University of Isfahan

Course outline
Civil Engineering Undergraduate Program

Department of Civil Engineering
Faculty of Civil Engineering and Transportation
University of Isfahan

November 2024

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	
CN:2822076	Islamic Thought 1	2	2	-	-	-
CN:2822075	Islamic Thought 2	2	2	-	-	**2822076**
CN:2822072	Islamic Ethics	2	2	-	-	
CN:2822074	Islamic Revolution	2	2	-	-	
CN:2822066	Islamic History	2	2	-	-	
CN:2822077	Quran Studies	2	2	-	-	
CN:2822022	Human Right in Islam	2	2	-	-	
CN:1212317	General Literature	3	3	-	-	
CN:1716524	General Foreign Language	3	3	-		
CN:1312844	Physical Education 1	1	-	2	-	-
CN:1312753	Physical Education 2	1	-	2	-	**1312844**
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	
CN:4014143	Calculus 1	3	3	-	1	-
CN:4014142	Calculus 2	3	3	-	1	**4014143**
CN:4016069	Differential Equations	3	3	-	1	**4014142 (P/C)**
CN:4212465	Physics 1 (Mechanics and Heat)	3	3	-	1	**4014143 (P/C)**
CN:3016247	Computer Programming	3	3	-	-	**4014143**
CN:3016127	Numerical Methods	2	2	-	-	**4016069 3016247 (P/C)**
CN:4212555	Physics Lab 1	1	-	3	-	**4212465 (P/C)**
CN:4012354	Statistics and Probability for Engineering	2	2	-	1	**4014143**
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	
CN:3016085	Strength of Materials I	4	4			
CN:3016129	Structural Analysis I	3	3			
CN:3016086	Structural Analysis II	2	2			
CN:3016272	Principles of Earthquake Engineering	2	2			
CN:3016132	Design of Concrete Structures I	3	3			
CN:3016133	Design of Concrete Structures II	3	3			
CN:3016134	Design of Concrete Structures Project	1		1		
CN:3016135	Design of Steel Structures I	3	3			
CN:3016136	Design of Steel Structures II	3	3			
CN:3016137	Design of Steel Structures Project	1		1		
CN:3016138	Construction Materials and Concrete Technology	3	3			
CN:3016139	Construction Materials and Concrete Technology Laboratory	1		1		
CN:3016140	Architectural Design	2	1	1		
CN:3016141	Soil Mechanics	3	3			
CN:3016142	Soil Mechanics Laboratory	1		1		
CN:3016143	Foundation Engineering	3	3			
CN:3016145	Water and Wastewater Engineering	3	3			
CN:3016146	Water and Wastewater Engineering Project	1		1		
CN:3016147	Transportation Engineering	2	2			
CN:3016275	Loading of Structures	2	2			
CN:3016276	Technical Training	2		2		
CN:3016151	Environmental	2	2			

Course No.	Course Title	Credits	Hours per week			Prerequisites/ Co-requisites
			Theoretical	Practical	Guided learning	
	Engineering					
CN:3016170	Hydraulics	2	2			
CN:3016171	Hydraulics Laboratory	1		1		
CN:3016172	Engineering Hydrology	2	2			
CN:3016173	Building Construction Methods	2	2			
CN:3016174	Road Construction	2	2			
CN:3016175	Road Construction Project	1		1		
CN:3016176	Pavement Design	2	2			
CN:3016274	Construction Projects Cost Estimation	2	2			
CN:3016240	Fluid Mechanics	3	3			
CN:3016241	Statics	3	3			
CN:3016242	Dynamics	3	3			
CN:3016273	Engineering Geology	2	1.5	0.5		
CN:3016245	Technical and Structural Drawing	2	1	1		
CN:3016246	Surveying and Operation	2	1	1		
CN:3016483	Fundamentals of Construction Management	3	3			
Total		82	69.5	12.5		

ARCHITECTURAL DESIGN

BASIC INFORMATION

Place in Curriculum and semester: Core, S1
Number of credits: 2

COURSE PREREQUISITES:

Technical and Structural Drawing

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr Hossein Tajmir Riahi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935307
Homepage: https://eng.ui.ac.ir/~h.tajmirriahi
Email Address: tajmir@eng.ui.ac.ir

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:

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

Web links:

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Computer Software:

AutoCAD

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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
4-5	An overview of the relationships and architectural spaces of buildings such as housing, training centers, libraries, industrial buildings, health centers
6-8	Introduction to architectural standards and how to use them in architectural designs
9-16	Architectural design of a building including plans, views, sections, collection plans and details

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	0% of final grade
Project	70% of final grade
Mid-Term Exam	0% of final grade
Final Exam	30% of final grade
	100%

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

Last update: September 2024

BUILDING CONSTRUCTION METHODS

BASIC INFORMATION

Place in Curriculum and semester: Core, S7 or S8
Number of credits: 2

COURSE PREREQUISITES:

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COURSE CO-REQUISITES:

Design of Steel Structures II, Design of Concrete Structures II

TEACHERS:

Person in charge: Dr. Mehran Zeynalian
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935270
Email Address: m.zeynalian@eng.ui.ac.ir
Others: m.zeynalian@eng.ui.ac.ir

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:

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

Web links:

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Computer Software:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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,

Week	Topic
	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

Assignments	20% of final grade
Project	20% of final grade
Mid-Term Exam	30% of final grade
Final Exam	30% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

COMPUTER APPLICATIONS IN CIVIL ENGINEERING

BASIC INFORMATION

Place in Curriculum and semester: Elective, S5
Number of credits: 2

COURSE PREREQUISITES:

1. Numerical Methods
2. Structural Analysis II

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Mehrdad Hejazi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935308
Homepage: http://eng.ui.ac.ir/~m.hejazi
Email Address: m.hezaji@eng.ui.ac.ir

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:

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

Web links:

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Computer Software:

SAP2000, ETABS, SAFE

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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

Week	Topic
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
12-14	- Design of concrete structures
15-16	- Design of steel structures

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	10% of final grade
Project	60% of final grade
Mid-Term Exam	0% of final grade
Final Exam	30% of final grade
	100%

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Last update: September 2024

CONCRETE STRUCTURES PROJECT

BASIC INFORMATION

Place in Curriculum and semester: Core, S7 OR S8
Number of credits: 1

COURSE PREREQUISITES:

Design of concrete Structures II
Loading of Structures

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. M. Zandi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 3793 5305
Homepage: http://eng.ui.ac.ir/~m.zandi
Email Address: s.m.zandi@eng.ui.ac.ir

WEEKLY HOURS

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

COURSE OBJECTIVES

Students are expected to:
In this course, students will be introduced to the application of the principles of concrete structures in the design of structures and will design a concrete building in practice as a group work.

REQUIRED STUDENT RESOURCES

Textbooks and References:

- J. C. McCormac and R. Brown, “Design of Reinforced Concrete”, 10th Edition, Wiley, 2015.
- A. Nilson, D. Darwin and C. Dolan, “Design of Concrete Structures”, 15th Edition, McGraw-Hill Science/Engineering/Math, 2015.
- C. Meyer, “Design of Concrete Structures”, 1st Edition, Prentice Hall, 1995.
- ACI Committee 318. Building Code Requirements for Structural Concrete: (ACI 318-19); and Commentary (ACI 318R-19). Farmington Hills, MI: American Concrete Institute, 2019.
- Iranian National Code, No. 9, 2020.
- American Society of Civil Engineers, “Minimum Design Loads for Buildings and Other Structures: SEI/ASCE 7-16”, 1st Edition, ASCE, 2016.

Web links:

-

Computer Software:

Etabs, Safe, Sap, AutoCAD

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic	Reading /Assignment
1-2	Familiarity with different types of vertical and lateral resistant systems and how to select them in a design	-
3	Special issues of loading concrete structures	HW 1
4-5	How to distribute the load between the resistant components	HW 2

Week	Topic	Reading /Assignment
6-7	How to present the design results and prepare executive plans	HW 3
8-16	Complete design of the concrete structure of a multi-story building: Determining the resistant system on the architectural plan, selecting the lateral resistant system, loading, initial analysis, initial design, detailed analysis, final design, preparation of executive plans, preparation of final calculation book	HW 4 to 10

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	50% of final grade
Project	0% of final grade
Mid-Term Exam	0% of final grade
Final Exam	50% of final grade
	100%

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Last update: September 2024

CONSTRUCTION MATERIALS AND CONCRETE TECHNOLOGY

BASIC INFORMATION

Place in Curriculum and semester: Core, S3
Number of credits: 3

COURSE PREREQUISITES:

Engineering Geology

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr Hossein Tajmir Riahi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935307
Homepage: https://eng.ui.ac.ir/~h.tajmirriahi
Email Address: tajmir@eng.ui.ac.ir

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:

- N. Jackson and R. K. Dhir, “Civil Engineering Materials”, Macmillan Education, 1988.
- J. M. Illuston, “Construction Materials”, E&FN Spon, 1994.
- A. R. Lyons, “Materials for Architects and Builders: An Introduction”, Arnold, London, 1997.
- R. C. Smith and C. K. Andres, “Materials of Construction”, McGraw-Hill, 1989.
- 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	Topic
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

Week	Topic
	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

Assignments	0% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	60% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

CONSTRUCTION MATERIALS AND CONCRETE TECHNOLOGY LABORATORY

BASIC INFORMATION

Place in Curriculum and semester: Core, S5
Number of credits: 1

COURSE PREREQUISITES:

Construction Materials and Concrete Technology

COURSE CO-REQUISITES:

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TEACHERS:

The person in charge: Dr. Mahmoud Hashemi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935086
Homepage: http://eng.ui.ac.ir/~m.hashemi
Email Address: m.hashemi@eng.ui.ac.ir

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:

- ASTM, “Annual Book of ASTM Standards, Vol 04.01 Cement; Lime; Gypsum”, American Society for Testing & Materials, 2004.
- ASTM, “Annual Book of ASTM Standards, Vol 04.02 Concrete and Aggregates”, American Society for Testing & Materials, 2004.
- 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.
- N. Jackson and R. K. Dhir, “Civil Engineering Materials”, Macmillan Education, 1988.
- 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	Topic
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

Week	Topic
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

EVALUATION PROCEDURES AND GRADING CRITERIA

Technical Lab Reports	50% of final grade
Practical Exam	25% of final grade
Mid-Term Exam	0% of final grade
Final Exam	25% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

DESIGN OF CONCRETE STRUCTURES I

BASIC INFORMATION

Place in Curriculum and semester: Core, S4
Number of credits: 3

COURSE PREREQUISITES:

Building materials and concrete technology,
structural analysis 1

COURSE CO-REQUISITES:

structural analysis 1

TEACHERS:

Person in charge: Dr. Maryam Daei
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935310
Homepage: http://eng.ui.ac.ir/~m.daei
Email Address: m.daei@eng.ui.ac.ir

WEEKLY HOURS

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

COURSE OBJECTIVES

Students are expected to:

- ✓ Be familiar with concrete constructional systems and technology
- ✓ Design of concrete structures

REQUIRED STUDENT RESOURCES

Textbooks and References:

- J. C. McCormac and R. Brown, “Design of Reinforced Concrete”, 8th Edition, Wiley, 2008.
- A. Nilson, D. Darwin and C. Dolan, “Design of Concrete Structures”, 14th Edition, McGraw-Hill

Web links:

-

Computer Software:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
1	Mechanical properties of concrete under immediate and long-term loads
2	Compressive strength, tensile, shear strength of concrete
3	Strength of concrete under multilateral stresses
4	Deformation of concrete (elastic, shrinkage, depression)
5	Types of steel used in reinforced concrete, mechanical properties of steel
6	Reinforced concrete components design methods
7	Safety concepts and limit states, loading compositions and analysis methods
8	Behavior of reinforced concrete beams under bending in different loading stages
9	Bending capacity of beam
10	Axial capacity of columns, buckling

Week	Topic
11	Calculation of components under axial tension
12	Capacity of components against combination of bending and axial force
13	Uniaxial and biaxial bending
14	Behavior of reinforced concrete beams under shear forces
15	Investigating the behavior of reinforced concrete components under torsion
16	Effect of concurrent shear and torsion or bending and torsion

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	20% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	40% of final grade
	100%

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

Last update: September 2024

DESIGN OF CONCRETE STRUCTURES II

BASIC INFORMATION

Place in Curriculum and semester: Core, S5
Number of credits: 3

COURSE PREREQUISITES:

Design of Concrete Structures I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Maryam Daei
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935310
Homepage: http://eng.ui.ac.ir/~m.daei
Email Address: m.daei@eng.ui.ac.ir

WEEKLY HOURS

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

COURSE OBJECTIVES

Students are expected to:

- ✓ Be familiar with concrete constructional systems and technology
- ✓ Design of concrete structures – Continue

REQUIRED STUDENT RESOURCES

Textbooks and References:

- J. C. McCormac and R. Brown, "Design of Reinforced Concrete", 8th Edition, Wiley, 2008.
- Nilson, D. Darwin and C. Dolan, "Design of Concrete Structures", 14th Edition, McGraw-Hill

Web links:

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Computer Software:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
1-2	Theory of adhesion of concrete and steel, anchoring of steel in concrete
3-4	Operation criteria and related limitations
5-6	Cracking due to bending, calculating the crack width and the method of limiting it
7-8	Determining the drift, its rules and limitations
9	Investigation of types of durable systems, reinforced concrete frames and shear walls
10	Investigation of types of load distribution methods
11-12	Investigation of types of methods of approximate analysis of single beams and frames
13-14	Familiarity with different floor system: T-beams, one-sided and two-sided slabs, and slabs without beams
15-16	Calculating reinforced concrete foundations and shear walls

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	20% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	40% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

DESIGN OF STEEL STRUCTURES I

BASIC INFORMATION

Place in Curriculum and semester: Core, S5
Number of credits: 3

COURSE PREREQUISITES:

-

COURSE CO-REQUISITES:

Structural Analysis I

TEACHERS:

The person in charge: Dr. Abadolreza Ataie
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935291
Homepage: http://eng.ui.ac.ir/`a.ataei
Email Address: a.ataei@eng.ui.ac.ir

WEEKLY HOURS

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

COURSE OBJECTIVES

Students are expected to:

- ✓ The purpose of this course is to familiarize students with the principles of steel structure design codes.

REQUIRED STUDENT RESOURCES

Textbooks and References:

- S. G. Salmon and J. E. Johnson, "Steel Structures: Design and Behavior", 5th Edition, Prentice-Hall, New York, 2008.
- E. H. Gaylord and C. N. Gaylord, "Design of Steel Structures", 3rd Edition, McGraw-Hill, New York, 1992.
- American Institute of Steel Construction (AISC) "Specification for Structural Steel Buildings (AISC 2005)", Illinois, 2005.
- M. Azhari, H. Amoushahi and R. Mirghaderi, "Design of Steel Structures 5", 16th Edition, Arkan Danesh, 2019.
- Iranian National Code, No. 10, 2014.

Web links:

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Computer Software:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic	Reading /Assignment
1	Structural sections and mechanical properties of steel	-
2	Principle of design of steel structures	-
3	Design of members for tension	-
4	Design of members for tension	HW 1
5-6	Design of members for compression	-
7	Design of members for compression	HW 2
8-11	Design of members for flexure	-

Week	Topic	Reading /Assignment
12	Design of members for shear	-
13	Design for serviceability	HW 3
14	Flanges and webs with concentrated forces	-
15	Design of members for combined coaxial force and flexure	-
16	Design of members for combined coaxial force and flexure	HW 4

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	50% of final grade
	100%

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

Last update: September 2024

DESIGN OF STEEL STRUCTURES II

BASIC INFORMATION

Place in Curriculum and semester: Core, S5
Number of credits: 3

COURSE PREREQUISITES:

Design of Steel Structures II

COURSE CO-REQUISITES:

-

TEACHERS:

The person in charge: Dr. Abadalreza Ataie
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935291
Homepage: http://eng.ui.ac.ir/`a.ataei
Email Address: a.ataei@eng.ui.ac.ir

WEEKLY HOURS

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

COURSE OBJECTIVES

Students are expected to:

- ✓ The purpose of this course is to familiarize students with the principles of steel structure design codes and the connections.

REQUIRED STUDENT RESOURCES

Textbooks and References:

- S. G. Salmon and J. E. Johnson, "Steel Structures: Design and Behavior", 5th Edition, Prentice-Hall, New York, 2008.
- E. H. Gaylord and C. N. Gaylord, "Design of Steel Structures", 3rd Edition, McGraw-Hill, New York, 1992.
- American Institute of Steel Construction (AISC) "Specification for Structural Steel Buildings (AISC 2005)", Illinois, 2005.
- M. Azhari, H. Amoushahi and R. Mirghaderi, "Design of Steel Structures 5", 16th Edition, Arkan Danesh, 2019.
- M. Azhari, H. Amoushahi and R. Mirghaderi, "Design of Steel Structures 6", 5th Edition, Arkan Danesh, 2019.
- Iranian National Code, No. 10, 2014.

Web links:

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Computer Software:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic	Reading /Assignment
1-3	Design of bolted connections	-
4	Design of welded connections	-
5	Design of welded connections	HW 1
6	Design of bracing connections	-
7-8	Design of simple shear connections	-

Week	Topic	Reading /Assignment
9	Design of fully restrained moment connections	-
10	Design of fully restrained moment connections	-
11	Design of fully restrained moment connections	HW 2
12	Design of base plates	-
13-14	Design of plate girders	-
15	Design of composite beams	-
16	Design of composite beams	HW 3

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	50% of final grade
	100%

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

Last update: September 2024

DYNAMICS

BASIC INFORMATION

Place in Curriculum and semester: Core, S3
Number of credits: 3

COURSE PREREQUISITES:

Statics

COURSE CO-REQUISITES:

-

TEACHERS:

The person in charge: Dr. Mohamad Ali Rahgozar
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935286
Homepage: http://eng.ui.ac.ir/~m.rahgozar
Email Address: m.rahgozar@eng.ui.ac.ir

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:

- R. C. Hibbeler, "Engineering Mechanics: Dynamics and Student Study Pack with FBD Package", 11th Edition, Prentice Hall, 2006.
- J. L. Meriam and L. G. Kraige, "Engineering Mechanics: Dynamics", 6th Edition, Wiley, 2006.
- 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:

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Computer Software:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic	Reading /Assignment
1	Introduction to dynamics, basic concepts, Newton's laws, units, gravitation, dimensions and dimensional analysis: an introduction	HW1
2	Kinematics of particles: rectilinear motion, plane rectilinear motion	-
3	Rectangular coordinates, normal and tangential coordinates	

Week	Topic	Reading /Assignment
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

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	50% of final grade
	100%

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

Last update: September 2024

ENGINEERING GEOLOGY

BASIC INFORMATION

Place in Curriculum and semester: Core, S2
Number of credits: 2

COURSE PREREQUISITES:

-

COURSE CO-REQUISITES:

-

TEACHERS:

The person in charge: Dr. Mahmoud Hashemi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935086
Homepage: http://eng.ui.ac.ir/~m.hashemi
Email Address: m.hashemi@eng.ui.ac.ir
Other instructors: Dr. Mojtaba Heidari (TA)

WEEKLY HOURS

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

COURSE OBJECTIVES

The course is aimed to make student familiar with the scientific principles of geology and effects of geological environment on engineering structures and development projects.

Students are expected to learn:

- ✓ Status of geology in civil engineering and reasons behind ignoring geology and site investigations
- ✓ Geological processes (igneous, metamorphic, structural geology and plate tectonics), description of creation of the earth and its components, theory for formation of continents, plate tectonics theory
- ✓ Geological materials (minerals and rocks)
- ✓ Geological structures (stratification/foliation, folds, faults, joints, dyke, sill)
- ✓ Rock weathering
- ✓ Surface running water (river, fluvial and alluvial deposits, landforms' patterns, meanders)
- ✓ Embankement/Slope instability (slide, fall, flow)
- ✓ Earthquake (its formation, scattering, magnitude, intensity)
- ✓ Practical activities including few laboratory study sessions to identify most important minerals and rocks in by-hand-collected samples, introducing geological and topographic maps, areal photos and satellite images, and determination of UTM/latitude/longitude locations by GPS receiver handset

REQUIRED STUDENT RESOURCES

Required devices:
For field study, mobile GPS should be activated. The softwares CLINOMETER, FIELDMOVE CLINO,GOOGLE EARTH, GOOGLE MAP (Android/Iphone version) should be installed on mobile devices.

Textbooks:

- R.E. Hunt, "Geotechnical Investigation Methods: A Field Guide for Geotechnical Engineers", 1st Edition, CRC Press, 2006.

References:

- F. G. Bell, "Engineering Geology", 2nd Edition, Butterworth-Heinemann, 2007.
- D. G. Price , M.H. de Freitas "Engineering Geology: Principals and Practice", 1st Edition, Springer, 2008.
- T. Waltham, "Foundations of Engineering Geology", 3rd Edition, Taylor & Francis, 2009.

Web links for Required Computer Softwares:

FieldMove Clino:
https://play.google.com/store/apps/details?id=com.mve.fieldmove.clino&hl=fa&gl=US
CLINOMETER:
https://play.google.com/store/apps/details?id=com.plaincode.clinometer&hl=fa&gl=US
GOOGLE EARTH:
https://play.google.com/store/apps/details?id=com.google.earth&hl=fa&gl=US
COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
1	Status of geology in civil engineering
2	description of creation of the earth and its components, theory for formation of continents, plate tectonics theory
3	Geological materials (minerals and rocks)
4	Geological studies-part 1: laboratory works including working with optically polarized microscope and studying features of minerals from thin section samples of various rocks and minerals and taking digital images
5	Geological processes (igneous rocks)
6	Geological processes (sedimentary rocks)
7	Geological processes (metamorphic rocks)
8	Geological studies-part 2: office works including introducing geological and topographic maps, areal photos and satellite images
9	Geological structures: basic concepts (stratification/foliation, folds, joints)
10	Geological studies-part 3: office works including measuring dip/strike/dip direction for discontinuities determination of UTM/latitude/longitude locations by GPS receiver/mobile phone handset-training about preparation of geological report (contents and structure)
11	Geological structures: applied concepts (faults)
12	Earthquake (its formation, scattering, magnitude, intensity)
13	Geological studies-part 4: surface field visit works including various geological features such as types of rocks, types of faults, studying outcrops, measuring dip/strike/dip direction for discontinuities determination of UTM/latitude/longitude locations by GPS receiver/mobile phone handset. The work done should be prepared as a concise illustrated geological reconnaissance report
14	Rock weathering-Surface running water (river, fluvial and alluvial deposits, landforms' patterns, meanders)
15	Geological studies-part 5: field visit works for subsurface exploration studies including various geological features such as drilling rig, core boxes, borehole logs, insitu tests. The work done should be prepared as a concise illustrated geological exploration report
16	Embankement/Slope instability (slide, fall, flow) & subsidence

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments & reports (attendance required in laboratory and field visits)	50% of final grade
Project	0% of final grade
Mid-Term Exam	20% of final grade
Final Exam	30% of final grade
	100%

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

Last update: September 2024

ENGINEERING HYDROLOGY

BASIC INFORMATION

Place in Curriculum and semester: Core, S4
Number of credits: 2

COURSE PREREQUISITES:

Fluid Mechanics, Statistics and Probabilities

COURSE CO-REQUISITES:

Fluid Mechanics

TEACHERS:

Person in charge: Dr. Mohammadali Alijanian
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 3793 5317
Homepage: http://eng.ui.ac.ir/`m.alijanian
Email Address: m.alijanian@eng.ui.ac.ir

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:

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

Web links:

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Computer Software:

ABAQUS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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

Week	Topic
12	Flood routing
13	Groundwater Hydrology
14	Hydrograph
15	Unique Hydrograph
16	Utilizing statistics in hydrology

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	10% of final grade
Project	10% of final grade
Mid-Term Exam	30% of final grade
Final Exam	50% of final grade
	100%

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

Last update: September 2024

ENGINEERING PRINCIPLES OF WATER AND WASTEWATER TREATMENT

BASIC INFORMATION

Place in Curriculum and semester: Elective, S6
Number of credits: 3

COURSE PREREQUISITES:

-

COURSE CO-REQUISITES:

-

TEACHERS:

The person in charge: Dr. Ali Dehnavi
Course language: currently in Persian
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37934226
Homepage: http://eng.ui.ac.ir/~a.dehnavi
Email Address: a.dehnavi@eng.ui.ac.ir

WEEKLY HOURS

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

COURSE OBJECTIVES

Students are expected to:

- ✓ Understand the need for water and wastewater treatment
- ✓ Awareness of the water and wastewater quality indices and indexes.
- ✓ Learning the principles and design criteria of water treatment processes.
- ✓ Learning the principles and design criteria of wastewater treatment processes.

REQUIRED STUDENT RESOURCES

Textbooks and references:

In English:

- John C. Crittenden & et.al., "MWH's Water Treatment Principles and Design", Third Edition, John Wiley & Sons, Inc., 2012.
- N. P. Cheremisinoff, "Handbook of Water and Wastewater Treatment Technologies", 1st Edition, Butterworth-Heinemann, 2001.
- G. Tchobanoglous & etal. Burton, Franklin Louis, H. David Stensel, and George Tchobanoglous, eds. "Wastewater engineering: treatment and Resource recovery". McGraw-Hill, Metcalf & Eddy, 2007.

In Persian:

- Mahmoud paikari & Arjomand Mehrabani, "Water treatment fundamental", Sixth edition, Arkan Danesh, 2018.
- Mohammad Calkesh Amiri, "Water treatment principles", Thirteenth edition, Arkan Danesh, 2019.

Web links:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
1	Introduction to the lesson, its general presentation and need for water and wastewater treatment
2	Water and wastewater indices and indexes
3	Continue of water and wastewater indices and indexes
4	Water treatment processes: generals of water treatment, suspended solids removal methods , sedimentation type
5	Continue of water treatment processes: sedimentation type continue, sedimentation design criteria
6	Continue of water treatment processes: flocculation and coagulation processes principles
7	Continue of water treatment processes: flocculation and coagulation processes design criteria
8	Continue of water treatment processes: hardness and hardness removal by chemical precipitation and membrane methods
9	
10	Continue of water treatment processes: water filtration processes and design criteria
11	Continue of water treatment processes: water disinfection and aeration for pollution removal from water
12	Wastewater treatment: introduction to wastewater treatment, especially biological wastewater treatment
13	Wastewater treatment: Preliminary and primary treatment: screening, grit removal and primary sedimentation.
14	Wastewater treatment: secondary treatment, introduction to activated sludge, lagoon treatment and secondary sedimentation
15	
16	Wastewater treatment: disinfection, , introduction to advanced treatment and reuse

EVALUATION PROCEDURES AND GRADING CRITERIA

Total Semester exercises	10% of final grade
First Exam (until week 11)	60% of final grade
Final Exam (from week 11 to 16)	30% of final grade
Total Points	100 %

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

Last update: September 2024

ENVIRONMENTAL ENGINEERING

BASIC INFORMATION

Place in Curriculum and semester: Core, S4
Number of credits: 2

COURSE PREREQUISITES:

-

COURSE CO-REQUISITES:

-

TEACHERS:

The person in charge: Dr. Shervin Jamshidi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37932426
Homepage: https://engold.ui.ac.ir/~sh.jamshidi
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 principles and theories of environmental engineering
- ✓ become familiar with the environmental challenges in civil engineering

REQUIRED STUDENT RESOURCES

Textbooks and References:

- Masten S.J. and Davis M.L., Principles of Environmental Engineering and Science, 4th Edition, McGraw Hill, 2020.
- Kutz M., Handbook of Environmental Engineering, Wiley, 2018.
- Salvato J.A., Nemerow N.L. and Agardy F.J., Environmental Engineering, 5th Edition, Wiley, 2003.
- Metcalf and Eddy, Wastewater Engineering: Treatment and Resource Recovery, 5th Edition, McGraw Hill, 2014.
- Chapra S.C., Surface Water Quality Modeling, Waveland Press, 2008.

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
1	Definitions and terminology
2	An introduction to environmental challenges and conservation
3	An introduction to ecosystem services and natural cycles
4	An introduction to sustainable development
5	System thinking in environmental management
6	Pollution (types and standards)
7	Principles of air pollution
8	Air pollution transport (Gaussian model)
9	Air pollution treatment and control

Week	Topic
10	Principles of water pollution (Surface and groundwater)
11	Water pollution transport (Mass balance)
12	An introduction to water and wastewater engineering
13	Principles of wastewater treatment and management practices
14	Principles of municipal solid waste management and reuse
15	Approaches in environmental engineering and pollution control
16	Project presentations

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignment "A"	5% of final grade
Assignment "B"	5% of final grade
Assignment "C"	10% of final grade
Assignment "D"	5% of final grade
Comprehensive Assignment	25% of final grade
Final Exam	50% of final grade
Total Points	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

FLUID MECHANICS

BASIC INFORMATION

Place in Curriculum and semester: Core, S3
Number of credits: 3

COURSE PREREQUISITES:

Dynamics

COURSE CO-REQUISITES:

Dynamics

TEACHERS:

The person in charge: Dr. Ahmad Shanehsazzadeh
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935328
Homepage: http://eng.ui.ac.ir/~a.shanehsazzadeh
Email Address: a.shanehsazzadeh@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 physical properties of fluids and consider the governing equations of static and moving fluids.

REQUIRED STUDENT RESOURCES

Textbooks and References:

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

Web links:

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Computer Software:

ABAQUS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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

Week	Topic
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

Assignments	10% of final grade
Project	10% of final grade
Mid-Term Exam	30% of final grade
Final Exam	50% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

FOUNDATION ENGINEERING

BASIC INFORMATION

Place in Curriculum and semester: Core, S6
Number of credits: 3

COURSE PREREQUISITES:

Soil Mechanics, Concrete Structure I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Maysam Mashayekhi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935295
Homepage: http://eng.ui.ac.ir/~m.mashayekhi
Email Address: m.mashyekhi@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 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:

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

Web links:

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Computer Software:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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

Week	Topic
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

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	50% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

OPEN CHANNEL HYDRAULICS

BASIC INFORMATION

Place in Curriculum and semester: Core, S5
Number of credits: 2

COURSE PREREQUISITES:

Fluid Mechanics

COURSE CO-REQUISITES:

-

TEACHERS:

The person in charge: Dr. Ahmad Shanehsazzadeh
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935328
Homepage: http://eng.ui.ac.ir/~a.shanehsazzadeh
Email Address: a.shanehsazzadeh@eng.ui.ac.ir

WEEKLY HOURS

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

COURSE OBJECTIVES

Flow in open channel is part of fluid mechanics and the knowledge is applied in many civil engineering practices including design of hydraulic structures, river engineering, roads coastal and ocean engineering,
By the end of the course students are expected to:

- ✓ Understand the definition, physics and behavior of flow in open channels
- ✓ Apply the fluid mechanics basic laws in the open channels
- ✓ Solve the problems of steady flows in open channels
- ✓ Design open channel geometry for the given flow and slope
- ✓ Calculate the water surface profile of gradually varied flow

REQUIRED STUDENT RESOURCES

Textbooks and References:

- Open Channel Flow, Henderson.
- Open Channel Hydraulics, Ven Te Chow.

Web links:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
1	Introduction and concepts
2	Open channel flow classification, definitions
3	Reviewing the fluid mechanics principles
4	Bernoulli's and momentum correction factors
5	Equation of continuity in open channels
6	Bernoulli's equation in rectangular open channels
7	Specific energy
8	Critical flow and control sections

Week	Topic
9	Bernoulli's equation in non-rectangular open channels
10	Momentum equation in rectangular open channels
11	Momentum equation in non-rectangular open channels
12	Uniform flow - concept
13	Uniform flow- Chezy and Manning equation
14	The best hydraulic section
15	Gradually varied flow equation and profiles
16	Gradually varied flow computation

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	30% of final grade
Final Exam	60% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

INDUSTRIAL WASTEWATER TREATMENT

BASIC INFORMATION

Place in Curriculum and semester: Core, S6
Number of credits: 2

COURSE PREREQUISITES:

Environmental Engineering
Hydraulics

COURSE CO-REQUISITES:

-

TEACHERS:

The person in charge: Dr. Shervin Jamshidi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37932426
Homepage: https://engold.ui.ac.ir/~sh.jamshidi
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:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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

Week	Topic
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

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	50% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

STRUCTURAL LOAD DETERMINATION

BASIC INFORMATION

Place in Curriculum and semester: Core, S5
Number of credits: 1

COURSE PREREQUISITES:

Structural Analysis I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Hossien Amoushahi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 3793 5285
Homepage: http://eng.ui.ac.ir/~h.amoushahi
Email Address: h.amoushahi@eng.ui.ac.ir

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:

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

Web links:

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Computer Software:

ABAQUS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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

Week	Topic
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

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	30% of final grade
Final Exam	60% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

MECHANICS OF MATERIALS I

BASIC INFORMATION

Place in Curriculum and semester: Core, S4
Number of credits: 4

COURSE PREREQUISITES:

Statics

COURSE CO-REQUISITES:

-

TEACHERS:

The person in charge: Dr. Mohamad Ali Rahgozar
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935286
Homepage: http://eng.ui.ac.ir/~m.rahgozar
Email Address: m.rahgozar@eng.ui.ac.ir

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:

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

Web links:

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Computer Software:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	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

Week	Topic	Reading /Assignment
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

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	50% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

MECHANICS OF MATERIALS II

BASIC INFORMATION

Place in Curriculum and semester: Core, S5
Number of credits: 2

COURSE PREREQUISITES:

Mechanics of materials I

COURSE CO-REQUISITES:

-

TEACHERS:

The person in charge: Dr. Mohamad Ali Rahgozar
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935286
Homepage: http://eng.ui.ac.ir/~m.rahgozar
Email Address: m.rahgozar@eng.ui.ac.ir

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:

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

Web links:

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Computer Software:

Abaqus

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	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	-

Week	Topic	Reading /Assignment
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	-
6	Analysis of curved beams: stresses and deformation	HW2
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	HW7
15	Density of elastic energy, elastic energy of deformed beam	-
16	Energy-based methods for structural analysis, virtual work method	HW8

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	50% of final grade
	100%

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

Last update: September 2024

MECHANICS OF MATERIALS LABORATORY

BASIC INFORMATION

Place in Curriculum and semester: Core, S5
Number of credits: 2

COURSE PREREQUISITES:

Mechanics of Materials I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Mohammad Heidari-Rarani
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, 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:

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

Web links:

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Computer Software:

Excel, Matlab

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
1	An overview of the list of tests in the laboratory and dividing students to the groups

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	25% of final grade
Project	25% of final grade
Mid-Term Exam	0% of final grade
Final Exam	50% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

STRUCTURAL OPTIMIZATION

BASIC INFORMATION

Place in Curriculum and semester: Elective, S7 or S8
Number of credits: 3

COURSE PREREQUISITES:

Structural Analysis II

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Maryam Daei
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935310
Homepage: http://eng.ui.ac.ir/~m.daei
Email Address: m.daei@eng.ui.ac.ir

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:

- Kaveh, Ali. Optimal structural analysis. Vol. 24. John Wiley & Sons, 2014.
- 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	Topic
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

Week	Topic
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

Assignments	5% of final grade
Project	10% of final grade
Mid-Term Exam	35% of final grade
Final Exam	50% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

PRINCIPLES OF EARTHQUAKE ENGINEERING

BASIC INFORMATION

Place in Curriculum and semester: Core, S7 or S8
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 Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935307
Homepage: https://eng.ui.ac.ir/~h.tajmirriahi
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:

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

Web links:

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Computer Software:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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

Week	Topic
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

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	50% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

PROJECT EVALUATION & COST ESTIMATION

BASIC INFORMATION

Place in Curriculum and semester: Core**,** S5
Number of credits: 1

COURSE PREREQUISITES:

Architectural Design

COURSE CO-REQUISITES:

Architectural Design

TEACHERS:

Person in charge: Dr. Hamed Yazdian
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 3793 5326
Homepage: http://eng.ui.ac.ir/~h.yazdian
Email Address: h.yazdian@eng.ui.ac.ir

WEEKLY HOURS

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

COURSE OBJECTIVES

Students are expected to:

- ✓ General Introduction to get acquainted with types of contract, conditions of contract and getting tenders.
- ✓ Developing relationship with employer, consulting engineers, contractor, and formulating duties of groups.
- ✓ Methods of measurement for some type of constructions.
- ✓ Cost analysis for different types of constructions.
- ✓ At the end of this course the student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents. Student should also be able to prepare value estimates.

REQUIRED STUDENT RESOURCES

Textbooks and References:

- H.V. Ormand, “Estimating for Residential Construction”, Von llllNostrand Reinhold, New York, 1978.
- B. Rosner, *Fundamentals of biostatistics*. Nelson Education, 2015.

Web links:

Building cost estimation simplified - Course (swayam2.ac.in)

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
1	General Introduction to get acquainted with types of contract, conditions of contract
2	Get acquainted with cost analysis and cost table preparation
3	Developing relationship with employer, consulting engineers, contractor, and formulating duties of groups
4	Procedure of estimating of all different type of construction works
5	Cost analysis for different types of constructions
6	Abstract of Estimated Cost
7	Projects

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignment "A"	10 points
Assignment "B"	10 points
Assignment "C"	10 points
Assignment "D"	10 points
Comprehensive Assignment	80 points
Mid-Term Exam	120 points
Final Exam	160 points
Total Points	400 points

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SYLLABI ON WEB PAGES

Last update: September 2024

STRUCTURAL RELIABILITY ANALYSIS

BASIC INFORMATION

Place in Curriculum and semester: Elective, S6
Number of credits: 2

COURSE PREREQUISITES:

Probability and statics for engineering, Structural analysis I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Maryam Daei
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935310
Homepage: http://eng.ui.ac.ir/~m.daei
Email Address: m.daei@eng.ui.ac.ir

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:

- Nowak, Andrzej S., and Kevin R. Collins. Reliability of structures. CRC Press, 2012.
- 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	Topic
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)

Week	Topic
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

Assignments	5% of final grade
Project	10% of final grade
Mid-Term Exam	35% of final grade
Final Exam	50% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

SOIL MECHANICS

BASIC INFORMATION

Place in Curriculum and semester: Core, S4
Number of credits: 3

COURSE PREREQUISITES:

Strength of Materials

COURSE CO-REQUISITES:

Strength of Materials

TEACHERS:

Person in charge: Dr. Maysam Mashayekhi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935295
Homepage: http://eng.ui.ac.ir/~m.mashayekhi
Email Address: m.mashyekhi@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 fundamental principles, essential concepts of soils behavior with respect to their physical- mechanical properties
- ✓ become familiar with soil mechanics application in engineering problems.

REQUIRED STUDENT RESOURCES

Textbooks and References:

- 1. B. M. Das, “Principles of Geotechnical Engineering”, 7th edition, CL-Engineering, 2009.
- J.N. Cernica, “Geotechnical Engineering: Soil Mechanics”, 1st edition, Wiley, 1994.
- V.N.S. Murthy, “Geotechnical Engineering”, 1st edition, CRC Press, 2002.
- D.P. Coduto, “Foundation Design: Principles and Practices”, 2nd Edition, Prentice Hall, 2000.
- K. Terzaghi and R. B. Peck, “Soil Mechanics in Engineering Practice”, 2nd Edition, John Wiley, 1967

Web links:

-

Computer Software:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
1	Basic definitions, soil formation, soil structure, phase relations
2	Soil classification, soil classification criteria, soil classification systems, application of soil classification systems in engineering projects
3	Soil compaction: theory of compaction, effect of energy on compaction, compaction curve, field control specifications
4	Seepage: flow in soil, Darcy’s law, coefficient of permeability and its measurement methods
5	Seepage: Laplace’s equation of continuity, flow nets
6	Seepage: seepage calculation, seepage through earth dams

Week	Topic
7-8	Effective stress, total stress and pore-water pressure in saturated soils, seepage force, uplift pressure
9	Shear strength of soils: stability of soils, stress path, limiting equilibrium failure plane
10	Shear strength of soils: measurement of soil shear strength parameters, direct shear test, triaxial test
11	Stress distribution in soil, stress distribution under different types of foundations, Stress isobars, Newmark's chart
12	Consolidation: consolidation theory, consolidation settlement
13	Consolidation: Terzaghi's consolidation theory, mathematical equations of one dimensional consolidation
14	Consolidation: consolidation time rate, preconsolidation pressure, elastic settlement,
15	Consolidation: Oedometer test and determination of consolidation parameters required for settlement calculation
16	Earth pressure: at rest, active and passive earth pressure, earth pressure considering displacements, Rankine and Coloumb earth pressure theory

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	20% of final grade
Project	0% of final grade
Mid-Term Exam	30% of final grade
Final Exam	50% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

SOIL MECHANICS LABORATORY

BASIC INFORMATION

Place in Curriculum and semester: Core , S5
Number of credits: 1

COURSE PREREQUISITES:

Soil Mechanics

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Maysam Mashayekhi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935295
Homepage: http://eng.ui.ac.ir/~m.mashayekhi
Email Address: m.mashyekhi@eng.ui.ac.ir

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

Web links:

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Computer Software:

Microsoft Office

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
1	Orientation, introduction, lab safety and regulations
2	Grain-size distribution (sieve analysis and hydrometer analysis)
3	Atterberg limits
4	Compaction

Week	Topic
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

EVALUATION PROCEDURES AND GRADING CRITERIA

Technical Lab Reports	50% of final grade
Practical Exam	25% of final grade
Mid-Term Exam	0% of final grade
Final Exam	25% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

STATICS

BASIC INFORMATION

Place in Curriculum and semester: Core, Statics, S2
Number of credits: 3

COURSE PREREQUISITES:

Calculus I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. M. Zandi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 3793 5305
Homepage: http://eng.ui.ac.ir/~m.zandi
Email Address: s.m.zandi@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:

- Meriam J., Kraige L., Bolton J. N. Engineering Mechanics: Statics 8th edition, John Wiley & Sons; 2014.
- Beer F., Johnson E., Mazurek D., Cornwell P., Self B. Vector Mechanics for Engineers, Statics and Dynamics 11th edition, McGraw-Hill; 2015.
- 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	Topic
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

Week	Topic
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

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	50% of final grade
	100%

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APPROVED ACADEMIC HONESTY STATEMENT

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SYLLABI ON WEB PAGES

Last update: September 2024

STEEL STRUCTURES PROJECT

BASIC INFORMATION

Place in Curriculum and semester: Core, S7 or S8
Number of credits: 1

COURSE PREREQUISITES:

Design of Steel Structures II, Loading of Structures

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Hossien Amoushahi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 3793 5285
Homepage: http://eng.ui.ac.ir/~h.amoushahi
Email Address: h.amoushahi@eng.ui.ac.ir

WEEKLY HOURS

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

COURSE OBJECTIVES

Students are expected to:
In this course, students will be introduced to the application of the principles of steel structures in the design of structures and will design steel structures in practice as a group work.

REQUIRED STUDENT RESOURCES

Textbooks and References:

- S. G. Salmon and J. E. Johnson, "Steel Structures: Design and Behavior", 5th Edition, Prentice-Hall, New York, 2008.
- E. H. Gaylord and C. N. Gaylord, "Design of Steel Structures", 3rd Edition, McGraw-Hill, New York, 1992.
- American Institute of Steel Construction (AISC) "Specification for Structural Steel Buildings (AISC 2005)", Illinois, 2005.
- M. Azhari, H. Amoushahi and R. Mirghaderi, "Design of Steel Structures 5", 16th Edition, Arkan Danesh, 2019.
- Iranian National Code, No. 10, 2014.
- American Society of Civil Engineers, "Minimum Design Loads for Buildings And Other Structures: SEI/ASCE 7-16", 1st Edition, ASCE, 2016.
- J. Holmes, "Wind Loading of Structures", 3rd Edition, Taylor & Francis, 2017.

Web links:

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Computer Software:

Etabs, Safe, Sap, AutoCAD

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic	Reading /Assignment
1	Familiarity with different types of vertical and lateral resistant systems and how to select them in a design	-

Week	Topic	Reading /Assignment
2	Special issues of loading steel structures	HW 1
3	How to distribute the load between the resistant components	HW 2
4	How to present the design results and prepare executive plans	HW 3
5-13	Complete design of the steel structure of a multi-storey building: Determining the resistant system on the architectural plan, selecting the lateral resistant system, loading, initial analysis, initial design, detailed analysis, final design, preparation of executive plans, preparation of final calculation book	HW 4 to 12
14-16	Complete design of a steel industrial frame and presentation of calculation book	HW 13 to 15
1	Familiarity with different types of vertical and lateral resistant systems and how to select them in a design	-
2	Special issues of loading steel structures	HW 1
3	How to distribute the load between the resistant components	HW 2
4	How to present the design results and prepare executive plans	HW 3
5-13	Complete design of the steel structure of a multi-storey building: Determining the resistant system on the architectural plan, selecting the lateral resistant system, loading, initial analysis, initial design, detailed analysis, final design, preparation of executive plans, preparation of final calculation book	HW 4 to 12
14-16	Complete design of a steel industrial frame and presentation of calculation book	HW 13 to 15

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	50% of final grade
Project	0% of final grade
Mid-Term Exam	0% of final grade
Final Exam	50% of final grade
	100%

ATTENDANCE STATEMENT

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STUDENTS WITH DISABILITIES ACT FOR STUDENTS WITH SPECIAL NEEDS STATEMENT

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SYLLABI ON WEB PAGES

Last update: September 2024

STRUCTURAL ANALYSIS I

BASIC INFORMATION

Place in Curriculum and semester: Core, S5
Number of credits: 3

COURSE PREREQUISITES:

Mechanics of Materials I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. M. Zandi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 3793 5305
Homepage: http://eng.ui.ac.ir/~m.zandi
Email Address: s.m.zandi@eng.ui.ac.ir

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:

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

Web links:

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COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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
5-6	Influence lines for determinate and indeterminate structures and their application
7-9	Determination of deflections of structures by the area moment, elastic load and conjugate beam methods
10-14	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
15-16	Analysis of statically indeterminate structures: deformation method, superposition principle, support settlement, temperature, member defect

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	45% of final grade
Final Exam	45% of final grade
	100%

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

Last update: September 2024

STRUCTURALL ANALYSIS II

BASIC INFORMATION

Place in Curriculum and semester: Core, S6
Number of credits: 3

COURSE PREREQUISITES:

Structural Analysis I

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. M. Zandi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 3793 5305
Homepage: http://eng.ui.ac.ir/~m.zandi
Email Address: s.m.zandi@eng.ui.ac.ir

WEEKLY HOURS

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

COURSE OBJECTIVES

Students are expected to:

- ✓ In this course, students will be introduced to the theory and application of stiffness methods for analysis of indeterminate structures.

REQUIRED STUDENT RESOURCES

Textbooks and References:

- R. C. Hibbeler, “Structural Analysis”, 10th Edition, Prentice-Hall, New Jersey, 2017.
- Y. Y. Hsieh, “Elementary Theory of Structures”, 4th edition, Prentice-Hall, New Jersey, 1995.
- C. H. Norris, J. B. Wilbur and S. Utku, “Elementary Structural Analysis”, 4th Edition, McGraw-Hill, Auckland, 1990
- R. E. Sennett, “Matrix Analysis of Structures”, Waveland Pr Inc, New York, 2000.
- W. McGuire, R. H. Gallagher, and R. D. Ziemian, “Matrix Structural Analysis”, 2nd Edition, Wiley, New York, 1999.
- V. J. Meyers, “Matrix Analysis of Structures”, Harper and Row, New York, 2011.
- A. Kassimali “Matrix Analysis of Structures” 2nd edition, Cengage Learning; 2011.

Web links:

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Computer Software:

Matlab, Mathematica

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic	Reading /Assignment
1	Familiarity with different types of structural analysis methods	
2	Slope-deflection method: theory and application	
3	Slope-deflection method: beams and frames without lateral movement	
4	Slope-deflection method: frames with lateral movement	HW 1

Week	Topic	Reading /Assignment
5	Symmetry in structures: direct symmetry	
6	Symmetry in structures: inverse symmetry and the principle of superposition	HW 2
7	Moment distribution method: theory and application	
8	Moment distribution method: beams and frames without lateral movement	
9	Moment distribution method: frames with lateral movement	HW 3
10	Approximate analysis of static indeterminate structures	HW 4
11-16	Matrix analysis of structures	HW 5

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	20% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	40% of final grade
	100%

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

Last update: September 2024

SYSTEMS ENGINEERING

BASIC INFORMATION

Place in Curriculum and semester: Elective, S6
Number of credits: 2

COURSE PREREQUISITES:

Calculus II, Engineering Statistics and Probability

COURSE CO-REQUISITES:

-

TEACHERS:

Person in charge: Dr. Ramtin Moeini
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935293
Homepage: http://eng.ui.ac.ir/~r.moeini
Email Address: r.moeini@eng.ui.ac.ir

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:

- Kossiakoff and W. N. Sweet, Systems Engineering Principles and Practice, 1st Edition, Wiley-Interscience, 2002.
- S. Blanchard, System Engineering Management, 4th Edition, Wiley, 2008.
- G. Hadley , Linear programming, Addison Wesley publishing company Inc, 1994.
- J. Arora, Introduction to optimum Design, McGraw-Hill, 2004.
- 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:

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Computer Software:

Matlab, LINDO, LINGO, GAMS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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

Week	Topic
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

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	50% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

TECHNICAL AND STRUCTURAL DRAWING

Place in Curriculum and semester: Core, S1
Number of credits: 2

COURSE PREREQUISITES:
-
COURSE CO-REQUISITES:
-
TEACHERS:
Person in charge: Dr Hossein Tajmir Riahi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935307
Homepage: https://eng.ui.ac.ir/~h.tajmirriahi
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:
- American Society of Mechanical Engineering, ''ASME Y14.5-2018: Dimensioning and Tolerancing'', ANSI, 2018.
- D. A. Madsen and D. P. Madsen, “Engineering Drawing and Design”, 6th Edition, Delmar Cengage Learning, 2016.
- 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	Topic
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

Week	Topic
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

Assignments	25% of final grade
Project	25% of final grade
Mid-Term Exam	0% of final grade
Final Exam	50% of final grade
	100%

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SYLLABI ON WEB PAGES

Last update: September 2024

FUNDAMENTALS OF TUNNEL ENGINEERING

BASIC INFORMATION

Place in Curriculum and semester: Core, S7
Number of credits: 2

COURSE PREREQUISITES:

Soil Mechanics

COURSE CO-REQUISITES:

-

TEACHERS:

The person in charge: Dr. Mahmoud Hashemi
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935086
Homepage: http://eng.ui.ac.ir/~m.hashemi
Email Address: m.hashemi@eng.ui.ac.ir
Other instructors: Dr. Somaye Farashi (TA)

WEEKLY HOURS

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

COURSE OBJECTIVES

The course is aimed to make student familiar with the history of tunneling engineering, rock mass classifications, stress analysis around the openings and design of tunnel support systems.
Students are expected to learn:

- ✓ History of tunneling engineering and planning considerations, history of tunneling, types of tunnels, design challenges, design stages, tunnel excavation methods
- ✓ Rock mass structure and collection of structural geology data, types of structural features, important characteristics of discontinuities, analysis and presentation of structural geology data
- ✓ Rock mass classifications: the concepts and its necessity, Terzaghi Rock load classification, Stini & Lauffer classification, RSR classification, RMR classification, Q-system classification. GSI classification, empirical relation to estimate Young modulus and uniaxial compressive strength, application of classifications in estimation of temporary support systems, evaluation of various rock mass classification systems
- ✓ Stress analysis around the openings: insitu stress state, insitu stress coefficient estimation relations and evaluations methods, post-excavation influence zone for tunnels, stress distribution around the circular and ellipsoidal openings, stress distribution relations for circular tunnels, effect of tunnel cross section and related theories for stress around multiple openings
- ✓ Design of tunnel support systems: support and strengthening fundamentals for tunnels considering load bearing arch, analysis of ground-support interaction (ground and support reaction curves), estimation of single support behavior such as rock bolt, steel arch and shotcrete, determination of capacity and the resulting curve for composite supports
- ✓ Application of supports in underground openings, types of supports and the principles of their applications, pre-support and pre-consolidation
- ✓ Rock bolts and dowels: types of anchors and rock bolts systems, installation of rock bolts, wire nets and meshes
- ✓ Shotcrete: engineering properties, application and construction methods, mesh- and fiber-reinforced shotcrete

REQUIRED STUDENT RESOURCES

Textbooks and References:

- E. Hoek, P.K. Kaiser and W.F. Bawden, "Support of Underground Excavations in
- Hard Rock", 4th Edition, Prentice Hall, 2000.
- Hoek, E., and Brown. E. T., 1985, Underground Excavation, Inst. Metall. & Min.,
- London, 273 p.
- J. O. Bickel and T. R. Kuesel, "Tunnel Engineering Handbook", 1st Edition, Krieger Publishing Company, 1991.
- P. Lunardi, "Design and Construction of Tunnels: Analysis of Controlled Deformations in Rock and Soils", 1st Edition, Springer, 2008.
- D. Kolymbas, "Tunneling and Tunnel Mechanics", Springer; 1st Edition, 2008.
- 4- L. Obert and W.I. Duvalle, "Rock Mechanics and the Design of Structures in Rock", 1st Edition, Wiley, 1967.

Web links for Required Computer Softwares:

RocSupport ver 3.0: https://rocsupport-application.software.informer.com/3.0/

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
1	History of tunneling engineering and planning considerations, history of tunneling, types of tunnels, design challenges, design stages, tunnel excavation methods
2	Excavation method for tunneling (conventional, TBM, roadheader)(partial/full face)
3	cut & cover methods (top-down, down-top)
4	Rock mass structure and collection of structural geology data, types of structural features, important characteristics of discontinuities, analysis and presentation of structural geology data
5	Rock mass classifications: the concepts and its necessity, Terzaghi Rock load classification, Stini & Lauffer classification, RSR classification
6	Rock mass classifications: RMR classification, Q-system classification
7	Rock mass classifications: GSI classification, empirical relation to estimate Young modulus and uniaxial compressive strength, application of classifications in estimation of temporary support systems, evaluation of various rock mass classification systems
8	Stress analysis around the openings: insitu stress state, insitu stress coefficient estimation relations and evaluations methods
9	Stress analysis around the openings: post-excavation influence zone for tunnels, stress distribution around the circular openings (stream flow theory), stress distribution relations for circular tunnels,
10	Stress analysis around the openings: effect of tunnel cross section and related theories stress around multiple openings, stress distribution around the noncircular & ellipsoidal openings
11	Design of tunnel support systems: support and strengthening fundamentals for tunnels considering load bearing arch
12	Design of tunnel support systems: analysis of ground-support interaction behavior while tunnel excavation (ground and support reaction curves)
13	Design of tunnel support systems: relations for ground-support interaction (ground and support reaction curves), estimation of single support behavior such as rock bolt, steel arch and shotcrete, determination of capacity and the resulting curve for composite supports
14	Application of supports in underground openings, types of supports and the principles of their applications, pre-support and pre-consolidation
15	Rock bolts and dowels: types of anchors and rock bolts systems, installation of rock bolts, wire nets and meshes

Week	Topic
16	Shotcrete: engineering properties, application and construction methods, mesh- and fiber-reinforced shotcrete

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments & reports (attendance required in laboratory and field visits)	50% of final grade
Project	0% of final grade
Mid-Term Exam	20% of final grade
Final Exam	30% of final grade
	100%

ATTENDANCE STATEMENT

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SYLLABI ON WEB PAGES

Last update: September 2024

WATER AND WASTEWATER ENGINEERING

BASIC INFORMATION

Place in Curriculum and semester: Core, S4
Number of credits: 3

COURSE PREREQUISITES:

Hydraulics, Engineering Hydrology

COURSE CO-REQUISITES:

Engineering Hydrology

TEACHERS:

Person in charge: Dr. Ramtin Moeini
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935293
Homepage: http://eng.ui.ac.ir/~r.moeini
Email Address: r.moeini@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 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:

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

Web links:

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Computer Software:

EPANET, WaterCAD, SewrCAD, WaterGEMS, SewerGEMS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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)

Week	Topic
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	Rock bolts and dowels: types of anchors and rock bolts systems, installation of rock bolts, wire nets and meshes
16	Shotcrete: engineering properties, application and construction methods, mesh- and fiber-reinforced shotcrete

EVALUATION PROCEDURES AND GRADING CRITERIA

Assignments	10% of final grade
Project	0% of final grade
Mid-Term Exam	40% of final grade
Final Exam	50% of final grade
	100%

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

Last update: September 2024

WATER AND WASTEWATER ENGINEERING PROJECT

BASIC INFORMATION

Place in Curriculum and semester: Core, S7 or S8
Number of credits: 1

COURSE PREREQUISITES:

Water and wastewater engineering

COURSE CO-REQUISITES:

Water and wastewater engineering

TEACHERS:

Person in charge: Dr. Ramtin Moeini
Office location: Department of Civil Engineering, Faculty of Civil Engineering and Transportation, University of Isfahan, Hezar-Jerib av., Isfahan, Iran
Phone Number: +98 (31) 37935293
Homepage: http://eng.ui.ac.ir/~r.moeini
Email Address: r.moeini@eng.ui.ac.ir

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:

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

Web links:

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Computer Software:

EPANET, WaterCAD, SewrCAD, WaterGEMS, SewerGEMS

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic
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)
4-5	Become familiar with EPANET software and modeling the real problem
6-7	Become familiar with WaterCAD software and modeling the real problem
8-9	Become familiar with WaterGEMS software and modeling the real problem

Week	Topic
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)
12-13	Become familiar with WaterCAD software and modeling the real problem
14-15	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% of final grade
Sewer network project	50% of final grade
	100%

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