

		The Regorous Method
Final Exam		

Ground Water Hydraulics

Week	hours	Topics Covered
Topic I: Well Hydraulics		
1-5	15	<ul style="list-style-type: none"> – Steady Radial Flow to a Wall – Steady Radial flow in a Confined aquifer – Steady Radial flow in a unconfined aquifer – Unconfined Aquifer with Uniform Recharge Capture Zone of a Well in Uniform Flow
Topic II: Theis Method for aquifer constant (pumping test)		
6-7	6	Theis method of solution, Cooper – jacop method of solution
Topic III: multi well system (well interference)		
8-9	6	Multiple well system (well interference)
Topic IV: boundaries (Image well method)		
10-15	18	<ul style="list-style-type: none"> – Wells Near Straight Constant Head Boundaries – Wells Near Straight Impermeable Boundaries – Wells Near Circular Constant Head Boundaries Unsteady radial flow in a confined aquifer
Final Exam		

Flow in Porous Media

Week	hours	Topics Covered
Topic I: Introduction		
1-4	12	<ul style="list-style-type: none"> – Porous media Definition and Parameters – Occurrence of Groundwater Porous media Recharge and Discharge.
Topic II: Aquifer Storage and permeability measurement		
5-8	12	<ul style="list-style-type: none"> – Specific yield and specific retention – Permeability and hydraulics conductivity, – Estimating Average Hydraulic Conductivities: Transmissivity. Energy and Hydraulic Head
Topic III: Principles of Ground Water Flow		
9-10	6	<ul style="list-style-type: none"> – Darcy's Law and Hydraulic Potential Specific Discharge and Average Linear Velocity
Topic IV: Contour map and direction of flow		

11-13	9	<ul style="list-style-type: none"> Ground Water Flow Direction and flow net Flow line, equipotential line, boundaries. Flow line refraction Contour map and direction of flow
Topic V: Steady-state flow in confined and unconfined aquifer		
14-15	6	<ul style="list-style-type: none"> Steady-state flow in a confined aquifer Steady-state flow in unconfined aquifer
Final Exam		

Piles and Stability of Earth Structures

week	hours	Topics Covered
1	4	Piles: Single pile in clay
2	4	single pile in sand
3	4	pile groups (the distribution of piles in groups)
4	4	pile groups (the distribution of piles in groups)
5	4	efficiency of pile groups
6	4	negative skin friction in piles
7	4	Lateral earth pressure: Rankine's earth pressure theory-horizontal surface of soil
8	4	Rankine's earth pressure theory-horizontal surface of soil
9	4	Rankine's theory-inclined surface of soil
10	4	Coulomb's earth pressure theory
11	4	Stability of retaining walls
12	4	Stability of cantilever sheet piles
13	4	Stability of anchored sheet piles
14	4	Principles of retaining walls design
15	4	Structural design of retaining walls
Final Exam		

Design of Sanitary Structures

week	hours	Topics Covered
1	4	- Water consumption and factors affected -Forecasting population
2	4	- Water for Fire demand, Design periods, Aqueducts and water pipes
3	4	- Intake types and design, Systems of Distribution Of Water,
4	4	Service water pressures, Design of water distribution systems
5	4	- Pipe Network Design, Pumps,
6	4	- Treatment of water, Theory of sedimentation, design of settling tanks,
7	4	- Coagulation process, chemical coagulants and design criteria

8	4	- Flocculation and design criteria, Filtration, theory, types, filter media
9	4	Disinfection, techniques and disinfectants,
10	4	Sewerage, general considerations, sources of sewage, quantity
11	4	Wastewater treatment plant, screens, grit chambers in wastewater treatment plant,
12	4	Primary treatment systems, plain sedimentation, rectangular tanks, circular and square tanks
13	4	Biological treatment (suspended growth/ activated sludge processes)
14	4	Biological treatment (attached- growth/trickling filters processes),
15	4	- Biosolids stabilization process, aerobic and anaerobic digestions
Final Exam		

Water Resources Management

Week	hours	Topics Covered
Topic I: Concepts and definitions		
1-2	6	<ul style="list-style-type: none"> - The water cycle - Three characteristics of water - Integrated water resources management - Policy principles - Sustainability of water resources - Institutional aspects - Strategic issues
Topic II: - Water Resources Development		
3-4	6	<ul style="list-style-type: none"> - Integrated Water Resources Management (IWRM) - Planning, Design, Construction Operation and Maintenance
Topic III: - Storm Water Management		
5-6	6	<ul style="list-style-type: none"> - Water quality and quantity issues - Rules today and tomorrow - Structural and nonstructural control Metrics and measures
Topic IV: - Water resources		
7-9	9	<ul style="list-style-type: none"> - The water balance - Groundwater resources - Surface water - Catchment yield - The rainbow of water revisited

		<ul style="list-style-type: none"> - The water balance as a result of human interference.
Topic V: - Water allocation principles		
10	3	<ul style="list-style-type: none"> - Introduction - Balancing demand and supply <p style="text-align: right;">Issues in water allocation</p>
Topic VI: - Water Demand		
11	3	<p style="text-align: center;">Urban water demand</p> <ul style="list-style-type: none"> - Estimation of urban water demand <p style="text-align: right;">Pricing of urban water</p>
12	3	<p style="text-align: center;">Agricultural water demand</p> <ul style="list-style-type: none"> - Yield response to water - Crop water requirements <p style="text-align: right;">Yield reduction due to water shortage</p>
13	3	<p style="text-align: center;">Environmental water requirements</p> <ul style="list-style-type: none"> - Introduction <p style="text-align: right;">Quantifying environmental water requirements.</p>
Topic VII: - Water Resources System Analysis		
14-15	18	<ul style="list-style-type: none"> - Benefit cost analysis - System analysis:- <ul style="list-style-type: none"> a- Simulation b- Optimization - Decision maker Requirements: <p>Problem Definition, Model Construction, Model Validation, Model Solution, Solution Appropriateness, and Results Implementation.</p>
Final Exam		

Estimation and Specifications

Week	hours	Topics Covered
Topic I:		
1-3	12	Analysis reinforced concrete materials and its quantities like (cement, coarse aggregate, fine aggregate, and reinforcement).
Topic II: -		
4-6	12	Analysis other construction materials and its quantities like (bricks, hollow blocks, curbstone, ceiling, ...etc).
Topic III: -		
7	4	Pipe culverts
Topic IV: -		
8	4	Box culverts

Topic V: -		
9-10	8	Product fresh concrete
Topic VI: -		
11-13	12	Laboratory test structural members
Topic VII: -		
13-15	12	Bells of quintets of project (BOQ)
Final Exam		

Ethics

Week	hours	Topics Covered
Topic I: Introduction to Ethics		
1,2	8	Historical review, importance ,definition , evolution.
Topic II: -Philosophy of engineering		
3	4	Conceptual approaches to problem solving
Topic III: - Codes of Ethics		
4	4	Codes developed to approach ethical issues
Topic IV: - Conflict formation and resolution		
5	4	Review methods of conflict analysis and management
Topic V: - Levels of values		
6	4	Individual, Professional, and Institutional Values
Topic VI: - Leadership in Engineering		
7,8	8	Leadership concepts applied to engineering context
Topic VII: - Competency with Good Character		
9,10,11	12	Review competency based skills and community-based attitudes for engineering profession
Topic VIII: - Engineering & community		
12,13,14	12	Social responsibilities of engineering profession and complementing roles.
Final Exam		

English Language IV

Week	hours	Topics Covered	Learning Outcomes
Topic I: the tense system			
1	3	The tense system, informal language, compound words, social expressions	
2	3	Present perfect, simple and continuous, hot verbs- make, do, exclamations	
3	3	Narrative tenses, past simple ,continuous and perfect, active and passive, showing interest and surprise, exchanging information	
Topic II: - Interaction			
4	3	Questions and negatives', prefixes and antonyms, being polite	

5	3	Future forms, hot verbs- take, put, telephoning
Topic III: - Business expressions		
6	3	Expression of quantities, 'export and ex'port , business expression and numbers
Topic IV: - Academic skills		
7	3	Listening: factor affect listening, predicting and taking notes Speaking: formal natural and informal language, punctuation. Reading: methods of reading, skimming and scanning. Writing: checking writing, brain storming
8	3	Listening: recognizing sign posts Speaking: sentence stress Reading: context meaning Writing: writing an article
9	3	Listening: listening for details Speaking: defining and describing objects Reading: topic sentences Writing: writing essay
10	3	Listening: distinguishing speakers Speaking: conversational topics Reading: purpose and audience Writing: formal expressions
11	3	Listening: interpreting meaning Speaking: checking understanding Reading: making notes Writing: paraphrasing and summarizing
12	3	Listening: taking detailed notes Speaking: presentations Reading: developing search plan Writing: extra information- research
13	3	Listening: contractions and linking Speaking: survey questions and result reporting Reading: avoiding repetitions Writing: coherent writing
14	3	Listening: supporting an argument Speaking: rephrasing, explaining Reading: intensive reading Writing: describing a process
15	3	Listening: dealing with longer listings Speaking: transitions Reading: interpreting data Writing: describing chart/graph
Final Exam		

12. Infrastructures

12.a. The department's library includes all methodological and source books and bindings related to the practical aspect.

12.b. Available Special Requirements:

12.b.1. Industrial workshops for the first stage (available)

12.b.2. Periodicals (available at the college library level)

12.b.3. Computer laboratories (available at the college's computer center level)

12.B.4. The department provides a virtual library on the Telegram application that includes hundreds of methodological and source books

12. c. Community Facilities:

12.c.1. Coordination with the Directorate of Water Resources to make visits to experts in the field of specialization to give lectures in the department

12.c.2. Conducting scientific trips periodically in each semester to one of the hydraulic structure's sites in cooperation with the directorates of water resources in Najaf and other nearby governorates.

12.c.3. Coordination with state departments directly related to the department's specialization to train third-stage students in the department during the summer vacation (summer training)

12.c.4. Cooperation between our college and the department on the one hand and the relevant state departments regarding the exchange of scientific cooperation with regard to conducting laboratory tests in the department's laboratories, as well as conducting scientific research for postgraduate students in other universities. Special books are also issued by the college to provide assistance to our students by providing them with information or examinations and helping them to complete the requirements of graduation research.

13. Admission

13.a. Graduates of the preparatory school - the biological branch are accepted every year at a graduation rate determined by the central admission of the department of studies, planning and follow-up in the Iraqi Ministry of Higher Education and Scientific Research

13.b. The lowest number accepted each year in the department	50 students
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13.c. The largest number that the department accommodates each academic year	75 students
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14. Personal Development Planning

14.a. The department aspires to raise the scientific level of its teaching staff by encouraging the completion of postgraduate studies and encouraging scientific research to obtain the degrees required for scientific promotion.

14.b. The department seeks to open a postgraduate program (Master's) by 2023 in two specializations:
Master's degree Hydraulic Structures
Master's degree in water resources

15. Key Sources of Information about the Program

- "Environmental Engineering" Howard S. Peavy, Donald R. Rowe, and George Tchobanoglous, McGraw-Hill, 1985, (ISBN 0-07-100231-6)
- "Introduction to Environmental Engineering" 3rd Edition, P. Aarne Vesilind, Susan M. Morgan, and Lauren G. Heine, Christopher M. Shortt, 2010, (ISBN-13:978-0-495-29585-3).
- "Introduction to Environmental Engineering and Science" 3rd Edition, Masters and Ela, Prentice Hall, 2007, (ISBN 9780131481-930)

Curriculum Skills Map																			
Please tick in the relevant boxes where individual Program Learning Outcomes are being assessed																			
				Program Learning Outcomes															
Year / Level	Course Code	Course Title	Core (C) or Option (O)	Knowledge and understanding				Subject – Specific Skills				Thinking Skills				General and Transferable Skills (or) other skills relevant to employability and personal development			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
First / 1 st Sem.	KHWE2301	Engineering Mechanics I	Core	√	√	√		√		√							√	√	
	KHWE2302	Mathematics (1) I	Core			√				√		√					√		
	KHWE1303	Computer Principles and Programming	Core			√				√	√	√	√				√		
	KHWE2204	Engineering Drawing I	Core					√			√					√	√		
	KHWE2205	Engineering Statistical	Core			√		√	√				√		√		√		
	KHWE3206	Water Engineering and Irrigation Principles	Core	√	√	√			√	√				√			√	√	√

	KHWE1207	Human Rights and Democratic	Core				√									√			√
	KHWE1008	Arabic Language	Core																√
First / 2 nd Sem.	KHWE2309	Engineering Mechanics II	Core	√	√	√		√		√							√	√	
	KHWE2310	Mathematics (1) II	Core			√				√		√					√		
	KHWE2211	Engineering Drawing II	Core					√			√					√	√		
	KHWE3212	Probability	Core			√		√	√				√		√		√		
	KHWE3313	Engineering Geology and Soil Physics	Core	√	√				√					√	√		√	√	
	KHWE1314	English Language (1)	Core																√
	KHWE2215	Workshops	Core				√	√								√		√	√
Second / 1 st Sem.	KHWE3416	Fluid Mechanics I	Core	√	√	√		√	√			√				√	√	√	√
	KHWE2317	Mathematics (2) I	Core			√				√		√					√		
	KHWE3318	Survey I Engineering	Core		√	√		√								√	√	√	√
	KHWE2319	Computer Applications (Mat Lab)	Core			√				√	√	√	√				√		

	KHWE2320	Strength of Materials I	Core	√	√	√				√							√	√	
	KHWE3221	Design of Irrigation and Drainage Systems	Core	√	√	√			√	√							√	√	√
	KHWE3222	Building Materials and Methods of Constructions	Core		√	√	√	√			√	√				√	√	√	√
Second / 2 nd Sem.	KHWE3423	Fluid Mechanics II	Core	√	√	√		√	√			√				√	√	√	√
	KHWE2324	Mathematics (2) II	Core			√				√		√					√		
	KHWE3325	Survey II Engineering	Core		√	√		√								√	√	√	√
	KHWE3326	Concrete Technology	Core		√	√	√	√			√	√				√	√	√	√
	KHWE2327	Strength of Materials II	Core	√	√	√				√							√	√	
	KHWE3228	CAD Construction Drawing	Core					√			√					√	√		
	KHWE1229	English Language II	Core																√
Third/ 1 st Sem.	KHWE3430	Open Channel Hydraulics I	Core	√	√	√		√	√			√				√	√	√	√
	KHWE3331	Theory of Structures I	Core		√	√		√		√							√	√	
	KHWE3332	Reinforced Concrete Design I	Core		√	√		√		√							√	√	

	KHWE3333	Soil Mechanics and Foundations I	Core		√	√	√	√		√		√			√		√	√	
	KHWE3334	Water Quality Control	Core	√		√	√		√	√		√	√	√	√		√	√	
	KHWE3235	Engineering Hydrology	Core	√	√	√			√	√		√			√	√	√		
	KHWE2236	Engineering Analysis	Core			√		√		√	√						√		
Third / 2 nd Sem.	KHWE3437	Open Channel Hydraulics II	Core	√	√	√		√	√			√					√	√	√
	KHWE3338	Theory of Structures II	Core		√	√		√		√							√	√	
	KHWE3339	Design of Concrete II	Core		√	√		√		√							√	√	
	KHWE3340	Soil Mechanics and Foundations II	Core		√	√	√	√		√		√			√		√	√	
	KHWE2341	Numerical Analysis	Core			√		√		√	√						√		
	KHWE3342	Engineering Economic and Management	Core		√	√	√	√	√		√	√	√				√	√	√
	KHWE3324	GIS & Remote Sensing	Core	√	√	√			√	√			√	√	√	√	√		
Fourth /1 st Sem.	KHWE3344	Design of Hydraulics Structures I	Core	√	√	√	√	√	√	√		√	√		√	√	√	√	√
	KHWE3345	Structural Design of Hydraulic Structures I	Core		√	√		√		√							√	√	

	KHWE3246	Earth Dams Engineering	Core	√	√	√		√	√	√		√	√		√	√	√	√	√
	KHWE3247	Flow in Porous Media	Core	√	√	√	√	√	√						√		√	√	
	KHWE3248	Engineering Profession Ethics	Core				√	√			√					√			√
	KHWE3349	Estimation and Specifications	Core			√	√				√					√	√		√
	KHWE2250	Engineering Project	Core	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth / 2 nd Sem.	KHWE3351	Design of Hydraulic Structures II	Core	√	√	√	√	√	√	√		√	√		√	√	√	√	√
	KHWE3352	Structural Design of Hydraulic Structures II	Core		√	√		√		√							√	√	
	KHWE3353	Piles and Stability of Earth Structures	Core		√	√	√	√		√		√			√		√	√	
	KHWE3354	Sanitary Engineering	Core			√	√		√	√		√	√	√	√		√	√	
	KHWE3255	Ground Water Hydraulics	Core	√	√	√	√	√	√					√	√		√	√	
	KHWE3256	Water Resources Management	Core	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	KHWE2257	Engineering Project	Core	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

