University of Isfahan

Course Outline
Civil Engineering Undergraduate Programme

Department of Civil Engineering
Faculty of Civil and Transportation Engineering
University of Isfahan
Isfahan, Iran
www.ui.ac.ir

January 2020

1. Definition and goal

Civil engineering undergraduate program is one of the higher education programs that its goal is training skilled experts for design, construction and management of civil engineering projects.

2. Duration of Program and the structure

The average duration of this program is 4 years. Every semester lasts 16 complete weeks of education. Each theoretical course takes 16 hours, each laboratory course might take 32 or 48 hours, and each workshop takes 48 hours each semester.

3. Credits

The total number of credits in this program is 140 that is described in Table 1. The titles of the aforementioned courses are as listed in Table 1 to 4.

Table 1. Course credits of Civil Engineering Undergraduate Program

No.	Type of courses	Credits
1	General courses	22
2	Basic courses	20
3	Core courses	82
4	Elective courses	16
Total		140

Table 2. General courses for Civil Engineering undergraduate program

Course No.	Course Title	Credits	Hours per week			Prerequisites/ Co-requisites
			Theoretical	Practical	Guided learning	
GC-01	Islamic Thought 1	2	2	-	-	-
GC-02	Islamic Thought 2	2	2	-	-	**GC-01**
GC-03	Islamic Ethics	2	2	-	-	
GC-04	Islamic Revolution	2	2	-	-	
GC-05	Islamic History	2	2	-	-	
GC-06	Quran Studies	2	2	-	-	
GC-07	Human Right in Islam	2	2	-	-	
GC-08	General Literature	3	3	-	-	
GC-09	General Foreign Language	3	3	-		
GC-10	Physical Education 1	1	-	2	-	-
GC-11	Physical Education 2	1	-	2	-	**GC-10**
Total		22	20	4		

Table 3. Basic courses for Civil Engineering undergraduate program

Course No.	Course Title	Credits	Hours per week			Prerequisites/ Co-requisites
			Theoretical	Practical	Guided learning	
MA 18-14-452	Calculus 1	3	3	-	1	-
MA 18-14-450	Calculus 2	3	3	-	1	**MA 18-14-452**
DE 18-14-453	Differential Equations	3	3	-	1	**MA 18-14-450 (P/C)**
PH 18-22-120	Physics 1 (Mechanics & Heat)	3	3	-	1	**MA 18-14-452 (P/C)**
CP 20-22-174	Computer Programming	3	3	-	-	**MA 18-14-452**
NC 20-22-167	Numerical Methods	2	2	-	-	**DE 18-14-453 CP 20-22-174 (P/C)**
FL 18-22-432	Physics Lab 1	1	-	3	-	**PH 18-22-120 (P/C)**
CE 30-16-244	Statistics & Probability for Engineering	2	2	-	1	**MA 18-14-452**
Total		20	19	3		

Table 4. Core courses for Civil Engineering undergraduate program

Course No.	Course Title	Credits	Hours per week			Prerequisites/ Co-requisites
			Theoretical	Practical	Guided learning	
CE 30-16-128	Strength of Materials I	4	4			
CE 30-16-129	Structural Analysis I	3	3			
CE 30-16-130	Structural Analysis II	3	3			
CE 30-16-131	Principles of Earthquake Engineering	2	2			
CE 30-16-132	Design of Concrete Structures I	3	3			
CE 30-16-133	Design of Concrete Structures II	3	3			
CE 30-16-134	Design of Concrete Structures Project	1		1		
CE 30-16-135	Design of Steel Structures I	3	3			
CE 30-16-136	Design of Steel Structures II	3	3			
CE 30-16-137	Design of Steel Structures Project	1		1		
CE 30-16-138	Construction Materials and Concrete Technology	3	3			
CE 30-16-139	Construction Materials and Concrete Technology Laboratory	1		1		

Course No.	Course Title	Credits	Hours per week			Prerequisites/ Co-requisites
			Theoretical	Practical	Guided learning	
CE 30-16-140	Architectural Design	2	1	1		
CE 30-16-141	Soil Mechanics	3	3			
CE 30-16-142	Soil Mechanics Laboratory	1		1		
CE 30-16-143	Foundation Engineering	3	3			
CE 30-16-145	Water and Wastewater Engineering	3	3			
CE 30-16-146	Water and Wastewater Engineering Project	1		1		
CE 30-16-147	Transportation Engineering	2	2			
CE 30-16-148	Loading of Structures	2	2			
CE 30-16-150	Technical Training	2		2		
CE 30-16-151	Environmental Engineering	2	2			
CE 30-16-170	Hydraulics	2	2			
CE 30-16-171	Hydraulics Laboratory	1		1		
CE 30-16-172	Engineering Hydrology	2	2			
CE 30-16-173	Building Construction Methods	2	2			
CE 30-16-174	Road Construction	2	2			

Course No.	Course Title	Credits	Hours per week			Prerequisites/ Co-requisites
			Theoretical	Practical	Guided learning	
CE 30-16-175	Road Construction Project	1		1		
CE 30-16-176	Pavement Design	2	2			
CE 30-16-177	Construction Projects Cost Estimation	2	1	1		
CE 30-16-240	Fluid Mechanics	3	3			
CE 30-16-241	Statics	3	3			
CE 30-16-242	Dynamics	3	3			
CE 30-16-243	Engineering Geology	2	2			
CE 30-16-245	Technical and Structural Drawing	2	1	1		
CE 30-16-246	Surveying and Operation	2	1	1		
CE 30-16-001	Fundamentals of Construction Management	3	3			
Total		82	69	13		

ARCHITECTURAL DESIGN

BASIC INFORMATION

Course prefix, title and semester: Architectural Design
Number of credits: 2

COURSE PREREQUISITES:

Technical and Structural Drawing

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: -
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 3793----
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
3 h	-	-	-

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with the principles of architecture and to reinforce the spirit of creativity in architectural design

REQUIRED STUDENT RESOURCES

Textbooks and References:

1. A. Jefferis and D. A. Madsen, "Architectural Drafting and Design", 7th Edition, Delmar Cengage Learning, 2016.
2. J J. F. Harbeson, J. Blatteau and S. L. Tatman, "The Study of Architectural Design", 1st Edition, W.W. Norton & Co., 2008.
3. A. Pressman, "Architectural Design Portable Handbook", 1st Edition, McGraw-Hill, 2001.

Web links: -

Computer Software: AutoCAD

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Definition of architecture	-
2	Understanding the work and role of the architect in relation to construction plans and projects	-
3	Method of cooperation between architects and civil engineers	-
4	An overview of the relationships and architectural spaces of buildings such as housing, training centres, libraries, industrial buildings, health centres	-
5	An overview of the relationships and architectural spaces of buildings such as housing, training centres, libraries, industrial buildings, health centres	-
6	Introduction to architectural standards and how to use them in architectural designs	-
7	Introduction to architectural standards and how to use them in architectural designs	-
8	Introduction to architectural standards and how to use them in architectural designs	-
9	Architectural design of a building including plans, views, sections, collection plans and details	-
10	Architectural design of a building including plans, views, sections, collection plans and details	-
11	Architectural design of a building including plans, views, sections, collection plans and details	-
12	Architectural design of a building including plans, views, sections, collection plans and details	-
13	Architectural design of a building including plans, views, sections, collection plans and details	-
14	Architectural design of a building including plans, views, sections, collection plans and details	-
15	Architectural design of a building including plans, views, sections, collection plans and details	-
16	Architectural design of a building including plans, views, sections, collection plans and details	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (0%), Project (70%), Midterm (0%), Final (30%)

ATTENDANCE STATEMENT

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STUDENTS WITH DISABILITIES ACT FOR STUDENTS WITH SPECIAL NEEDS STATEMENT

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APPROVED ACADEMIC HONESTY STATEMENT

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SYLLABI ON WEB PAGES

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BUILDING CONSTRUCTION METHODS

BASIC INFORMATION

Course prefix, title and semester: Compulsory, Building Construction Methods, Q7 or Q8
Number of credits: 2

COURSE PREREQUISITES:

-

COURSE CO-REQUISITES:

Design of Steel Structures II, Design of Concrete Structures II

TEACHERS:

Person in charge: -
Office location: Department of Civil and Transportation Engineering, University of Isfahan, Isfahan, Iran
Phone Number: +98 (31) 3793----
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
2 h	-	-	-

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with the construction methods of steel structures
- ✓ become familiar with the construction methods of concrete structures

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- E. Allen and J. Iano, "Fundamentals of Building Construction: Materials and Methods", 6th Edition, Wiley, 2013.
2- J. R. Illingworth, "Construction Methods and Planning", 2nd Edition, Taylor & Francis, 2007.
3- W. P. Spence and E. Kultermann, "Construction Materials, Methods and Techniques", 4th Edition, Cengage Learning, 2016.

Web links: -

Computer Software: -

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Different issues of construction workshop and its equipping, storing materials, necessary machinery in the workshop and safety issues at the workshop	-
2	Welding Executive Principles, Examination of Welding Fittings, Welding Executive Rules, Welding Quality Control and Welding Fittings	-
3	Introduction of standard bolts and rivets, examination of bolts and rivet connections and their Executive regulations	-
4	Different Methods of constructing steel frames, preparation of different steel parts on the ground, transportation and installation of the parts in their locations, applicable rules	-
5	Visiting a steel workshop	-
6	Visiting a steel structure during its construction	-
7	Different Types of false ceilings and their installation methods, Principles of concrete falsework, design of falsework and its parts, Erection of falseworks for different parts (foundations, columns, beams, slabs, sloping surfaces)	-
8	Different issues of concrete structures drawings, cutting and bending of reinforcement, reinforcement installation, prefabricated grids	-
9	Different issues of producing and transporting concrete and its necessary machinery	-
10	Different methods of concrete casting, concrete compaction, concrete casting in different atmospheric conditions, expansion joints	-
11	Different methods for curing concrete	-
12	Laboratory tests and tools needed for quality control of concrete	-
13	Different methods for determining post-construction building strength	-
14	Brief introduction to prefabricated buildings and how to prepare prefabricated parts	-
15	Visiting a concrete structure during its construction	-
16	Visiting a prefabricated concrete construction workshop	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (20%), Project (20%), Midterm (30%), Final (30%)

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SYLLABI ON WEB PAGES

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COMPUTER APPLICATIONS IN CIVIL ENGINEERING

BASIC INFORMATION

Course prefix, title and semester: Computer Applications in Civil Engineering
Number of credits: 2

COURSE PREREQUISITES:

1. Numerical Methods
2. Structural Analysis II

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: -
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 3793----
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
2 h	-	-	-

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with the most commonly used civil engineering software

REQUIRED STUDENT RESOURCES

Textbooks and References:

1. CSI, "CSI Analysis Reference Manual for SAP2000, ETABS and SAFE", Computers and Structures, Inc., 2017.
2. CSI, "BASIC ANALYSIS REFERENCE MANUAL", Computers and Structures, Inc., 2016.
3. CSI, "Concrete Frame Design Manual", Computers and Structures, Inc., 2017.

Web links: -

Computer Software: SAP2000, ETABS, SAFE

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Introducing various computer programs including: Mapping, drawing curves and statistical calculations programs AutoCAD, EXCEL, SPSS,	-
2	Introducing numerical programs NISA, LUSAS, ABAQUS, ANSYS, ADINA, PLAXIS, NASTRAN, DRAIN, SAP2000, ETABS2000, SAFE, IDARC, OPENSEES, BISPEC, PERFORM, SEWER, MATLAB, MATHEMATICA, SEISMOSIGNAL, SEISMOSTRUCT	-
3	Introduction to Linux operating system and open source software	-
4	More complete descriptions of SAP2000, ETABS2000, SAFE and capabilities including:	-
5	- Introducing different parts of the program and initial modelling - Define geometry	-
6	- Entering member details and applying boundary conditions - Loading	-
7	- Truss, beam and frame elements - Application of restrictions on degrees of freedom - The effect of shear deformation and the effect of rigid parts on the end members	-
8	- Solid elements, plane stress, plane strain, plate, axial symmetry	-
9	- Shell elements, and membrane and bending issues	-
10	- Hydrostatic pressure on water structures	-
11	- Structural analysis with the software	-
12	- Design of concrete structures	-
13	- Design of concrete structures	-
14	- Design of concrete structures	-
15	- Design of steel structures	-
16	- Design of steel structures	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Project (60%), Midterm (0%), Final (30%)

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

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CONSTRUCTION MATERIALS AND CONCRETE TECHNOLOGY

BASIC INFORMATION

Course prefix, title and semester: Construction Materials and Concrete Technology
Number of credits: 3

COURSE PREREQUISITES:

Engineering Geology

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: -
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 3793----
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
3 h	-	-	-

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with different types of construction materials properties
- ✓ become familiar with concrete properties and its production

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- N. Jackson and R. K. Dhir, "Civil Engineering Materials", Macmillan Education, 1988.
2- J. M. Illuston, "Construction Materials", E&FN Spon, 1994.
3- A. R. Lyons, "Materials for Architects and Builders: An Introduction", Arnold, London, 1997.
4- R. C. Smith and C. K. Andres, "Materials of Construction", McGraw-Hill, 1989.
5- A. M. Neville and J. J. Brooks, "Concrete Technology", Longman Scientific & Technical, Singapore, 1987

Web links: -

Computer Software: -

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Introduction: importance and application of materials in construction	-
2	Metals: structure, strength properties, module of elasticity, brittleness, strengthening, fatigue and other properties of Iron, Cast Iron, Steel, Copper and its alloys, Lead, Zinc, Aluminum, application of metals in construction	-
3	Nonmetal materials except concrete: Gypsum: production methods, physical and chemical and strength properties, applications Lime: production methods, physical and chemical and strength properties, applications	-
4	Mortars: Production, properties of different mortars such as lime mortar, cement-lime mortar, cement mortar and their applications Brick and Tile: raw materials and production, classification and different types of brick, brick properties, brick testing, applications	-
5	Stone: stone types, characterization, properties, applications	-
6	Polymers: structure, polymer technology, mechanical and thermal properties, durability of polymers, polymer types and their applications in construction Heat insulating and water proofing materials in building, applicable materials, properties Glass: production methods, properties, glass types, applications in construction	-
7	Bitumen and Asphalt: production methods, properties, bitumen and asphalt testing, applications	-
8	Cement: chemistry of cement, production, physical, chemical and mechanical properties of cement, cement testing, application of different cement types	-
9	Concrete: definition, importance, differences with other materials especially steel	-
10	Aggregates: classification, physical and mechanical properties such as specific gravity, water absorption, porosity, shape and texture, dimensions, particle size distribution, strength, impurities in aggregates and their effects	-
11	Water: properties of proper water for concrete mixing and curing, effect of quality and quantity of water on concrete	-

	Additives; properties and application of additives, accelerators, retarders, plasticizer and supper plasticizer, air entraining	
12	Fresh concrete properties: workability definition, workability testing, effect of concrete materials on workability, bleeding, segregation	-
13	Concreting: concrete mixing methods, transport, casting and compaction Concrete mix design: laboratory and ready mix design, standards	
14	Concrete curing: different methods of curing and its effect on concrete properties, hot and cold weather concreting, application of different concrete types	
15	Hardened concrete properties: testing of hardened concrete, compressive, tensile and flexural strength, module of elasticity, shrinkage, creep and effect of various parameters	
16	Defects and durability: chemical and physical defects, preventive methods, improve durability of concrete Concrete types and their applications: light weight concrete, high density concrete, precast concrete, high strength concrete, polymer concrete, fiber reinforced concrete, Ferrocement concrete	

EVALUATION PROCEDURES AND GRADING CRITERIA

Midterm (40%), Final (60%)

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

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CONSTRUCTION MATERIALS AND CONCRETE TECHNOLOGY LABORATORY

BASIC INFORMATION

Course prefix, title and semester: Construction Materials and Concrete Technology Laboratory
Number of credits: 1

COURSE PREREQUISITES:

Construction Materials and Concrete Technology

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: -
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 3793----
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
-	-	3 h	-

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with some of laboratory tests of construction materials and concrete technology

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- ASTM, "Annual Book of ASTM Standards, Vol 04.01 Cement; Lime; Gypsum", American Society for Testing & Materials, 2004.
2- ASTM, "Annual Book of ASTM Standards, Vol 04.02 Concrete and Aggregates", American Society for Testing & Materials, 2004.
3- ASTM, "Annual Book of ASTM Standards, Vol 04.05 Chemical-Resistant Nonmetallic Materials; Vitrified Clay Pipe; Concrete Pipe; others", American Society for Testing & Materials, 2004.
4- N. Jackson and R. K. Dhir, "Civil Engineering Materials", Macmillan Education, 1988.
5- J. M. Illuston, "Construction Materials", E&FN Spon, 1994.
A. M. Neville and J. J. Brooks, "Concrete Technology", Longman Scientific & Technical, Singapore, 1987

Web links: -

Computer Software: -

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Orientation, Introduction, Lab Safety and Regulations	-
2	Cement: specific gravity, Fineness, Consistency test	-
3	Cement: Initial and final setting times, compressive, tensile and flexural strength of cement mortar	-
4	Aggregate: coarse aggregate particle size distribution, specific gravity, bulk density, water absorption, abrasion value	-
5	Aggregate: fine aggregate particle size distribution, specific gravity, bulk density, water absorption	-
6	Aggregate: coarse aggregate abrasion value	-
7	Concrete Mix design and production	-
8	Fresh Concrete: workability, air content	-
9	Brick: physical properties, compressive, flexural strength, freeze and thaw	-
10	Gypsum: fineness, consistency, bulk density, initial setting,	-
11	Hardened concrete tests: compressive, flexural strength, module of elasticity	-
12		-
13		-
14		-
15		-
16		-

EVALUATION PROCEDURES AND GRADING CRITERIA

Technical Lab Reports (50%), Practical Exam (25%), Final Exam (25%)

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

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DYNAMICS

BASIC INFORMATION

Course prefix, title and semester: Dynamics

COURSE PREREQUISITES:

Statics

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: -
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 3793 5323
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
3 h	-	-	1 h

COURSE OBJECTIVES

- ✓ Throughout this course, the students are expected to become capable of applying principles of Newtonian physics to simple mechanical systems which are not in equilibrium
- ✓ At the end of this course, students should be capable to draw information regarding dynamics of a system based on mathematical descriptions: kinematics
- ✓ Students are also expected to become capable to apply Newton's second law to various dynamic systems and analyze them in terms of the forces which are generated as a result of motion
- ✓ Students should also become capable to apply various methods of dynamic analysis including energy approach and principles of linear and angular momentum to various basic dynamic systems

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- R. C. Hibbeler, "Engineering Mechanics: Dynamics and Student Study Pack with FBD Package", 11th Edition, Prentice Hall, 2006.
2- J. L. Meriam and L. G. Kraige, "Engineering Mechanics: Dynamics", 6th Edition, Wiley, 2006.
3- F. Beer, E. R. Johnston, W. Clausen, E. Eisenberg and P. Cornwell, "Vector Mechanics for Engineers: Dynamics", 9th Edition, McGraw-Hill Science/Engineering/Math, 2009.

Web links: -

Computer Software: -

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Introduction to dynamics, basic concepts, Newton's laws, units, gravitation, dimensions and dimensional analysis: an intriduction	HW1
2	Kinematics of particles: rectilinear motion, plane rectilinear motion	-
3	Rectangular coordinates, normal and tangential coordinates	
4	Polar coordinates, sample problems	-
5	Space curvilinear motion, cylindrical and spherical coordinates	-
6	Relative motion, constrained motion of connected particles	HW2
7	Kinetics of particles: Newton's second law, rectilinear and curvilinear motions	-
8	Energy methods, work and energy, kinetic and potential energy	-
9	Linear and angular impulse and momentum, special applications including impact, relative motion, central-force motion	HW3
10	Kinetics of systems of particles, generalized Newton's second law	-
11	Work and energy approach, impulse and momentum, with applications	HW4
12	Plane kinematics of rigid bodies, rotation, absolute motion	-
13	Relative motion, angular velocity and acceleration, relative velocity and acceleration, instantaneous center of zero velocity, motion relative to rotating axes	HW5
14	Plane kinetics of rigid bodies: translation, fixed-axis rotation, general plane motion	-
15	Work and energy relations, impulse-momentum	HW6
16	Vibration and time response, free and forced vibration, vibration of rigid bodies	HW7

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Midterm (40%), Final (50%)

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SYLLABI ON WEB PAGES

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ENGINEERING HYDROLOGY

BASIC INFORMATION

Course prefix, title and semester: Compulsory, Engineering Hydrology
Number of credits: 2

COURSE PREREQUISITES:

Fluid Mechanics, Statistics and Probabilities

COURSE CO-REQUISITES:

Fluid Mechanics

TEACHERS:

Person in charge: -
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 3793----
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
2 h	-	-	1 h

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with principles of hydrology and its application in civil projects.

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- D.R. Maidment, "Handbook of Hydrology", McGraw-Hill, 1993.
2- A.D. Ward, S.W. Trimble, S.R. Burckhard and J.G. Lyon, “Environmental Hydrology”, CRC Press, 2015.
3- C.W. Fetter, “Applied Hydrology”. 4th edition. Waveland Press, 2018.

Web links: -

Computer Software: ABAQUS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Hydrologic cycle	-
2	Meteorology and atmosphere properties	-
3	Air Mass and Fronts	-
4	Precipitation	-
5	Evapotranspiration	-
6	Moving Fluids: Streams, stream line	-
7	Water infiltration into soil	-
8	Water basin	-
9	Hygrometry	-
10	Homogeneity, consistency and data mining	-
11	Runoff	-
12	Flood routing	-
13	Groundwater Hydrology	-
14	Hydrograph	-
15	Unique Hydrograph	-
16	Utilizing statistics in hydrology	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Project (10%), Midterm (30%), Final (50%)

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

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FLUID MECHANICS

BASIC INFORMATION

Course prefix, title and semester: Compulsory, Fluid Mechanics
Number of credits: 3

COURSE PREREQUISITES:

Dynamics

COURSE CO-REQUISITES:

Dynamics

TEACHERS:

Person in charge: -
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 3793----
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
3 h	-	-	1 h

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with physical properties of fluids and consider the governing equations of static and moving fluids.

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- 1. V. L. Streeter, E. B. Wylie and K. W. Bedford, "Fluid Mechanics", WCB/McGraw Hill, 1998.
2- I. H. Shames, "Mechanics of fluids", McGraw-Hill Professional, 2002.
3- B. R. Munson, D. F. Young and T. H. Okiishi, "Fundamentals of Fluid Mechanics", 5th Edition, Wiley, 2005.
4- R.W. Fox and A.T. McDonald, "Introduction of Fluid Mechanics", John Wiely & Sons, 1985.
5- F.M. White, "Fluid Mechanics", McGraw Hill, 1994.
6- B. Larock, R.W. Jeppson and G.Z. Watters, "Hydraulics of pipeline systems", CRC Press, 1999.

Web links: -

Computer Software: ABAQUS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Physical Properties of Fluids includes: density, viscosity, specific volume, module of elasticity, surface tension, cavitation, capillarity	-
2	Static fluids: Pascal law, pressure distribution in static fluid	-
3	Pressure force on sub-merged surfaces including horizontal, vertical and inclined surfaces, and curves	-
4	Archimedean law, forces on sub-merged and float objects	-
5	Relative Fluid Balance	-
6	Moving Fluids: Streams, stream line	-
7	System and control volume, Control volume survival equation	-
8	Differential form for analysis the fluid mechanics problems	-
9	Continuity equation, linear and angular momentum equation	-
10	Energy and Berloni equation	-
11	Using continuity and momentum, energy equations in measuring the velocity and pressure of the stream flow, measuring equipment	-
12	Dimensional Analysis and hydraulic models	-
13	The similarity laws: Reynolds, Froud, Euler, Mach, Principles of Hydraulic models	-
14	Flow in pressure pipes	-
15	Laminar and turbulence flow, boundary layer, developed flow, Energy and Hydraulic grade lines	-
16	Design of pressure lines (Series or Parallel), external flows and forces on objects	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Project (10%), Midterm (30%), Final (50%)

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SYLLABI ON WEB PAGES

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FOUNDATION ENGINEERING

BASIC INFORMATION

Course prefix, title and semester: Foundation Engineering
Number of credits: 3

COURSE PREREQUISITES:

Soil Mechanics, Concrete Structure I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: -
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 3793----
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
3 h	-	-	1 h

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with the soil exploration methods
- ✓ become familiar with shallow and deep foundation types and their design methods
- ✓ become familiar with earth retaining structures and their design methods

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- 1 B. M. Das, "Principles of Foundation Engineering", 6th Edition, CL-Engineering, 2006.
2- R. W. Day, "Foundation Engineering Handbook", 1st Edition, McGraw-Hill Professional, 2005.
3- J. E. Bowles, "Foundation Analysis and Design", 5th Edition, McGraw-Hill Publishing Co., 2001.
4- D.P. Coduto, "Foundation Design: Principles and Practices", 2nd Edition, Prentice Hall, 2000.
5- H.Y. Fang, "Foundation Engineering Handbook", 2nd edition, Springer, 1990.

Web links: -

Computer Software: -

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Soil exploration methods, soil boring and sampling, field tests, determination of effective parameters in foundation design	-
2	Shallow foundation types, bearing capacity of shallow foundation under axial loads, eccentric loads and inclined loads,	-
3	Bearing capacity of shallow foundation on slopes or layered soils,	-
4	Settlement of shallow foundations calculation and its control methods	-
5	Foundations on problematic soils, control of ground water in excavation and construction	-
6	Design of shallow foundations: spread footings, strap footings, strip footings	-
7	Mat foundations, rigid foundation, beam on elastic foundation	-
8	Retaining walls and retaining structures, flexible earth retaining structures,	-
9	Lateral earth pressure, Rankine's theory	-
10	Lateral earth pressure, Coulomb's theory	-
11	Hydrostatic water pressure	-
12	Design of rigid retaining walls	-
13	Deep foundations, static, dynamic and field bearing capacity of deep foundations	-
14	Deep foundations, static, dynamic and field bearing capacity of deep foundations	-
15	Group piles capacity and load distribution, pile cap design	-
16	Slope stability: stability of sandy slopes in dry and saturated conditions, stability of clay slopes, methods of slope stability analysis	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Midterm (40%), Final (50%)

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SYLLABI ON WEB PAGES

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INDUSTRIAL WASTEWATER TREATMENT

BASIC INFORMATION

Course prefix, title and semester: Industrial Wastewater Treatment
Number of credits: 2

COURSE PREREQUISITES:

Environmental Engineering
Hydraulics

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Asst. Prof. Shervin Jamshidi
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 37932426
Email Address: sh.jamshidi@eng.ui.ac.ir

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
2 h	-	-	-

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with the specifications of different types of industrial wastewater
- ✓ become familiar with the challenges and processes of industrial wastewater treatment

REQUIRED STUDENT RESOURCES

Textbooks and References:

- Eckenfelder W.W. (2006), Wastewater Treatment, Wiley
- Ng Wun Jern (2004), Industrial Wastewater Treatment
- Metcalf & Eddy Inc. (2004), Wastewater Engineering-Treatment and Reuse, 4th edition, McGraw Hill.
- Eckenfelder W.W. (1999), Industrial Water Pollution Control, 3rd edition, McGraw Hill

Web links: -

Computer Software: -

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Introduction and definitions	-
2	Types of wastewater	-
3	Types of industrial wastewater	-
4	Specifications of industrial wastewater	-
5	Standard parameters of wastewater treatment	-
6	Principals of wastewater treatment	-
7	Process flow of industrial WWTPs	-
8	Pretreatment processes in industrial WWTPs	-
9	Pretreatment processes in industrial WWTPs/2	-
10	Biological processes in industrial WWTPs	-
11	Biological processes in industrial WWTPs/2	-
12	Post-treatment processes in industrial WWTPs	-
13	Post-treatment processes in industrial WWTPs/2	-
14	Seminar/Project presentations	-
15	Seminar/Project presentations	-
16	Final Exam	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Project (40%), Final (50%)

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SYLLABI ON WEB PAGES

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STRUCTURAL LOAD DETERMINATION

BASIC INFORMATION

Course prefix, title and semester: Structural Load Determination
Number of credits: 1

COURSE PREREQUISITES:

Structural Analysis I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge:
Office location: Department of Civil Engineering and Transportation
Phone Number:
Email Address:

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
1 h	-	-	20 min

COURSE OBJECTIVES

This course focuses on design loads and calculations used in typical residential design. These design loads include dead, live, wind and seismic and are subject to acceptable practice and provisions of the ASCE 7 standard - Minimum Design Loads for Buildings and Other Structures.

REQUIRED STUDENT RESOURCES

Textbooks and References:
1. David Fanella, Structural Load Determination, 1st ed., McGraw-Hill, 2018.
2. ASCE/SEI 7 Minimum Design Loads For Buildings and Other Structures

Web links: -

Computer Software: ABAQUS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Introduction	-
2	Definition of Dead Load and Calculation for Weights of Materials and Constructions	-
3	Dead Load in Different Types of Floor: Slab, Joist & Block, Composite System, …	-
4	Uniformly Distributed and Concentrated Live Loads	-
5	Reduction in Live Loads	-
6	Provision for Partitions and Walls	-
7	Impact and Crane Loads	-
8	Flat Roof Snow Loads	-
9	Sloped Roof Snow Loads	-
10	Partial Loading and Unbalanced Roof Snow Loads	-
11	General Requirements of Wind Loads	-
12	Wind Loads affecting Main Wind Force-Resisting System	-
13	Wind Loads affecting Components and Cladding	-
14	Basic Requirements for Seismic Load	-
15	Equivalent Lateral Force Procedure	-
16	Loads Combinations	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Midterm (30%), Final (60%)

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SYLLABI ON WEB PAGES

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MECHANICS OF MATERIALS I

BASIC INFORMATION

Course prefix, title and semester: Mechanics of materials I
Number of credits: 4

COURSE PREREQUISITES:

Statics

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: -
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 3793 5323
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
4 h	-	-	1 h

COURSE OBJECTIVES

Students are expected to:

- ✓ Understanding the basic behavior of materials in structural components subject to various loading conditions
- ✓ To get students acquainted with how tensile and shear forces as well as bending and torsional moments are withstood in structural components such as truss and beam elements
- ✓ To derive the basic equations which describe how basic structural elements deform when subjected to various loading condition

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- E. P. Popov, S. Nagarajan and Z. A. Lu, "Mechanics of Materials", 2nd Edition, Prentice-Hall, Englewood Cliffs, New Jersey, 1976.
2- F. P. Beer, E. R. Jr. Johnston and J. T. Dewolf, "Mechanics of Materials", 5th Edition, McGraw-Hill, New York, 2008.
3- J. M. Gere and S. P. Timoshenko, "Mechanics of Materials", 3rd Edition, PWS-Kent, Boston, 1990.

Web links: -

Computer Software: -

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Review of methods of statics, stress in members of a structure, stress on an oblique plane under axial loading	-
2	Introduction of stress components and notations, the concept of safety factor and some design considerations	-
3	Axial loading: stress and deformation, application of the deformation theory to statically indeterminate problems,	HW1
4	Sample problems involving thermal stresses	-
5	Poisson's ratio, generalized Hooke's law, dilatation and bulk modulus	-
6	Shear strain Shear modulus and relation with Young's modulus and Poisson's ratio, Saint-Venant's principle, the concept of stress concentration	HW2
7	Torsion: shear stresses in circular shafts, angle of twist,	-
8	Statically indeterminate problems, transmission shafts, stress concentration	HW3
9	Non-circular members, thin-walled members with closed or open cross-sections	HW4
10	Pure bending, stress distribution and deformation,	-
11	Bending in composite materials, eccentric axial loading in a plane of symmetry, Stress distribution due to simultaneous bending moments in different directions, principle axes and asymmetric cross-sections	HW5
12	Shear stresses in beams: shear stress distribution,	HW6
13	Thin-walled structures, longitudinal shear on a beam element, Asymmetric cross sections and shear center	-
14	Transformation of stress and strain, combined loading, Mohr's circle, principle stresses and principle directions, maximum shear stresses, sample problems	HW7
15	Columns: stability problem, energy approach, critical load of buckling in elastic columns, differential equation formulation for finding the buckling load	-
16	Effect of boundary conditions on the critical load of buckling, effective length of columns, deformation and moment magnification due to eccentric axial loads	HW8

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Midterm (40%), Final (50%)

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SYLLABI ON WEB PAGES

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MECHANICS OF MATERIALS II

BASIC INFORMATION

Course prefix, title and semester: Mechanics of materials II
Number of credits: 2

COURSE PREREQUISITES:

Mechanics of materials I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: -
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 3793 5323
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
2 h	-	-	1 h

COURSE OBJECTIVES

Students are expected to:

- ✓ To get students acquainted with a general and fundamental approach toward stress analysis in solids
- ✓ To demonstrate how basic principles of stress analysis can be applied to more advanced problems including materials with nonlinear behavior

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- F. P. Beer, E. R. Jr. Johnston and J. T. Dewolf, "Mechanics of Materials", 7th Edition, McGraw-Hill, New York, 2014.
2- E. P. Popov, S. Nagarajan and Z. A. Lu, "Mechanics of Materials", 2nd Edition, Prentice-Hall, Englewood Cliffs, New Jersey, 1976.
3- J. M. Gere and S. P. Timoshenko, "Mechanics of Materials", 3rd Edition, PWS-Kent, Boston, 1990.
4- A. P. Boresi and R. J. Schmidt, "Advanced Mechanics of Materials", 6th Edition, Wiley, 2002.
5- R. Cook and W. Young, "Advanced Mechanics of Materials", 2nd Edition, Prentice Hall, 1998.

Web links: -

Computer Software: Abaqus

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Stress as a tensor, traction vector on an arbitrary surface and relation with stress tensor, principle stresses as eigenvalues of the stress tensor, the concept of tensor	-
2	Stress transformation, transformation matrix, octahedral stresses, hydrostatic stress, deviatoric stresses, stress invariants	-
3	Equilibrium equation in terms of stress components	HW1
4	Deformation theory: strain as a tensor, strain-displacement relations, Strain compatibility	-
5	Deformation theory and beam theory: assessment of the beam theory	HW2
6	Analysis of curved beams: stresses and deformation	
7	Plastic deformation, non-linear stress-strain behavior in the plastic regime, fundamentals of plastic deformation	-
8	Plastic deformation under uniaxial loading, elastic-perfectly plastic behavior	HW3
9	Residual stresses and deformation in plastically deformed members under uniaxial loading	HW4
10	Plastic deformation of circular shafts under torsion, residual stresses and deformation	-
11	Plastic deformation of beams subject to loading, onset of plasticity	HW5
12	Residual deformation, neutral axis in asymmetric cross-sections	HW6
13	Tresca and von-Mises yield criteria, sample problems with combined loading conditions	-
14	Thin-walled pressure vessels: cylindrical and spherical	-
15	Density of elastic energy, elastic energy of deformed beam	HW7
16	Energy-based methods for structural analysis, virtual work method	HW8

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Midterm (40%), Final (50%)

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SYLLABI ON WEB PAGES

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MECHANICS OF MATERIALS LABORATORY

BASIC INFORMATION

Course prefix, title and semester: Optional, Mechanics of Materials Laboratory, Q1
Number of credits: 2

COURSE PREREQUISITES:

Mechanics of Materials I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Mohammad Heidari-Rarani
Office location: Mechanical Engineering Department, Faculty of Engineering, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37932783
Email Address: m.heidarirarani@eng.ui.ac.ir

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
-	-	2	-

COURSE OBJECTIVES

Students are expected to:

- ✓ Be familiar with experimental test setups.
- ✓ Understand the basic concepts of mechanical engineering in practice.
- ✓ Calculate the difference between theory and experiment and the effective parameters to reduce the difference

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- F. P. Beer, E. R. Jr. Johnston and J. T. Dewolf, “Mechanics of Materials”, 7th Edition, McGraw-Hill, New York, 2014.
2- E. P. Popov, S. Nagarajan and Z. A. Lu, “Mechanics of Materials”, 2nd Edition, Prentice-Hall, Englewood Cliffs, New Jersey, 1976.
3- J. M. Gere and S. P. Timoshenko, “Mechanics of Materials”, 3rd Edition, PWS-Kent, Boston, 1990.

Web links: -

Computer Software: Excel, Matlab

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	An overview of the list of tests in the laboratory and dividing students to the groups	-
2		-
3		-
4		-
5		-
6		-
7		-
8		-
9		-
10		-
11		-
12		-
13		-
14		-
15		-
16		-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (25%), Project (25%), Final (50%)

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SYLLABI ON WEB PAGES

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STRUCTURAL OPTIMIZATION

BASIC INFORMATION

Course prefix, title and semester: Structural Optimization
Number of credits: 3

COURSE PREREQUISITES:

Structural Analysis II

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge:
Office location: Department of Civil Engineering and Transportation
Phone Number:
Email Address:

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
3 h	-	-	1 h

COURSE OBJECTIVES

Finding the best response for system considering the constraints is the goal of engineering optimization. Many of the problems in civil engineering can be modelled as optimization problems. In this course, the general steps involved in formulating optimization model are described. Then, the optimization theory is introduced and different optimization techniques and numerical algorithms are discussed and applied in the mathematical programming examples.

REQUIRED STUDENT RESOURCES

Textbooks and References:

1. Kaveh, Ali. Optimal structural analysis. Vol. 24. John Wiley & Sons, 2014.
2. Vanderplaats, Garret N. Numerical optimization techniques for engineering design: with applications. Vol. 1. New York: McGraw-Hill, 1984.

Web links: -

Computer Software: MATLAB

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Introduction	-
2	General Problem Statement	-
3	Calculus Review	-
4	Method of Lagrange Multipliers	-
5	Karush-Kuhn-Tucker Optimality Conditions	-
6	One-Variable Unconstrained Optimization	-
7	Polynomial Approximations	-
8	Golden Section Method	-
9	Multivariable Unconstrained Optimization	-
10	Gradient Search Procedure	-
11	Standard Linear Programming Form	-
12	Sequential Linear Programming	-
13	Quadratic Programming	-
14	Separable Programming	-
15	Heuristic and Meta-heuristic Algorithm	-
16	Genetic Algorithm	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (5%), Project (10%), Midterm (35%), Final (50%)

ATTENDANCE STATEMENT

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STUDENTS WITH DISABILITIES ACT FOR STUDENTS WITH SPECIAL NEEDS STATEMENT

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APPROVED ACADEMIC HONESTY STATEMENT

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SYLLABI ON WEB PAGES

Syllabi presented on web pages shall contain the date of last update.

PRINCIPLES OF EARTHQUAKE ENGINEERING

BASIC INFORMATION

Course prefix, title and semester: Compulsory, Principles of Earthquake Engineering, Q7 or Q8
Number of credits: 2

COURSE PREREQUISITES:

Loading of Structures

COURSE CO-REQUISITES:

Structural Analysis II

TEACHERS:

Person in charge: Dr. Hossein Tajmir Riahi
Office location: Department of Civil and Transportation Engineering, University of Isfahan, Isfahan, Iran
Phone Number: +98 (31) 37935307
Email Address: tajmir@eng.ui.ac.ir

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
3 h	-	-	1 h

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with the concepts of seismology
- ✓ become familiar with the principles of seismic design and common methods of seismic analysis, and a variety of earthquake resistant structural systems.
- ✓ become familiar with different earthquake resistant structural systems.

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- A. Elnashai and L. D. Sarno, “Fundamentals of Earthquake Engineering”, 2nd Edition, Wiley, 2015.
2- Y. Bozorgnia and V. V. Bertero, “Earthquake Engineering: From Engineering Seismology to Performance-Based Engineering”, 1st Edition, CRC, 2004.
3- W.F. Chen and C. Scawthorn, “Earthquake Engineering Handbook”, 1st Edition, CRC, 2002.

Web links: -

Computer Software: -

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Principles of seismology, causes of earthquake occurrence	-
2	Earthquake related phenomena, earthquake measurement scale, seismicity of Iran and the world	-
3	Calculating design earthquake, Factors affecting earthquake intensity, influence of distance and soil properties on earthquake intensity	-
4	Seismic risk analysis	-
5	Probabilistic and deterministic methods	-
6	Dynamic of structures, equations of motion, problem statement and solution methods	-
7	single degree of freedom (SDOF) free vibration analysis without damping	-
8	SDOF free vibration analysis with damping	-
9	Response to harmonic and periodic excitations	-
10	Response to harmonic and periodic excitations	-
11	Force transmission and vibration isolation	-
12	Energy dissipated in viscous damping, equivalent viscous damping	-
13	Response to arbitrary, step, and pulse excitations	-
14	Principles of modal analysis	-
15	Spectral analysis of structures	-
16	Response spectra	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Midterm (40%), Final (50%)

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

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STRUCTURAL RELIABILITY ANALYSIS

BASIC INFORMATION

Course prefix, title and semester: Structural reliability analysis
Number of credits: 2

COURSE PREREQUISITES:

Probability and statics for engineering, Structural analysis I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge:
Office location: Department of Civil Engineering and Transportation
Phone Number:
Email Address:

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
2 h	-	-	40 min

COURSE OBJECTIVES

The aim in structural reliability analysis is calculation of failure probability in which failure is defined as violation of limit state function. Students are expected to become familiar with the following topics:

- ✓ Application of probability and statistics in the analysis and design of civil engineering systems
- ✓ First order reliability methods
- ✓ Probabilistic modeling of loading and resistance parameters

REQUIRED STUDENT RESOURCES

Textbooks and References:

1. Nowak, Andrzej S., and Kevin R. Collins. Reliability of structures. CRC Press, 2012.
2. Melchers, Robert E., and André T. Beck. Structural reliability analysis and prediction. John Wiley & Sons, 2018.

Web links: -

Computer Software: MATLAB, EXCEL

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Introduction and Basic Background	-
2	Review of Probability Theory and Statistics	-
3	Probability Distributions	-
4	Concept of Limit State Function and Failure Probability	-
5	Dead Load, Permanent and Transient Live Load Models	-
6	Environmental Load Model (Snow, Wind and Earthquake)	-
7	Time-Variant Reliability Assessment of Load Combinations	-
8	Borges Model for Load Combination	-
9	Turkstra`s Rule	-
10	Probabilistic Models of Resistance for Steel Components	-
11	Probabilistic Models of Resistance for Reinforced Concrete Components	-
12	First Order Second Moment Reliability Index	-
13	Hasofer-Lind Method	-
14	Sensitivity and Importance Vector	-
15	Design Codes	-
16	Calibration of Partial Safety Factor	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (5%), Project (10%), Midterm (35%), Final (50%)

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SYLLABI ON WEB PAGES

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SOIL MECHANICS LABORATORY

BASIC INFORMATION

Course prefix, title and semester: Soil Mechanics Laboratory
Number of credits: 1

COURSE PREREQUISITES:

Soil Mechanics

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: -
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 3793----
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
-	-	3 h	-

COURSE OBJECTIVES

Students are expected to:

- ✓ Students will be familiar with soil mechanics laboratory testing

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- 1. B.M. Das, "Principles of Geotechnical Engineering", 7th edition, CL-Engineering, 2009.
2- American National Standards Institute (ANSI), "Geotechnical investigation and testing - Laboratory testing of soil", 1st Edition, 2007.
3- B.M. Das, "Soil Mechanics Laboratory Manual", Oxford University Press, 7th edition, 2008.
4- ASTM, "Annual Book of ASTM Standards, Vol 04.08 Soil and Rock", American Society for Testing & Materials, 2004.
5- ASTM, "Annual Book of ASTM Standards, Vol 04.09 Soil and Rock", American Society for Testing & Materials, 2004.
6- J.Bardet, "Experimental Soil Mechanics", Prentice-Hall, 1997.
7- K. Terzaghi and R. B. Peck, "Soil Mechanics in Engineering Practice", 2nd Edition, John Wiley, 1967.

Web links: -

Computer Software: Microsoft Office

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Orientation, introduction, lab safety and regulations	-
2	Grain-size distribution (sieve analysis and hydrometer analysis)	-
3	Atterberg limits	-
4	compaction	-
5	California bearing ratio (CBR)	-
6	Sand equivalent	-
7	Direct shear	-
8	Unconfined compression	-
9	Triaxial	-
10	Consolidation	-
11	Permeability - constant head method	-
12	Permeability - falling head method	-
13	Specific gravity	-
14		-
15		-
16		-

EVALUATION PROCEDURES AND GRADING CRITERIA

Technical Lab Reports (50%), Practical Exam (25%), Final Exam (25%)

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

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STATICS

BASIC INFORMATION

Course prefix, title and semester: Compulsory, Statics, Q2
Number of credits: 3

COURSE PREREQUISITES:

Calculus I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Hossein Tajmir Riahi
Office location: Department of Civil and Transportation Engineering, University of Isfahan, Isfahan, Iran
Phone Number: +98 (31) 37935307
Email Address: tajmir@eng.ui.ac.ir

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
3 h	-	-	1 h

COURSE OBJECTIVES

Students are expected to:

- ✓ draw a free body diagram and apply Newton's third law to identify the forces
- ✓ understand the concept of equilibrium equations and apply them to analyze a forced system
- ✓ be familiar with a variety of mechanical systems such as structures and frames

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- Meriam J., Kraige L., Bolton J. N. Engineering Mechanics: Statics 8th edition, John Wiley & Sons; 2014.
2. Beer F., Johnson E., Mazurek D., Cornwell P., Self B. Vector Mechanics for Engineers, Statics and Dynamics 11th edition, McGraw-Hill; 2015.
3. Hibbler R. Engineering Mechanics: Statics and Student Study Pack with FBD Package. Prentice Hall; 2006.

Web links: -

Computer Software: -

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Introduction to statics: scalars and vectors, Newton's laws, the system of units	-
2	Force: force classification, action and reaction, concurrent forces, vector components, the moment of a force about a point and a line	-
3	Cross product, Varignon's theorem, couple, force-couple systems, the resultant of a planar system of forces	-
4	Moment and couple in three-dimensional force systems, the resultant of a general system of forces, wrench resultant	-
5	Equilibrium: the free-body diagram, equilibrium conditions in two and three dimensions, categories of equilibrium	-
6	Two-force and three-force members, alternative equilibrium equations	-
7	Structures: plane trusses, a method of joints	-
8	Method of sections, space trusses, frames and machines	-
9	Distributed forces: center of mass, centroids of lines, areas, and volumes, composite bodies, theorems of pappus	-
10	Beams, distributed loads, shear, bending, and their relationships	-
11	Flexible cables	-
12	Area moments of inertia: definitions, transfer of axes	-
13	Composite areas, products of inertia, rotation of axes	-
14	Friction: mechanism of dry friction, friction angles, wedges	-
15	Virtual work: work of a force and a couple, virtual work, equilibrium	-
16	The principle of virtual work, potential energy, the stability of equilibrium	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Midterm (40%), Final (50%)

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SYLLABI ON WEB PAGES

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STRUCTURAL ANALYSIS I

BASIC INFORMATION

Course prefix, title and semester: Structural Analysis I
Number of credits: 3

COURSE PREREQUISITES:

Mechanics of Materials I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: -
Office location: Department of Civil Engineering and Transportation
Phone Number: +98 (31) 3793----
Email Address: -----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
3 h	-	-	-

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with basic concepts of structural analysis and to calculate forces in structures

REQUIRED STUDENT RESOURCES

Textbooks and References:

1. R. C. Hibbeler, "Structural Analysis", 9th Edition, Pearson India, New Delhi, 2019.
2. Y. Y. Hsieh, "Elementary Theory of Structures", 4th Edition, Pearson India, New Delhi, 1995.
3. C. H. Norris, J. B. Wilbur and S. Utku, "Elementary Structural Analysis", 3rd Edition, McGraw-Hill, Auckland, 1976.

Web links: -

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Structural systems: statically determinate and indeterminate structures	-
2	Structural systems: stability and instability of structures	-
3	Determination and drawing diagrams of internal forces for determinate structures (axial force, shear force, bending moment, torsional moment)	-
4	Methods of analysis of simple and complex trusses	-
5	Influence lines for determinate and indeterminate structures and their application	-
6	Influence lines for determinate and indeterminate structures and their application	-
7	Determination of deflections of structures by the area moment, elastic load and conjugate beam methods	-
8	Determination of deflections of structures by the area moment, elastic load and conjugate beam methods	-
9	Determination of deflections of structures by the area moment, elastic load and conjugate beam methods	-
10	Energy methods for determination of deflections in structures: real work, virtual work, unit load, Castigliano's first and second theorem, Maxwell and Betti's law, support settlement, temperature, member defect	-
11	Energy methods for determination of deflections in structures: real work, virtual work, unit load, Castigliano's first and second theorem, Maxwell and Betti's law, support settlement, temperature, member defect	-
12	Energy methods for determination of deflections in structures: real work, virtual work, unit load, Castigliano's first and second theorem, Maxwell and Betti's law, support settlement, temperature, member defect	-
13	Energy methods for determination of deflections in structures: real work, virtual work, unit load, Castigliano's first and second theorem, Maxwell and Betti's law, support settlement, temperature, member defect	-
14	Energy methods for determination of deflections in structures: real work, virtual work, unit load, Castigliano's first and second theorem, Maxwell and Betti's law, support settlement, temperature, member defect	-

15	Analysis of statically indeterminate structures: deformation method, superposition principle, support settlement, temperature, member defect	-
16	Analysis of statically indeterminate structures: deformation method, superposition principle, support settlement, temperature, member defect	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Project (0%), Midterm (45%), Final (45%)

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SYLLABI ON WEB PAGES

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SYSTEMS ENGINEERING

BASIC INFORMATION

Course prefix, title and semester: Systems Engineering
Number of credits: 2

COURSE PREREQUISITES:

Calculus II, Engineering Statistics and Probability

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge:-
Office location: Department of Civil Engineering and Transportation
Phone Number:+98 (31) 3793----
Email Address:-----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
2 h	-	-	1 h

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with the analytical methods for planning.
- ✓ become familiar with applying these techniques for engineering problem, especially civil engineering.

REQUIRED STUDENT RESOURCES

Textbooks and References:

1. A. Kossiakoff and W. N. Sweet, Systems Engineering Principles and Practice, 1st Edition, Wiley-Interscience, 2002.
2. B. S. Blanchard, System Engineering Management, 4th Edition, Wiley, 2008.
3. G. Hadley , Linear programming, Addison Wesley publishing company Inc, 1994.
4. J. Arora, Introduction to optimum Design, McGraw-Hill, 2004.
5. S. K. Sears, G. A. Sears and R. H. Clough, Construction Project Management: A Practical Guide to Field Construction Management, 5th Edition, Wiley, 2008.

Web links: -

Computer Software: Matlab, LINDO, LINGO, GAMS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Presenting the syllables and policy regarding class absence, Introduction to the basis of operation researches field	-
2	Investigating the impact operation researches field on the engineering sciences and techniques	-
3	Primary investigating the different models and methods of solving different problems in the field operation research	-
4	Representing the principles of mathematical models and modeling techniques for civil several engineering problems	-
5	Allocation problem, distribution and transportation problems, network problems, replacement and maintenance problems	-
6	Modeling of some civil engineering problems (Tabulating, design of prefabricate pieces, crane design, traffic light management)	-
7	Linear Programming (LP) method: principles of mathematical modeling, LP theory, mathematical formulation of LP	-
8	Linear Programming (LP) method: solving linear models by graphical and simplex method, Model sensitivity analysis	-
9	Linear Programming (LP) method: Big-M and II-phase methods, Dual model	-
10	Network models: Basis and importance of network models, Shortest path model	-
11	Network models: Maximum flow model, Minimum spanning tree model, Critical path method	-
12	Dynamic Programming (DP) method: basis of DP method and its theory, methodology of solving classical problem	-
13	Dynamic Programming (DP) method: Traveling salesman problem (TSP), product allocation and warehousing	-
14	Dynamic planning with probabilistic and known assumptions	-
15	Using mathematical programming and models for decision making process	-
16	Primary familiarized software such as LINGO, LINDO, GAMS	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Midterm (40%), Final (50%)

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STUDENTSWITH DISABILITIES ACT FOR STUDENTS WITH SPECIAL NEEDS STATEMENT

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SYLLABI ON WEB PAGES

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TECHNICAL AND STRUCTURAL DRAWING

BASIC INFORMATION

Course prefix, title and semester: Compulsory, Technical and Structural Drawing, Q1
Number of credits: 2

COURSE PREREQUISITES:

-

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Hossein Tajmir Riahi
Office location: Department of Civil and Transportation Engineering, University of Isfahan, Isfahan, Iran
Phone Number: +98 (31) 37935307
Email Address: tajmir@eng.ui.ac.ir

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
1 h	1 h	-	-

COURSE OBJECTIVES

Students are expected to:

- ✓ Learn basic concepts about structural drawing.
- ✓ Draw three principle views of objects.
- ✓ Draw perspective of objects by two views.

REQUIRED STUDENT RESOURCES

Textbooks and References:

1- American Society of Mechanical Engineering, "ASME Y14.5-2018: Dimensioning and Tolerancing", ANSI, 2018.
2- D. A. Madsen and D. P. Madsen, “Engineering Drawing and Design”, 6th Edition, Delmar Cengage Learning, 2016.
3- C. H. Jensen, J. D. Helsel and D. Short, “Engineering Drawing and Design”, 7th Edition, McGraw-Hill Higher Education, 2007.

Web links: -

Computer Software: AutoCAD

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	An introduction to the structural drawing and its applications	-
2	Projection of point, line, plane, and object on a plane	-
3	Introduction of three principle views of objects	-
4	The draw of three principle views of objects	-
5	The draw of the third view of objects by two principle views	-
6	The draw of the perspective of objects	-
7	Types of normal perspective such as Isometric, Dimetric, and trimetric	-
8	Types of oblique perspective such as cavalier and cabinet	-
9	Draw symmetric and asymmetric section of objects	-
10	Types of sections such as half section, local section, and radial section, Exceptions of section	-
11	The standard size of drawing papers, Identify various standards in structural, electrical and mechanical drawings	-
12	Usual structural drawings such as foundation, beam and column plan, structural details, sections and views	-
13	Steel and concrete structures drawings	-
14	An introduction to the AutoCAD software	-
15	Draw simple shapes by the AutoCAD software	-
16	Draw structural drawings by the AutoCAD software	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (25%), Project (25%), Final (50%)

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

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WATER AND WASTEWATER ENGINEERING

BASIC INFORMATION

Course prefix, title and semester: Water and wastewater Engineering
Number of credits: 3

COURSE PREREQUISITES:

Hydraulics, Engineering Hydrology

COURSE CO-REQUISITES:

Engineering Hydrology

TEACHERS:

Person in charge:-
Office location: Department of Civil Engineering and Transportation
Phone Number:+98 (31) 3793----
Email Address:-----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
3 h	-	-	1 h

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with the design of water distribution network and related software.
- ✓ become familiar with the design of wastewater network and related software.
- ✓ become familiar with the design of runoff collection network and related software.

REQUIRED STUDENT RESOURCES

Textbooks and References:

1. A. K. Sharma, Design of Water Supply Pipe Networks, Wiley-Interscience, 2008.
2. B. S.N. Raju, Water supply and wastewater engineering, New Dehli Publisher: Tata McGraw-Hill, 2000.
3. S.R. Qasim, Wastewater Treatment Plants: Planning, Design and Operation, second edition, Routledge Publisher, 2017.
4. B.E. Larock, R.W. Jeppson and G.Z. Watters, Hydraulics of pipeline systems- CRC Press, 1999.

Web links: -

Computer Software: EPANET, WaterCAD, SewrCAD, WaterGEMS, SewerGEMS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Presenting the syllables and policy regarding class absence, fundamental concepts and water distribution generalities	-
2	A review of fluid mechanics concepts and generalities (continuity, momentum and energy equations)	-
3	Design time period determination and population prediction at the end of design time period	-
4	Determining the average daily per capita per day water usage and consumption changes and defining the factors affecting them	-
5	Presenting different calculation methods for pressure flow and defining the water distribution network components (pipes, valves, reservoir and pumps)	-
6	Presenting the basics and general concepts regarding the design capacity of water system components, water supplies, transmission pipes, treatment plants, storage tanks and reservoir.	-
7	Defining he different types of water distribution networks and related equations, The Principles of designing and formulating branching and looped networks	-
8	Defining different methods for solving looped network formulations (simple iterative, linear theory, Newton-Raphson, Hardy Cross)	-
9	Fundamental concepts and wastewater network generalities, presenting different design process including study, design, operation and maintenance of wastewater networks.	-
10	Defining the different methods of sewer and runoff collection and their advantages and disadvantages	-
11	Hydrological and hydraulic bases of sewer and surface runoff and related equation	-
12	Calculation of urban wastewater, design time period, population, peak coefficients, design discharge	-
13	Calculating the amount of runoff discharge	-
14	Hydraulic Basics of wastewater network and related equations	-
15	Defining the wastewater network components including	-

	pipes, manholes, inlets, overflows spillway, wash basins.	
16	Primary familiarized design software such as EPANET, WaterCAD, SewrCAD, WaterGEMS, SewerGEMS	-

EVALUATION PROCEDURES AND GRADING CRITERIA

HWs (10%), Midterm (40%), Final (50%)

ATTENDANCE STATEMENT

The course instructor must clearly inform students on the first day of class and in writing in the syllabus of their (1) policy regarding class absence and (2) policy, if any, for making up missed assignments. If class attendance is a component of the course grade, the course instructor must clearly communicate this to the class in writing in the syllabus.

STUDENTSWITH DISABILITIES ACT FOR STUDENTS WITH SPECIAL NEEDS STATEMENT

The following statement must appear on all syllabi: "Any students with disabilities or other special needs, who need special accommodations in this course, are invited to share these concerns or requests with the instructor and contact the Disability Services Office as soon as possible."

APPROVED ACADEMIC HONESTY STATEMENT

The following statement must appear on all syllabi: "The academic community is operated on the basis of honesty, integrity, and fair play. It applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records.

SYLLABI ON WEB PAGES

Syllabi presented on web pages shall contain the date of last update.

WATER AND WASTEWATER ENGINEERING PROJECT

BASIC INFORMATION

Course prefix, title and semester: Water and wastewater engineering project
Number of credits: 1

COURSE PREREQUISITES:

Water and wastewater engineering

COURSE CO-REQUISITES:

Water and wastewater engineering

TEACHERS:

Person in charge:-
Office location: Department of Civil Engineering and Transportation
Phone Number:+98 (31) 3793----
Email Address:-----

WEEKLY HOURS

Theory	Problem Solving	Laboratory	Guided learning
2h	-	-	1 h

COURSE OBJECTIVES

Students are expected to:

- ✓ become familiar with the design of water distribution network and related software.
- ✓ become familiar with the design of wastewater network and related software.
- ✓ become familiar with the design of runoff collection network and related software.

REQUIRED STUDENT RESOURCES

Textbooks and References:

1. A. K. Sharma, Design of Water Supply Pipe Networks, Wiley-Interscience, 2008.
2. B. S.N. Raju, Water supply and wastewater engineering, New Dehli Publisher: Tata McGraw-Hill, 2000.
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Web links: -

Computer Software: EPANET, WaterCAD, SewrCAD, WaterGEMS, SewerGEMS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week 16	Topic	Reading /Assignment
1	Presenting the syllables and policy regarding class absence, defining the group member	-
2	Defining the project by defining the design area and gathering the necessary information (water distribution network)	-
3	Representing the basics and general concepts to design water distribution network, defining problem design constraints and limitations (such as velocity and pressure)	-
4	Become familiar with EPANET software and modeling the real problem	-
5	Become familiar with EPANET software and modeling the real problem	-
6	Become familiar with WaterCAD software and modeling the real problem	-
7	Become familiar with WaterCAD software and modeling the real problem	-
8	Become familiar with WaterGEMS software and modeling the real problem	-
9	Become familiar with WaterGEMS software and modeling the real problem	-
10	Defining the project by defining the design area and gathering the necessary information (wastewater network)	-
11	Representing the basics and general concepts to design water distribution network, defining problem design constraints and limitations (such as velocity, slopes, and cover depths)	-
12	Become familiar with WaterCAD software and modeling the real problem	-
13	Become familiar with WaterCAD software and modeling the real problem	-
14	Become familiar with WaterGEMS software and modeling the real problem	-
15	Become familiar with WaterGEMS software and modeling the real problem	-
16	The process of providing a complete report for project	-

EVALUATION PROCEDURES AND GRADING CRITERIA

Water network project (50%), Sewer network project (50%)

ATTENDANCE STATEMENT

The course instructor must clearly inform students on the first day of class and in writing in the syllabus of their (1) policy regarding class absence and (2) policy, if any, for making up missed assignments. If class attendance is a component of the course grade, the course instructor must clearly communicate this to the class in writing in the syllabus.

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