Ministry of Higher Education & Scientific Research
University Of Anbar
College of Engineering
Civil Engineering Department

Curriculum

For

Civil Engineering Department

2023-2024

Course Description

Courses are coded as follows:
1. Course code and number
2. Course title
3. Parenthesized numerals, e.g., (4-3-1-3), indicate, in order, the credit hours, the classroom hours (1 hour = 1 credit hour), tutorial hours (credit hour = 0), and the laboratory hours (2 hours = 1 credit hour).

Prerequisites, if any, are indicated at the course description. These have been established to assure an adequate and uniform background for students in advanced classes. Occasionally, students may feel they already have the appropriate background for an advanced course because of previous training, transfer credits, or credit by examination.

Course Numbering System

The number consists from 3 digits as following: -
UOA- University Requirements
ENG- College Requirements
CIV- Department requirements
Numbers from 001, 002, 003, ……. etc. describes the sequence of the course for each level in each requirement.

Graduation Requirements

Requirements	Credit hours
University Requirements	**17**
College Requirements	**34**
Department Requirements inc. Elective Classes	**94**
Total	**145**

University Requirements: 17 Credit Hours

Course No.	Course Title	Credit hours	Weekly hours		
			Lec.	Tut	Lab
UOA001	**Arabic language I**	**2**	**2**	**-**	**-**
UOA003	**English Language I**	**2**	**2**	**-**	**-**
UOA004	**English Language II**	**2**	**2**	**-**	**-**
UOA005	**Human Rights and Democracy**	**2**	**2**	**-**	**-**
UOA006	**Crimes of Baath Regime in Iraq**	**2**	**2**	**-**	**-**
UOA007	**Computer Science I**	**3**	**2**	**1**	**2**
UOA009	**English Language III**	**2**	**2**	**-**	**-**
UOA010	**English Language IV**	**2**	**2**	**-**	**-**
	Total	**17**	**16**	**1**	**2**

College Requirements: 34 Credit Hours

Course No.	Course Title	Credit hours	Weekly hours		
			Lec	Tut	Lab
ENG003	**Calculus I**	**3**	**3**	**1**	**-**
ENG004	**Calculus II**	**3**	**3**	**1**	**-**
ENG001	**Physics**	**4**	**3**	**-**	**2**
ENG002	**Chemistry**	**4**	**3**	**-**	**2**
ENG005	**Fundamentals of Electrical Engineering**	**3**	**2**	**1**	**2**
ENG007	**Engineering Drawing**	**3**	**2**	**2**	**2**
ENG006	**Engineering Mechanics (Statics)**	**3**	**3**	**1**	**-**
ENG008	**Calculus III**	**3**	**3**	**1**	**-**
ENG009	**Calculus IV**	**3**	**3**	**1**	**-**
ENG010	**Engineering Statistics**	**3**	**3**	**-**	**-**
ENG011	**Engineering Numerical Methods**	**3**	**2**	**2**	**2**
ENG012	**Management and Leadership Skills**	**2**	**2**	**-**	**-**
Total		**34**	**29**	**9**	**10**

Department Requirements: 94 Credit Hours

Course No.	Course Title	Credit Hours	Weekly hours		
			Lec.	Tut	Lab
CIV001	Building Materials	3	2	1	2
CIV005	Concrete Properties	4	3	1	2
CIV009	Building Construction	3	2	1	2
CIV002	Engineering Geology	3	2	1	2
CIV010	Fluid Mechanics	3	2	1	2
CIV006	Dynamics	3	3	1	-
CIV004	Strength of Materials I	3	3	1	-
CIV008	Strength of Materials II	3	2	1	2
CIV003	Engineering Surveying I	3	2	1	2
CIV007	Engineering Surveying II	3	2	1	2
CIV011	Structure I	3	3	1	-
CIV016	Structure II	3	3	1	-
CIV012	Reinforced Concrete Design I	3	3	1	-
CIV017	Reinforced Concrete Design II	3	3	1	-
CIV013	Construction Management	3	3	-	-
CIV020	Engineering Economy	3	3	-	-
CIV014	Soil Mechanics I	3	2	1	2
CIV018	Soil Mechanics II	3	2	1	2
CIV015	Hydrology	3	3	1	-
CIV019	Traffic Engineering	3	3	1	-
CIV021	Hydraulic Structures	3	3	-	-
CIV022	Foundation Engineering I	3	3	1	-
CIV023	Highway Engineering	3	2	2	2
CIV024	Steel Structure I	3	3	1	-
CIV026	Sanitary and Environmental Engineering	4	3	1	2
CIV027	Method of construction and Estimation	3	3	1	-
CIV025	Final Year Project I	3	2	-	2
CIV030	Final Year Project II	3	2	-	2
CIV028	Steel Structure II CE Elective I)	2	2	2	-
CIV029	Foundation Engineering II (CE Elective II)	2	2	2	-
CIV031	Design of Prestressed Concrete (CE Elective III)	2	2	2	-
CIV032	Highway Materials (CE Elective IV)	2	2	2	-
Total		94	80	32	28

CE Elective Classes: 12 Credit Hours

- Major electives courses are offered occasionally to meet specific demands of society and students.
- Subject to availability, four courses (8 credits) can be selected from the following list by the department:

Group	Course No.	Course Title	cr. Hrs.	Weekly hours		
				Lec.	Tut.	Lab
Group A (Structure Analysis& Design)	CIV033	Computer Application in Civil Engineering	2	1	1	2
	CIV034	Reinforced Concrete Design III	2	2	2	-
	CIV028	Steel Structure II	2	2	2	-
	CIV031	Design Prestressed Concrete	2	2	2	-
Group B (Geotechnical Eng.)	CIV033	Computer Application in Civil Engineering	2	1	1	2
	CIV029	Foundation Engineering II	2	2	2	-
	CIV035	Earth Retaining Structures	2	2	2	-
	CIV036	Selected Topics in Geotechnical Engineering	2	2	2	-
Group C (Hydraulics &Environmental Eng.)	CIV033	Computer Application in Civil Engineering	2	1	1	2
	CIV037	Environmental Impact Assessment	2	2	2	-
	CIV038	Hydraulic Application in Environmental Engineering	2	2	2	-
	CIV039	Water Quality Modeling and Control	2	2	2	-
Group D (Transportation Eng.)	CIV033	Computer Application in Civil Engineering	2	1	1	2
	CIV040	Pavement Design	2	2	2	-
	CIV032	Highway Materials	2	2	2	-
	CIV041	Transportation Planning	2	2	2	-
Group E (Construction Management)	CIV033	Computer Application in Civil Engineering	2	1	1	2
	CIV042	Project Management	2	2	2	-
	CIV043	Operation Research	2	2	2	-
	CIV044	Quality Management	2	2	2	-
		Total	40	35	35	10

Recommended Civil Engineering Department course plan by semester

First Year					
Semester I					
Category	**Subject**	**Hours**			**Units**
		Theoretical	**Tutorial**	**Practical**	
Department requirement	Building Materials	2	1	2	3
College requirement	Calculus I	3	1	-	3
College requirement	Physics	3	-	2	4
College requirement	Chemistry	3	-	2	4
University requirement	Computer Science I	2	1	2	3
University requirement	Arabic Language I	2	-	-	2
University requirement	Human Rights and Democracy	2	-	-	2
Total Hours and Units		17	3	8	21
Semester II					
Category	**Subject**	**Hours**			**Units**
		Theoretical	**Tutorial**	**Practical**	
Department requirement	Engineering Geology	2	1	2	3
College requirement	Calculus II	3	1	-	3
College requirement	Engineering Mechanics (Static)	3	1	-	3
College requirement	Engineering Drawing	2	2	2	3
College requirement	Fundamentals of Electrical Engineering	2	1	2	3
University requirement	English Language I	2	-	-	2
Total Hours and Units		14	6	4	17

Second Year					
Semester I					
Category	**Subject**	**Hours**			**Units**
		Theoretical	**Tutorial**	**Practical**	
Department requirement	Engineering Surveying I	2	1	2	3
Department requirement	Strength of Materials I	3	1	-	3
Department requirement	Concrete Properties	3	1	2	4
Department requirement	Dynamics	3	1	-	3
College requirement	Calculus III	3	1	-	3
University requirement	English Language II	2	-	-	2
University requirement	Crimes of Baath Regime in Iraq	2	-	-	2
Total Hours and Units		18	5	4	20
Semester II					
Category	**Subject**	**Hours**			**Units**
		Theoretical	**Tutorial**	**Practical**	
Department requirement	Engineering Surveying II	2	1	2	3
Department requirement	Strength of Materials II	2	1	2	3
Department requirement	Building Construction	2	1	2	3
Department requirement	Engineering Geology	3	-	-	3
Department requirement	Fluid Mechanics	2	1	2	3
College requirement	Calculus IV	3	1	-	3
Total Hours and Units		14	5	8	18

Third Year					
Semester I					
Category	**Subject**	**Hours**			**Units**
		Theoretical	**Tutorial**	**Practical**	
Department requirement	**Structure I**	**3**	**1**	**-**	**3**
Department requirement	**Reinforced Concrete Design I**	**3**	**1**	**-**	**3**
Department requirement	**Construction Management**	**3**	**-**	**-**	**3**
Department requirement	**Soil Mechanics I**	**2**	**1**	**2**	**3**
Department requirement	**Hydrology**	**3**	**1**	**-**	**3**
College requirement	**Engineering Statistics**	**3**	**-**	**-**	**3**
University requirement	**English Language III**	**2**	**-**	**-**	**2**
Total Hours and Units		**19**	**4**	**2**	**20**
Semester II					
Category	**Subject**	**Hours**			**Units**
		Theoretical	**Tutorial**	**Practical**	
Department requirement	**Structure II**	**3**	**1**	**-**	**3**
Department requirement	**Reinforced Concrete Design II**	**3**	**1**	**-**	**3**
Department requirement	**Engineering Economy**	**3**	**-**	**-**	**3**
Department requirement	**Soil Mechanics II**	**2**	**1**	**2**	**3**
Department requirement	**Traffic Engineering**	**3**	**1**	**-**	**3**
College requirement	**Engineering Numerical Methods**	**2**	**1**	**2**	**3**
Total Hours and Units		**16**	**5**	**4**	**18**

Fourth Year					
Semester I					
Category	**Subject**	**Hours**			**Units**
		Theoretical	**Tutorial**	**Practical**	
Department requirement	**Hydraulic Structures**	**3**	**-**	**-**	**3**
Department requirement	**Foundation Engineering I**	**3**	**1**	**-**	**3**
Department requirement	**Highway Engineering**	**2**	**2**	**2**	**3**
Department requirement	**Steel Structure I**	**3**	**1**	**-**	**3**
Department requirement	**Sanitary and Environmental Engineering**	**3**	**1**	**2**	**4**
Department requirement	**Final Year Project I**	**2**	**-**	**2**	**3**
University requirement	**English Language IV**	**2**	**-**	**-**	**2**
Total Hours and Units		**18**	**5**	**6**	**21**
Semester II					
Category	**Subject**	**Hours**			**Units**
		Theoretical	**Tutorial**	**Practical**	
Department requirement	**Methods of Construction and Estimation**	**3**	**1**	**-**	**3**
Department requirement	**Steel Structure II CE Elective I)**	**2**	**2**	**-**	**2**
Department requirement	**Foundation Engineering II (CE Elective II)**	**2**	**2**	**-**	**2**
Department requirement	**Design of Prestressed Concrete (CE Elective III)**	**2**	**2**	**-**	**2**
Department requirement	**Highway Materials (CE Elective IV)**	**2**	**2**	**-**	**2**
Department requirement	**Final Year Project II**	**2**	**-**	**2**	**3**
College requirement	**Management and Leadership Skills**	**2**	**-**	**-**	**2**
Total Hours and Units		**15**	**9**	**2**	**16**

Program Outcome Curriculum Map according to ABET/NGOs Criterion

First Year (Freshman) - First Semester (Fall Semester)								
Course Subject	**Course Code**	**1/i**	**2/ii**	**3/iv**	**4/v**	**5/vii**	**6/iii**	**7/vi**
Building Materials	**CIV001**	x					x	
Calculus I	**ENG003**	x						
Physics	**ENG001**	x					x	
Chemistry	**ENG002**	x					x	
Computer Science I	**UOA007**	x					x	x
Arabic Language I	UOA001			x				
Human Rights and Democracy	**UOA005**				x			
First Year (Freshman) - Second Semester (Spring Semester)								
Course Subject	**Course Code**	**1/i**	**2/ii**	**3/iv**	**4/v**	**5/vii**	**6/iii**	**7/vi**
Engineering Geology	**CIV002**	x				x	x	
Calculus II	**ENG004**	x						
Engineering Mechanics (Static)	**ENG006**	x						
Fundamentals of Electrical Engineering	**ENG005**	x					x	
Engineering Drawing	**ENG007**		x	x				x
English Language I	**UOA003**			x				

Second Year (Freshman) - First Semester (Fall Semester)

Course Subject	Course Code	1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
Engineering Surveying I	CIV003	x			x	x	x	x
Strength of Materials I	CIV004	x	x					
Concrete Properties	CIV005	x				x	x	x
Dynamics	CIV006	x						
Calculus III	ENG008	x						
Crimes of Baath Regime in Iraq	UOA006				x			
English Language II	UOA004			x				

Second Year (Freshman) - Second Semester (Spring Semester)								
Course Subject	Course Code	1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
Engineering Surveying II	CIV007	x				x	x	x
Strength of Materials II	CIV008	x					x	
Building Construction	CIV009	x			x		x	
Engineering Geology	CIV002	x				x		
Fluid Mechanics	CIV010	x					x	
Calculus IV	ENG009	x						

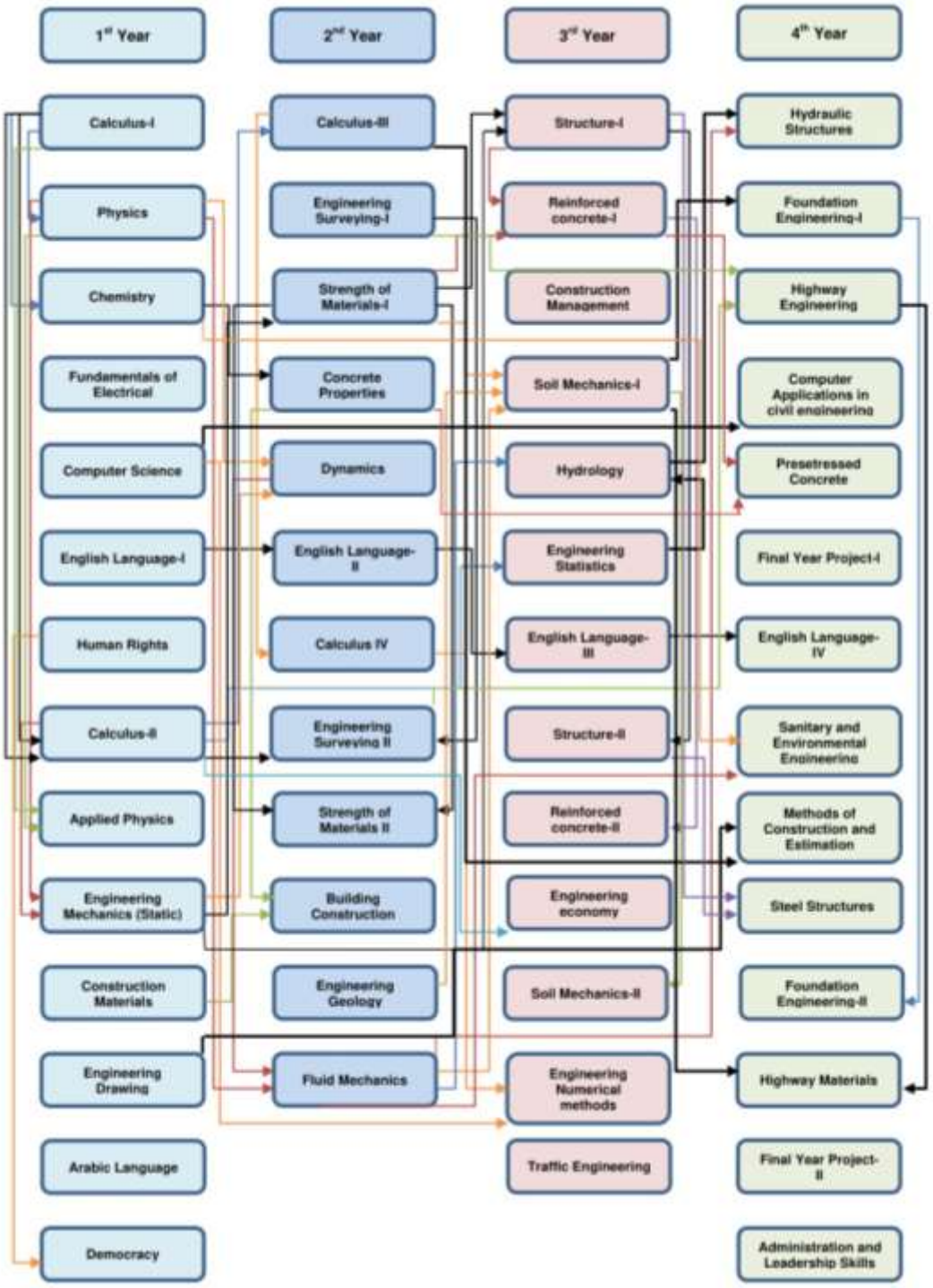
Third Year (Freshman) - First Semester (Fall Semester)

Course Subject	Course Code	1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
Structure I	CIV011	x						
Reinforced Concrete Design I	CIV012	x	x					
Construction Management	CIV013	x				x		
Soil Mechanics I	CIV014	x					x	
Hydrology	CIV015	x	x					
Engineering Statistics	ENG010	x				x		
English Language III	UOA009			x				

Third Year (Freshman) - Second Semester (Spring Semester)

Course Subject	Course Code	1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
Structure II	CIV016	x						
Reinforced Concrete Design II	CIV017	x	x					
Engineering Economy	CIV020	x						x
Soil Mechanics II	CIV014	x					x	
Traffic Engineering	CIV019	x	x		x			
Engineering Numerical Methods	ENG011	x						x

Fourth Year (Freshman) - First Semester (Fall Semester)								
Course Subject	**Course Code**	**1/i**	**2/ii**	**3/iv**	**4/v**	**5/vii**	**6/iii**	**7/vi**
Hydraulic Structures	CIV021	x	x					
Foundation Engineering I	CIV022	x	x			x		x
Highway Engineering	CIV023	x	x				x	
Steel Structure I	CIV024	x	x					
Sanitary and Environmental Engineering	CIV026	x	x	x			x	
Final Year Project I	CIV025	x	x	x	x	x	x	x
English Language IV	UOA010			x				
Fourth Year (Freshman) - Second Semester (Spring Semester)								
Course Subject	**Course Code**	**1/i**	**2/ii**	**3/iv**	**4/v**	**5/vii**	**6/iii**	**7/vi**
Methods of Construction and Estimation	CIV027	x			x	x		
Steel Structure II	CIV024	x	x					
Foundation Engineering-II	CIV029	x	x					
Highway Materials	CIV032	x	x				x	
Design of Prestressed Concrete	CIV031	x	x			x		x
Final Year Project-II	CIV030	x	x	x	x	x	x	x
Management and Leadership Skills	ENG012				x	x		


1st Year
2nd Year
3rd Year
4th Year
Calculus-I
Physics
Chemistry
Fundamentals of Electrical
Computer Science
English Language-I
Human Rights
Calculus-II
Applied Physics
Engineering Mechanics (Static)
Construction Materials
Engineering Drawing
Arabic Language
Democracy
Calculus-III
Engineering Surveying-I
Strength of Materials-I
Concrete Properties
Dynamics
English Language-II
Calculus IV
Engineering Surveying II
Strength of Materials II
Building Construction
Engineering Geology
Fluid Mechanics
Structure-I
Reinforced concrete-I
Construction Management
Soil Mechanics-I
Hydrology
Engineering Statistics
English Language-III
Structure-II
Reinforced concrete-II
Engineering economy
Soil Mechanics-II
Engineering Numerical methods
Traffic Engineering
Hydraulic Structures
Foundation Engineering-I
Highway Engineering
Computer Applications in civil engineering
Presetressed Concrete
Final Year Project-I
English Language-IV
Sanitary and Environmental Engineering
Methods of Construction and Estimation
Steel Structures
Foundation Engineering-II
Highway Materials
Final Year Project-II
Administration and Leadership Skills

UOA003 English Language I (2-2-0-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course is designed to enable the students to communicate effectively in English by concentration on many of the most useful language and grammar points. They will learn and practice these essential grammar points by using all four skills: reading, writing, listening, and speaking. Students, in this course, will improve their speaking and listening skills, build their English vocabulary and develop their ability to maintain conversations in English. Moreover, they will be able to talk about themselves, their interests and ask questions to others. Regarding writing skills, students will learn the basics of writing; begin with writing simple compound to complex sentences which make them able to use these kinds of sentences to write different kinds of paragraphs.

Recommended Textbook(s):

- John & Liz Soars, "New Headway Plus Beginner", 10th edition, 2012.

Prerequisites: None

Course Topics:

1. **Grammar** (Present, past, and future tenses, Questions & questions words), **Vocabulary** (Parts of speech, Words with more than one meaning), **Everyday English** (Social expressions I), **Reading** (people, the main communicators'- the many ways we communicate)
2. **Speaking** (Information gap, Discussion, Role-play), **Listening** (Neighbors), **Writing** (Informal Letter)
3. **Grammar** (Present tenses), **Vocabulary** (Describing countries, Collocation-Daily life), **Everyday English** (Making Conversation), **Reading** (Living in the USA)
4. **Speaking** (Information gap, exchanging information about immigrants to the USA), **Listening** ("You drive me mad", but I love you), **Writing** (Linking words, Describing a person)
5. **Grammar** (Past tenses), **Vocabulary** (Irregular verbs, Noun, verbs, and adjectives, making negatives), **Everyday English** (Time expressions, At, on, in), **Reading** (The burglars' friend, the thief, his mother, and $2 billion, Teenager goes on spending spree, Sherlock Holmes- the three students)
6. **Speaking** (Telling stories), **Listening** (An extract from the three students), **Writing** (Linking words, Writing a story 1)
7. **Grammar** (Quantity, Articles), **Vocabulary** (Buying things), **Everyday English** (Prices and shopping), **Reading** (Markets around the world)
8. **Speaking** (Survey-the good things and bad things about living in your city, Discussion), **Listening** ('My uncle's a shopkeeper'), **Writing** (Filling in forms)
9. **Grammar** (Verb patterns-1, Future intentions), **Vocabulary** (Hot verbs) **Everyday English** (How do you feel?), **Reading** (Hollywood kids- growing up in Los Angles isn't easy)
10. **Speaking** (What are your plans and ambitions? Being a teenager), **Listening** (A song- you've got a friend), **Writing** (Writing a postcard)
11. **Grammar** (What's it like? Comparative and superlative adjectives), **Vocabulary** (Talking about cities, Money, Synonyms and antonyms), **Everyday English** (Directions), **Reading** ('A tale of two millionaires'- one was mean and one was generous)
12. **Speaking** (Information gap, Discussion- the rich and their money), **Listening** (Living in another country), **Writing** (relative cluses1, describing a place)
13. **Practical session (speaking)**

Program and Course Outcomes :

By the end of successful completion of this course, the student will be able to:

1. Read and understand basic expressions, short and simple texts.
2. Integrate the use of the four language skills i.e. Reading, Listening, Speaking, Writing.
3. Demonstrate limited control of essential grammatical structures.
4. Recognize and use properly ancient and modern dictionaries to look up words and meanings.

UOA001 Arabic Language I (2-2-0-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course aims at building students' familiarity with and competence in Arabic literature in its various genres so as to increase their ability to appreciate literature and to develop their awareness of its concepts through the study of poetry, novel and the short story.

Recommended Textbook(s):

- Course supplements will be used to present extra information not covered in the textbook.

Prerequisites:

None

Course Topics:

1. Study the text of the Quran and analysis
2. In the language and spelling and rules, the rules of writing the hamza,
3. Written verbatim by Arab and Za - Rules of number and numerical adjective, punctuation
4. the method of detection for words in Arabic Dictionaries
5. In the applications of grammar and language- the actor and his deputy
6. Debutante and the news Acts missing
7. Equated with the letters already Byproducts
8. The case and exception
9. Ancient literary studies
10. Definition of literature and its importance
11. Ages historical Arabic literature – Modern Literary Studies
12. Study the texts of poetic eras (pre-Islamic, Islamic, Umayyad, Abbasid, Andalusia)
13. Study of ancient prose texts (speeches, messages)
14. examine the texts of modern poetry and contemporary
15. examine the texts of modern prose (drama, novel, article)

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. learn Modern Standard Arabic language skills like writing, reading and critical thinking
2. become familiar with challenges and major concerns in Arab society.
3. Expand cultural knowledge and functional vocabulary through readings and activities.
4. have the communicative skills necessary for daily life.

UOA005 Human Rights and Democracy (2-2-0-0)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course is designed to give the student the definition of freedom and the right language and idiomatically and legitimacy of the user, Origin of the right in the eyes of Islamic law, Elements of the right and types of, Personal freedom, Intellectual freedom, Rights and economic freedoms, Islam and Slavery, Human rights objectives, The use of freedom and the right general project, The right of a Muslim to his Muslim brother, Parental rights, Right neighbor, The right of women, Human rights in the heavenly religions, Religious tolerance in Islam.

Recommended Textbook(s):

By Topics

Prerequisites: None

Course Topics:

1. The definition of freedom and the right
2. Origin of the right in the eyes of Islamic law
3. Elements and Types of the Human right
4. Rights and economic freedoms
5. Islam and Slavery
6. Human rights objectives
7. The use of freedom and the right general project
8. The right of a Muslim

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Evaluate Human rights
2. Preservation of human rights in Islam
3. Evaluate the relationship between human rights and democracy

UOA006 Crimes of Baath regime in Iraq (2-2-0-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

During its rule, the previous regime committed a large number of different crimes, and their differences require clarifying concepts and definitions for the student to be aware of what he is going through, which is related to the subject of the curriculum.

Recommended Textbook(s):

- By Topics

Prerequisites:

None

Course Topics:

1. Knowing the crimes that occurred during the previous regime
2. Respecting international law and not violating human rights
3. Governance must be based on equality and justice among people
4. Respecting international laws and norms and not violating United Nations resolutions

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. state the crimes that occurred during the rule of the Baath Party
2. state the most important violations that occurred in the field of human rights and international law

UOA004 English Language II (2-2-0-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course is designed to enable the students to achieve academic oral and written communication to the standard required at university level. The course integrates all the language skills with emphasis on writing, and it stimulates students' imagination, and promotes personal expression. Students, in this course, are trained to apply critical thinking skills to a wide range of challenging subjects from diverse scientific topics. Course activities include writing various types of academic essays, acquiring advanced academic vocabulary, and getting involved in group discussions and debates. In addition, the course also includes other skills to consolidate the main skills, such as further readings in civil engineering.

Recommended Textbook(s):

- John & Liz Soars, "New Headway Plus- Pre-Intermediate Student's Book".
- John & Liz Soars, "New Headway Plus- Pre-Intermediate Workbook with Key".

Prerequisites:

- UOA003 English Language I

Course Topics:

1. Questions words
2. Tenses
3. Communication, Tenses
4. Grammar, Listening
5. Vocabulary and tenses
6. Quantities
7. Verb pattern1
8. Future intention, Comparative, and superlative adjectives
9. Tenses revision
10. Grammar
11. Time and conditional clauses
12. Verb pattern 2, Passive form
13. The actives and Passives

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Develop academic essay writing proficiency
2. Promote reading skills
3. Expand academic vocabulary through reading
4. Promote speaking ability through group discussions and debates
5. Promote critical thinking skills

UOA009 English Language III (2-2-0-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course is designed to enable the students to achieve academic oral and written communication to the standard required at university level. The course integrates all the language skills with emphasis on writing, and it stimulates students' imagination, and promotes personal expression. Students, in this course, are trained to apply critical thinking skills to a wide range of challenging subjects from diverse scientific topics. Course activities include writing various types of academic essays, acquiring advanced academic vocabulary, and getting involved in group discussions and debates. In addition, the course also includes other skills to consolidate the main skills, such as further readings in civil engineering.

Recommended Textbook(s):

- John & Liz Soars, "New Headway Plus- Beginner Student's Book", 10th ed 2014

Prerequisites:

- UOA004 English Language II

Course Topics:

1. Questions words
2. Tenses
3. Communication, Tenses
4. Grammar, Listening
5. Vocabulary and tenses
6. Quantities
7. Verb pattern1
8. Future intention, Comparative, and superlative adjectives
9. Tenses revision
10. Grammar
11. Time and conditional clauses
12. Verb pattern 2, Passive form
13. The actives and Passives

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Develop academic essay writing proficiency
2. Promote reading skills
3. Expand academic vocabulary through reading
4. Promote speaking ability through group discussions and debates
5. Promote critical thinking skills

UOA010 English Language IV (2-2-0-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course is designed to enable the students to achieve academic oral and written communication to the standard required at university level. The course integrates all the language skills with emphasis on writing, and it stimulates students' imagination, and promotes personal expression. Students, in this course, are trained to apply critical thinking skills to a wide range of challenging subjects from diverse scientific topics. Course activities include writing various types of academic essays, acquiring advanced academic vocabulary, and getting involved in group discussions and debates. In addition, the course also includes other skills to consolidate the main skills, such as further readings in civil engineering.

Recommended Textbook(s):

- John & Liz Soars, "New Headway Upper Intermediate Student's Book", 6th ed 2013

Prerequisites:

- UOA009 English Language III

Course Topics:

1. **Grammar** (The tense system and spoken English); **Vocabulary** (Compound of words lifestyle, home town, house-proud); **Reading** (A home from home-two people describe their experiences of living abroad); **Listening** ('things I miss from home'); **Speaking** (Exchanging information about people who live abroad); **Everyday English** (Social expressions); **Writing** (Applying for a job)
2. **Grammar** (Present perfect, simple and continuous, and spoken English); **Vocabulary** (Hot verbs, make, do make way, do damage); **Reading** ('Paradise Lost'- how tourism is destroying the object of its affection); **Listening** (An interview Tashi Wheeler about her travels as child with parents); **Speaking** (Information Gap); **Everyday English** (Exclamations); **Writing** (Informal letters and correcting mistakes)
3. **Grammar** (Narrative tenses, past simple, Counts, and Perfect); **Vocabulary** (books and films); **Reading** (Jane Austen-one of the world's most downloaded authors); **Listening** (The money jigsaw-a news item from BBC's radio); **Speaking** (Retelling a news story, responding to a news); **Everyday English** (Showing interest and surprise); **Writing** (Narrative writing 1)
4. **Grammar** (questions and negatives and spoken English); **Vocabulary** (Prefixes and Antonyms in context); **Reading** ('Diana and Elvis shot JFK!); **Listening** ('My most memorable lie'-people confess to untruths); **Speaking** (Discussion-good and bad lies); **Everyday English** (Being polite); **Writing** (Linking ideas)
5. **Grammar** (Future forms and spoken English); **Vocabulary** (Hot verbs-take, put); **Reading** ('Today's teenagers are just fine'); **Listening** arranging to meet-three friends decide a time and a place to get together); **Speaking** (Future possibilities in your life); **Everyday English** (Telephone conversations); **Writing** (writing Emails)
6. **Grammar** (Expression of quantity); **Vocabulary** (Words with variable stress); **Reading** (A profile of two famous brands); **Listening** (Radio advertisements-what's the product? What are the selling points?); **Speaking** (A lifestyle survey); **Everyday English** (Business expression, Numbers, Fractions, decimals, date, time…); **Writing** (A consumer survey)
7. **Grammar** (Modals and related verbs 1, spoken English, Declarative questions, and Question expressing surprise); **Vocabulary** (Hot verb-get); **Reading** ('Meet the kippers'-an article about grown-up children who won't leave home); **Listening** (Getting married-an Indian lady talks about her marriage); **Speaking** (The pros and cons of arranged marriage); **Everyday English** (Exaggeration and understatement); **Writing** (Arguing your case)

8. **Grammar** (Relative clauses); **Vocabulary** (Adverb collocations and adverb adjectives); **Reading** ('Chukotka, the coldest place on earth'-an article about a remote territory of Russia); **Listening** (Extreme experiences-people describe their experiences in extreme weather conditions); **Speaking** (Making descriptions longer, talking about your experiences); **Everyday English** (The world around); **Writing** (Describing places)
9. **Grammar** (Expressing habit); **Vocabulary** (Homonyms and Homophones); **Reading** ('People and their money-an article about three very different people); **Listening** (A teacher I will never forget-people describe a teacher who made a lasting impression on them); **Speaking** (Discussion-a teacher I'll never forget); **Everyday English** (Making your point); **Writing** (Writing of talking)
10. **Grammar** (Modal auxiliary verbs 2); **Vocabulary** (Synonyms); **Reading** ('How the West was won'-the story of settlers in nineteenth -century America); **Listening** (Hilaire Belloc's Tales for children); **Speaking** (The murder game-one man drops dead in a country house :); **Everyday English** (Metaphors and idioms-the body); **Writing** (Formal and informal letters and Emails)
11. **Grammar** (Hypothesizing); **Vocabulary** (Word pairs); **Reading** ('Have you ever wondered'? -the answers to some important questions in life); **Listening** (The interpretation of dreams-paul's amazing dream); **Speaking** (Practicing a conversation and describing your dreams); **Everyday English** (Moans and groans); **Writing** (narrative writing 2)
12. **Grammar** (Articles); **Vocabulary** (Hot words-life and time); **Reading** ('you are never too old'-A life in the day of Mary Hobson, who gained her PhD aged); **Listening** (happy days-people talk about what make them happy and unhappy); **Speaking** (Discussion-the different ages of life, and their pros and cons); **Everyday English** (Linking and commenting); **Writing** (Adding emphasis in writing)

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Develop academic essay writing proficiency
2. Promote reading skills
3. Expand academic vocabulary through reading
4. Promote speaking ability through group discussions and debates
5. Promote critical thinking skills

ENG012 Management and Leadership Skills (2-2-0-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course is designed for engineering students who are interested in advancing into management and leadership roles. You will gain a perspective on what it is like to be an engineering leader. You will develop awareness of your own strengths and weaknesses as a leader when you are placed in charge of a project. You will learn how to leverage your strengths and control your weaknesses. You will also learn how to manage relationships with your team members and how to set up a creative environment for your team to motivate each team member to reach his or her potential. You will also learn how to deal with different ethical issues that are related to engineering field.

Recommended Textbook(s):

- Benator, Barry and Thumann, Albert "Project Management and Leadership Skills for Engineering and Construction Projects." 2003, The Fairmont Press, Inc., USA
- Fleddermann, C. B. (2012). Engineering Ethics. Upper Saddle River, NJ: Prentice Hall.
- Code of Ethics- Iraqi Engineers Association

Prerequisites:

None

Course Topics:

1. Introduction to leadership
2. Leadership and management styles
3. Effective team leadership
4. Practical Implementation
5. Communication
6. Leadership and management styles
7. Professional Ethics
8. Introduction to Engineering Ethics
9. Ethical Issues in Engineering Practice
10. Steps in Confronting Moral Dilemmas
11. Case Studies

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Explain the basic concepts of leadership.
2. Build power and influence.
3. Add value to their sphere of influence
4. Give and receive feedback, actively listen, provide supportive communication, and coach and counsel their team members.

College Requirements Courses

ENG003 Calculus I (3-3-1-0)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

Calculus is the branch of mathematics that deals with the finding and properties of derivatives and integrals of functions, by methods originally based on the summation of infinitesimal differences. Mainly, calculus I deals with the following subjects: Limits and continuity. Differentiation. Applications of derivatives. Integration. Inverse functions. Applications of the Integral.

Recommended Text Book:

- Calculus, Early Transcendental by James Stewart, 8th Edition, 2016, Cengage Learning.

Prerequisites: None

Course Topics:

1. Functions and Inverse functions
2. The Tangent and Velocity Problems. The Limit of a Function
3. Calculating Limits Using the Limit Laws. Continuity
4. Limits at Infinity, Horizontal Asymptote. Infinite Limits, Vertical Asymptotes
5. The Derivative as a Function. Differentiation of Polynomials. The Product and Quotient Rules
6. Derivatives of Trigonometric Functions. The Chain Rule
7. Implicit Differentiation. Related Rates
8. How Derivatives Affect the Shape of a Graph. Maximum and Minimum Values.
9. The Mean Value Theorem and Summary of Curve Sketching
10. Optimization Problems. Anti-derivatives
11. The Definite Integral, Fundamental Theorem of Calculus
12. The Indefinite Integral and Net Change Theorem. The Substitution Rule.
13. Areas between Curves, Volumes. Volumes by Cylindrical Shells. Average Value of a Function
14. Integrals Involving Logarithmic Functions. Exp Functions. Derivative and Integrals Involving Inverse Trig Functions. Hyperbolic Functions and Hanging Cables.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Solve problems using the Fundamental Theorem of Calculus.
2. Evaluate Limits of the functions and their continuity.
3. Find the derivative of algebraic, trigonometric, exponential, and logarithmic functions.
4. Sketch the graph of a function using the information for the first and second derivatives
5. Solve problems involving applications of integrals including finding volume of solids of revolution and area between curves.

ENG004 Calculus II (3-3-1-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course introduces the fundamental theorem of calculus such as integration by definition, integration techniques, solving various integration problems, applications of integrals, sequence and series.

Recommended Text Book:

- Stewart, J., Clegg, D. K., & Watson, S. (2020). *Calculus: early transcendentals*. Cengage Learning.
- Thomas, G. B., Haas, J., Heil, C., & Weir, M. (2018). *Thomas' Calculus*. Pearson Education Limited.
- Kreyszig, E., Stroud, K. and Stephenson, G., 2008. Advanced engineering mathematics. *Integration*, *9*(4).

Prerequisites:

- ENG003 Calculus I

Course Topics:

1. Principles of Integration, Integral Methods, Integration Techniques - Integration by Parts
2. Integration Techniques - Trigonometric Integrals, Integration Techniques - Partial Fractions
3. Integration Techniques - Partial Fractions, Applications of Integrals - Infinite Integral Areas.
4. Applications of Integrals - Arc Length, Surface area, Applications of Integrals – Volumes (Disk, Washer, Shell)
5. Polar Coordinates - Common Polar Coordinate Graphs, Polar Coordinates - Tangents with Polar Coordinates, Curves defined by parametric equations. Polar Coordinates - Tangents with Polar Coordinates, Curves defined by parametric equations.
6. Sequences and Series.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Evaluate of definite, indefinite and improper integrals by using different integration techniques
2. determine arc length, surface area and volume by using the applications of integration techniques.
3. Define polar coordinate graphs and solve related problems including area, arc length and volume
4. Identify the properties of sequences and their limits with identifying standard convergent operations of power series.

ENG001 Physics (4-3-0-2)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

The course is a survey of the concepts, principles, methods and major findings of classical Physics. Primarily, it covers Newtonian mechanics, and thermal Physics, with topics include: Physics and measurement, Vectors, kinematics and dynamics of motion of a single particle in one and two dimensions, work and energy, system of particles, linear momentum and collisions, kinematics and dynamics of rotational motion, equilibrium of rigid bodies, and elasticity, fluid static and fluid dynamics, oscillatory motion, wave motion, and temperature and thermal equilibrium.

Recommended Text Book:

- R.D. Knight, Physics for Scientists and Engineers, 2nd ed., Pearson 2008.
- Serway - Physics for Scientists and Engineers with Modern Physics 10th ed 2019

For lab

- Laboratory Manual, Compiled by Instructor

Prerequisites:

Concurrent requirement with ENG003 Calculus I

Course Topics:

1- Physics and Measurement: Standards of Length, Mass and Time; Density of Atomic Mass**;** Dimensional Analysis**;** Conversion of Units**;** Estimate and Order of Magnitude Calculations**;** Significant Figures.

2- Motion in One Direction: Particle Model; Position, Velocity and Speed**;** Instantaneous Velocity and Speed**;** Acceleration**;** One-Dimensional Motion with Constant Acceleration**;** Freely Falling Object.

3- Vectors: Coordinate System**;** Vector and Scalar Quantity**;** Some Properties of Vectors; Adding Vectors; Subtracting Vectors; Component of Vectors and Unit Vectors

4- Motion in Two Dimension: The Position, Velocity and Acceleration Vectors; Two-Dimensional Motion with Constant Acceleration; Projectile Motion; Horizontal Range and Maximum Height of a Projectile; Uniform Circular Motion; Tangent and Radial Acceleration; Relative Velocity and Relative Acceleration.

5- The Laws of Motion: Newton's First Law and Inertial Frames**;** Mass; Newton's Second Law**;** The Gravitational Force and weight**;** Newton's Third Law; Forces and Friction; Experimental Observations

6- Circular Motion and Other Applications of Newton's Law: Non uniform Circular Motion; Resistance Force Proportional to Object Speed; Air Drag at High Speed.

7- Temperature: Zeroth Law of Thermodynamics; Thermometers and The Celsius Temperature Scale; The Constant Volume Gas Thermometer and The Absolute Temperature Scale; Thermal

Expansion and of Solids and Liquids; The Unusual Behavior of Water; Macroscopic Description of an Ideal Gas.

8- Energy and Energy Transfer: Work Done by Constant Force; The Scalar Product of Two Vectors; Work Done by Varying Force; Work DONE by a Spring; Kinetic Energy and the Work-Kinetic Energy Theorem; Conservations of Energy; Situations Involving Kinetic Energy; Power; Energy and the Automobile

Lab Section

Mechanical Physics Experiments

1- Determination The Density of Solid Materials

2- Verification of Hooks Law

3- Determination the Value of Gravity Acceleration (Simple Pendulum)

4- Determination the Coefficient of Viscosity

5- Measurement of Liquid Density

6- Verification of Newton's Second Law

7- Verification of continuity Equation

8- Determination the Mechanical Equivalent of Heat

9- Determination the Specific Heat Capacity of a Solid

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. describe the translational motion of a single particle in terms of position and inertial frames, inertia, velocity, acceleration, and force.
2. describe the rotational motion of a rigid body using the concepts of rotation angle, angular velocity, angular acceleration, angular momentum, moment of inertia, and torque.
3. Identify the forces acting on ordinary mechanical systems to be gravity and electromagnetics (Drag force, frictional force, normal force, etc.).
4. Define what is meant by: temperature, specific and molar capacity of heats.

ENG002 Chemistry (4-3-0-2)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course introduces the students to the basic principle of chemistry and chemical calculations, including mass relations in chemical reactions.

Recommended Textbook(s):

- Introductory Chemistry Essentials, Nivaldo J. Tro
- Chemistry. Steven S. Zumdahl, Susan A. Zumdahl, Donald J. DeCoste

Prerequisites:

- Concurrent requirement with ENG003 Calculus I

Course Topics:

1. Measurements. Handling Numbers. Dimensional Analysis in Solving Problems Recognize chemical safety and hazardous materials icons, and apply laboratory safety rules.
2. Atomic Number, Mass Number, and Isotopes. The Periodic Table.
3. Molecules and Ions. Describe laboratory instruments and some basic techniques used in the chemistry laboratory, including balances and standard volumetric equipment.
4. Chemical Formulas. Naming Compounds. Atomic Mass. Avogadro's number and Molar Mass of an Element. Describe and use UV/VIS spectrophotometric methods of analysis.
5. Molecular Mass. The Mass Spectrometer. Percent Composition of Compounds. Experimental Determination of Empirical Formulas. Chemical Reactions and Chemical Equations. Describe how to Prepare accurate laboratory reports of their experimental results.
6. Amounts of Reactants and Products. Limiting Reagent Calculations. Reaction Yield.
7. General Properties of Aqueous Solutions. Precipitation Reactions. Acid-Base Reactions. Oxidation-Reduction Reactions.
8. Concentration of Solutions. Acid-Base Titrations. Gases. Pressure.
9. The Ideal Gas Equation. Gas Stoichiometry. Partial Pressures
10. The Nature of Energy and Types of Energy. Energy Changes in Chemical Reactions. Introduction to Thermodynamics.
11. Enthalpy of Chemical Reactions. Calorimetry. Standard Enthalpy of Formation and Reaction.
12. From Classical Physics to Quantum Theory. Bohr's Theory of the Hydrogen Atom. Quantum Numbers. Atomic Orbitals.
13. Electron Configuration. Development of the Periodic Table. Periodic Classification of the Elements. Periodic Variation in Physical Properties.
14. Ionization Energy. Electron Affinity. Lewis Dot Symbols. The Ionic Bond. The Covalent Bond. Electro negativity. Writing Lewis Structures. Formal Charge and Lewis Structures.
15. The Concept of Resonance. Exceptions to the Octet Rule. Bond Energy. Molecular Geometry. Dipole Moment. Spectrophotometric Analysis of tetracycline

16. Valence Bond Theory. Hybridization of Atomic Orbital's. Hybridization in Molecules Containing Double and Triple Bonds. Delocalized Molecular Orbital's**.**

Lab. Section

1. Lab 1: Determine the concentration of the sodium hydroxide (NaOH) solution by titrating it with a standard solution of hydrochloric acid (HCl)
2. Lab 2: Determine the concentration of the acetic acid by titrating it with a standard solution of sodium hydroxide
3. Lab 3: Determine the concentration of the hydrochloric acid by titrating it with a standard solution of sodium carbonate (Na_2CO_3)
4. Lab 4: Determine the concentration of sodium carbonate (Na2CO3) and sodium bicarbonate (NaHCO3) in a mixture, titrating it with a standard hydrochloric acid solution.
5. Lab 5: Measurement of turbidity in a water sample with discussion
6. Lab 6: Density Measurements
7. Lab 7: Viscosity Measurements

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Provide a thorough understanding and principles of chemistry.
2. Provide a thorough understanding practical applications of chemical analysis, Chemical bonding and molecular geometry.
3. Provide a thorough understanding and practical applications of Stoichiometry.

ENG005 Fundamentals of Electrical Engineering (3-2-1-2)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course provides an introduction to fundamental concepts of electrical circuits, including circuit analysis techniques, circuit components, and basic circuit laws. Through theoretical discussions, practical examples, and hands-on laboratory experiments, students will develop a solid understanding of DC and AC circuits, circuit analysis methods, and circuit behaviors.

Recommended Textbook(s):

- "Electric Circuits" by James W. Nilsson and Susan A. Riedel (or equivalent)
- Alexander and Sadiku "Fundamentals of Electric Circuits" Third Edition McGraw Hill.
- Lab kit for hands-on experiments
- Multimeter and basic circuit components

Prerequisites: None

Course Topics:

1. Introduction to Electrical Circuits. - Overview of electrical circuits. - Basic circuit elements: voltage source, current source, resistor, capacitor, inductor. - Circuit variables: voltage, current, resistance, capacitance, inductance. - Circuit analysis techniques: Kirchhoff's laws, Ohm's law
2. Circuit Analysis Techniques (Part 1). - Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL). - Series and parallel circuits analysis. - Voltage and current division. - Node and mesh analysis. Circuit Analysis Techniques (Part 2). - Thevenin and Norton equivalent circuits - Superposition theorem. - Maximum power transfer theorem. - Source transformation Capacitors and Inductors. - Capacitance and capacitors. - Inductance and inductors - Capacitive and inductive circuits. - Transient analysis of RC and RL circuits. Time Domain Analysis. - Step response of RC and RL circuits. - Time constants and their significance - Charging and discharging of capacitors. - RL circuit response to sudden changes
3. Alternating Current (AC) Fundamentals - Introduction to AC circuits - Sinusoidal waveforms - Phasors and complex numbers in AC analysis - Impedance and admittance AC Circuit Analysis (Part 1) - Series and parallel AC circuits - Impedance matching. - Resonance in AC circuits. - Power in AC circuits
4. AC Circuit Analysis (Part 2) - Three-phase circuits. - Delta and wye configurations - Power factor correction. - Transformer basics
5. Frequency Response and Filters. - Frequency response of circuits. - Passive and active filters. - Bode plots. - Filter design considerations.
6. Operational Amplifiers (Op-Amps). - Introduction to operational amplifiers - Ideal op-amp characteristics. - Inverting and non-inverting amplifier configurations - Summing amplifier, difference amplifier, integrator, differentiator. Feedback and Oscillators - Feedback in amplifiers. - Positive and negative feedback. - Oscillator circuits: LC oscillators, RC oscillators, crystal oscillators. - Stability criteria. Review and Applications. - Review of course concepts. - Application of circuit analysis techniques to real-world problems. - Discussion of future topics and advanced courses. - Final exam preparation and review

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Understand the Basic Concepts and System of units, voltage and current, circuit elements, voltage and current sources, electrical resistance, capacitance, inductance and conductance, power and energy.
2. Apply the knowledge of different methods of analyzing circuits to find the unknown quantity of circuits
3. analyze electric circuit using simulation software

Lab Section

1	Introduction to the LAB
2	Ohm's law
3	Kirchhoff's current and voltage law
4	series-parallel network
5	Superposition theorem
6	Thevenin's theorem
7	Norton's theorem
8	LAB final exam

UOA007 Computer science I-(3-2-1-2)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course introduces students to computer fundamentals-related issues such as chronological development of computers, computer main features, types of computers, computer components (input and output devices). In addition, this course introduces students to the computer safety-related issues and the required skills to deal with operating system. This course will also help students to have the required skills to produce an efficient Word document. Finally, skills related to production effective presentation using Microsoft power point is also covered during this course.

Recommended Textbook(s):

- Computer fundamentals and its office applications* by G.H. Abdulmajeed, Z.M. Abbood, and M.D. Al-Hasany, 2016

Prerequisites: None

Course Topics:

1. Computer development, types and purpose of use
2. Main features of computers
3. Components of computers (input & output devices)
4. Computer safety
5. Types of Operating systems
6. Window operating system
7. Microsoft Word (Basics)
8. Microsoft Word (tabs and ribbons)
9. Microsoft Word (Advanced topics)
10. Microsoft PowerPoint (Basics).

Program and Course Outcomes:

By the end of this course students will be able to:

1. Identify development of computers, type and features of computers.

2. Identifying different components (input and output devices) of computer

3. identifying various risks of computers (viruses, malware, adware, etc.) and how to deal with operating system of computers.

4. How to deal with Microsoft Word to produce an effective document (various tabs, commands, advanced skills)

5. Skill of using Microsoft PowerPoint to produce effective presentations.

6. Work productively with peers as a member of an engineering team to implement a project.

ENG007 Engineering Drawing (3-2-2-2)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course discusses the fundamental concepts of engineering graphics. It gives also an introduction to computer graphics using CAD software. The following topics are covered: Drawing conventions such as standards, line types and dimensioning; drawing of inclined and curved surfaces; deducting the orthographic views from a pictorial; drawing full and half sections; deducting an orthographic view from given two views; pictorial sketching (isometric and oblique).

Recommended Textbook(s):

- Engineering Graphics for Degree, K.C.John, 7th ed, 2014
- Engineering drawing, A.W.Boundy, second edition.
- Engineering drawing, Abdul Rasul Khafaf, 1986

Prerequisites: None

Course Topics:

1. Introduction: graphic language, standards, instruments, letters…etc
2. Basics for interpreting drawings, line types, types of drawings and sketches
3. Rules for using calipers to draw circles
4. Engineering processes and their application for drawing geometric shapes
5. Orthographic views. Deducing front, top, and side views from a pictorial Dimensioning and Drawing Scale
6. Sectional views: full and half sections
7. Drawing a missed view from given two views
8. Pictorial sketching: isometric and oblique
9. Applications on the computer using the AutoCAD program

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Recognize the value of engineering graphics as a language of communication.
2. Infer the nature of engineering graphics, the relationships between 2D and 3D environments.
3. Visualize, comprehend, and deduce wide variety of objects, drawing the missing views/section views, and orthographic projections of an object.
4. Produce two- and three-dimensional drawings utilizing CAD software.

ENG006 Engineering Mechanics (Statics) (3-3-1-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course provides the student with a clear and thorough presentation of the theory and application of engineering mechanics: statics. Topics include calculating force systems resultants; applying equilibrium condition of particles and rigid bodies; analysis of simple trusses; calculating and sketching internal forces diagrams; solving statics problems involving friction; calculating center of gravity, centroids, and moment of inertia.

Recommended Textbook(s):

- R.C. Hibbeler, Engineering Mechanics: Statics, Prentice Hall, 12th ed., 2010.

Prerequisites:

- ENG003 Calculus I, ENG001 Physics

Course Topics:

1. Definition of vectors in 2D and 3D, Physical examples
2. Scalar and vector products, Analytical methods and graphical interpretation
3. Definition of moments and couples, Couples in 2D and 3D systems
4. Force systems with couples
5. Resultant and equivalence of 3D force system
6. Resultant and equivalence of 3D force system
7. Systems with couples' Analytical solutions
8. Concept of free body diagram (FBD)
9. Equations of equilibrium in 2D and 3D
10. Equilibrium of rigid bodies
11. Equilibrium of frames
12. Equilibrium of trusses
13. Friction

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Use scalar and vector principles to find resultants of various force systems and solve equilibrium problems of particles and rigid bodies.
2. Use fundamental concepts of structure analysis to analyze simple trusses and frames and find internal forces throughout structural members.
3. Apply mathematical theorems and methods to determine center of gravity, centroids, and moment of inertia of various shapes and areas.

ENG008 Calculus III (3-3-1-0)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course is aiming to prepare the student to understand many topics that related to the future study and in practicing the civil engineering afterwards. It includes introduction; Vector calculus. Functions of several variables. Differentials and applications. Double and triple integrals.

Recommended Textbook(s):

- Calculus, 8th edition (2007) by Howard Anton, (John Wiley & Sons, Inc, New York).
- Calculus, by H. Anton, I. Bivens, and S. Davis, 8th Edition, 2002, Wiley

Prerequisites:

- ENG004 Calculus II

Course Topics:

1. Rectangular Coordinate systems in 3-space. Vectors
2. Dot product, projections. Cross product
3. Change of parameters, Arc Length. Unit Tangent, Normal and Binormal vectors, Curvature Quadric Surfaces. Functions of two or more variables
4. Limits and continuity. Partial derivatives
5. Differentiability, Local Linearity. The Chain rule.
6. Directional derivatives and gradients. Tangent planes and normal vectors
7. Maxima and minima of functions of two variables. Lagrange multipliers
8. Double integrals. Double integrals over non rectangular regions
9. Double integrals in polar coordinates. Triple integrals

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Recognize the 3-space in different types of coordinates systems
2. Do operations on vectors
3. Identify the basic properties of the real-valued functions of several variables.
4. Recognize maxima and minima of functions of two variables. Lagrange multipliers
5. Evaluate multiple integrals in different types of coordinates systems

ENG009 Calculus IV (3-3-1-0)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

The laws of nature are expressed as differential equations. Scientists and engineers must know how to model the world in terms of differential equations, and how to solve those equations and interpret the solutions. This course focuses on linear differential equations and their applications in science and engineering.

Recommended Textbook(s):

- Fundamentals of Differential Equations bound with IDE CD (5th Edition) by Nagle, Saff and Snider
- Differential Equations with Boundary-Value Problems, seventh edition. Dennis G. Zill, Michael R Cullen. Copyright 2009, Brooks/Cole. ISBN-13: 978-0-495-10836-8
- Differential Equations with Boundary-Value Problems Student Solutions Manual. Warren S. Wright, Dennis G. Zill, Carol D. Wright. Copyright 2009, Brooks/Cole Publishing Company. ISBN 978-0-495-38316-1.

Prerequisites:

- ENG008 Calculus III

Course Topics:

1. Introduction to Differential Equations
2. First-Order Differential Equations
    - Solution curves without a solution.
    - Direction fields,
    - Autonomous first-order differential equations
    - Separation of variables
    - Linear equations
    - Exact equations
    - Solutions by substitutions
3. Higher-Order Differential Equations
4. Series Solutions of Linear Equations
5. The Laplace Transform
6. Systems of Linear First-Order Differential Equations

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to solve:

1. Model a simple physical system to obtain a first order differential equation.
2. Test the plausibility of a solution to a differential equation (DE) which models a physical situation by using reality-check methods such as physical reasoning, looking at the graph of the solution, testing extreme cases, and checking units.
3. Visualize solutions using direction fields and approximate them using Euler's method.
4. Find and classify the critical points of a first order autonomous equation and use them to describe the qualitative behavior and, in particular, the stability of the solutions.

ENG010 Engineering Statistics (3-3-0-0)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course deals with: Classification of Data. Graphical representation. Arithmetical description. Probability theory, Probability of an event and composite events. Addition rule and multiplication rule, independent events. Counting techniques. Random variables and probability distributions. Expected values. Continuous and discrete random variables. Normal distribution. Binomial distribution. Poisson distribution. Joint and marginal probability distributions. Independence of random variables. Covariance and correlation. Random sampling. Unbiased estimates. Statistical intervals and test of hypothesis for a single sample.

Recommended Textbook(s):

- William Mendenhall and Terry Sincich, Statistics for Engineering and the Sciences, Prentice Hall,
- . Elementary Statistics: A Step-by-Step Approach, by Allan G. Bluman, 6th edition

Prerequisites:

- ENG004 Calculus II

Course Topics:

1. Introduction
2. Data Summary and Presentation
3. Tendency measurement.
4. Application of tendency measurement
5. Probability: Addition rule, conditional probability, multiplication rule and Bayes Theorem
6. Discrete random variables. Probability mass function. Mean and variance of discrete random
7. variables
8. Probability Distribution functions: Uniform, Binomial, Geometric and Negative Binomial,
9. Hyper-geometric and Poisson Distribution.
10. Normal Distribution. Approximation to Binomial and Poisson Distribution. Exponential
11. distribution. Other continuous distributions.
12. Joint probability function. Multiple discrete and continuous random variables
13. Parameter estimation. Properties of estimators. Method of Moments
14. Correlation
15. Interval estimation. Inference on the mean of a population: variance known or unknown.
16. Inference on the variance of a normal population
17. Hypothesis testing about the mean and Proportion: Small and Large Sample

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:
1. Differentiate between a random process and a deterministic process.
2. Deal with sampled data; analyse it using several measures, and present it graphically.
3. Be familiar with probability theory and its applications.
4. Link the normal distribution to many populations in practice.
5. Judge statistical hypotheses by carrying statistical tests, using different significance levels.

ENG011 Engineering Numerical Methods (3-2-1-2)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

The numerical methods course involves solving engineering problems drawn from all fields of engineering. The numerical methods include: error analysis, roots of nonlinear algebraic equations, solution of linear and transcendental simultaneous equations, matrix and vector manipulation, curve fitting and interpolation, numerical integration and differentiation, solution of ordinary and partial differential equations.

Recommended Textbook(s):

- S. C. Chapra and R. P Canale, "Numerical Methods for Engineers", 6th edition 2010, McGraw-Hill.

Prerequisites:

- UOA007 Computer Science I, ENG009 Calculus IV

Course Topics:

1 Introduction, General concepts of numerical method, General definition of the types of numerical error
2 General definition of the types of numerical error, Roots
3 Roots
4 Roots, Solving system of linear equations
5 Curve Fitting, Polynomial Interpolation
6 Polynomial Interpolation, Integration and differentiation
7 Ordinary differential equation

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Be aware of the mathematical background for the different numerical methods introduced in the course.
2. Understand the different numerical methods to solve the algebraic equations and to solve system of linear and nonlinear equations.
3. Understand the different numerical methods for interpolation, differentiation, integration and solving set of ordinary differential equations.
4. Understand how numerical methods afford a mean to generate solutions in a manner that can be implemented on digital computers.
5. Use and create functions in MATLAB and EXCEL for solving numerical engineering problems.

CIV025 Final Year Project I (3-2-0-2)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

Problem statement, design concept, simulation work and hardware concept, or field work carried out in accordance with a preapproved project plan under the supervision of faculty member(s).

Recommended Textbook(s):

By Topics

Prerequisites:

By Topics

Course Topics:

- Topics will vary in accordance with the specific project assigned.
- Topics common to all projects:

1. Environmental Impacts
2. Transportation impact analysis
3. Economic project analysis
4. Professional Ethics
5. Safety issues

Program and Course Outcomes:

- to guide the students such a way that the students carry out a comprehensive work on the chosen topic which will stand them in good stead as they face real life situations.

CIV030 Final Year Project I (3-2-0-2)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

Continuation of CE 4332 work-Analytical, design, experimental, or field work carried out in accordance with a preapproved project plan under the supervision of faculty member(s).

Recommended Textbook(s):

By Topics

Prerequisites:

By Topics

Course Topics:

- Topics will vary in accordance with the specific project assigned.
- Topics common to all projects:

1. Environmental Impacts
2. Transportation impact analysis
3. Economic project analysis
4. Professional Ethics
5. Safety issues

Program and Course Outcomes:

- to guide the students such a way that the students carry out a comprehensive work on the chosen topic which will stand them in good stead as they face real life situations.

DEPARTMENT REQUIREMENTS COURCES

CIV001 Building Materials (3-2-1-2)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course covers, internal loading and stresses, axial and shear stresses, thin-walled pressure vessels, material properties, Strains, axial deformation, Hook's law, statically indeterminate members, Stresses due to temperature, Internal forces in beams (S.F.D & B.M.D).

Recommended Textbook(s):

- Kenneth N. Derucher, George P. Korfiatis, and A. Samer Ezeldin, Materials for Civil and Highway Engineers, Prentice Hall, 4th ed., 1998.
- Laboratory Manual, Compiled by Instructor

Prerequisites: None

Course Topics:

1 Introduction
2 Engineering materials.
3 Brick, Production of bricks, Testing of brick, Specification of bricks.
4 Binding materials, Gypsum, Lime
5 Wood, Defects of wood, Uses of wood,
6 Cement, Production of cement, Types of cement, Testing of cement,
7 Finishing materials, Paints
8 Insulating material,
9 Tiles
10 Metals (steel)
11 Building stone,
12 Glass Building block
13 Concrete block
14 Sanitary works, Pipes.
15 Water, New building materials

Program and Course Outcomes:
By the end of successful completion of this course, the student will be able to:
1. learn about the various materials, both conventional and modern, that are commonly used in civil engineering construction.
2. Identify the criteria for choice of the appropriate materials and the various tests for quality control in the use of these materials.
3. conduct tests for quality control in the use of these materials.

Lab Section

1. Compressive Strength of Brick
2. Absorption of Brick
3. Effloresces of Brick
4. Compressive Strength of Gypsum
5. Modulus of Rapture of Gypsum
6. Extension of Gypsum
7. Standard Consistence of Gypsum
8. General Shape of Tiles
9. Modulus of Rapture of Tiles
10. Tensile Strength of Steel Reinforcement

CIV005 Concrete Properties (4-3-1-2)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

The current course is designed for the undergraduate students in order to provide them with a well understanding of both properties of concrete (in fresh and hardened stages) as well as its raw materials.

Recommended Textbook(s):

- Neville, A. M. 2011. Properties of Concrete, London, Pearson Education Limited. or any Edition.
- Mehta, P. K. & Monteiro, P. J. M. 2006. Concrete: Microstructure, properties and materials, McGraw-Hill.

Prerequisites:

- ENG002 Chemistry, CIV001 Building Materials

Course Topics:

1. Introduction and general backgrounds
2. Cement, production and types
3. Cement, chemical and physical properties
4. Aggregate of concrete, classification and mechanical properties
5. Aggregate of concrete, physical properties and sieve analysis
6. Water in concrete works and mixing of concrete
7. Admixtures of concrete
8. Properties of fresh concrete
9. Design of concrete mixes
10. Strength of concrete
11. Elasticity of concrete
12. Volume changes in concrete (swelling and shrinkage)
13. Durability of Concrete and Special types of concrete

Lab Section:

1. Cement, standard consistency test
2. Cement, initial and final setting test
3. Cement, compressive strength test
4. Aggregate, sampling of aggregate
5. Aggregate, some physical and mechanical properties
6. Aggregate, sieve analysis
7. Fresh concrete, preparation of fresh concrete mix

8. Fresh concrete, mix design trial mix
9. Fresh Concrete, Flow, slump and compacting factor test
10 Hardened concrete, compressive strength test
11 Hardened concrete, tensile strength test
12 Hardened concrete, flexural strength test
13 Hardened concrete, modulus of elasticity

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Deeply understand the fundamentals properties of concrete and its raw materials.
2. Introduce or propose critical thoughts in how to develop the characterizations of the concrete and its raw materials based on point number 1.
3. Prepare and conduct most of the important tests for the concrete and its raw materials. (This is from theoretical background and Concrete Lab. works).
4. Deal with the problems of the concrete and its raw materials. This includes the concrete problems in fresh and hardening stages.
5. Develop different research skills in the course topics at BSc level.
6. Introduce critical thoughts in how to develop/invent new types of concrete or cement.

CIV009 Building Construction (3-2-1-2)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course is aiming to provide student with fundamental information that would be needed during the study as an engineering student and also to prepare the student to understand many topics that related to the future study and in practicing the civil engineering afterwards. It includes introduction; land work; foundation work; brick and wall work and finishing work.

Recommended Textbook(s):

- B.C. Punmaia 'Building construction' reprinted 2005
- R. Chudley 'building construction handbook, 7th edition, 2008

Prerequisites:

- CIV001 Building Materials, CIV005 Concrete Properties

Course Topics:

1. Introduction to building construction including stages of construction and buildings type
2. Earthwork: excavations and earth filling
3. Footing and foundation
4. Piles: uses and types
5. Concrete works: mixing, transport, pumping, compaction, finishing and curing
6. Brickwork
7. Walls: types and function
8. Floors and roofs
9. Arches, lintels and sills
10. Damp proofing
11. Doors and windows
12. Joints in buildings
13. Structural drawing

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. know about basic of construction wall, footing, stair and slab
2. know about the basic of form work and finishing work
3. learn skills about reading and drawing construction building such as R.C element details, plane of building
4. ability to do projects about construction
5. know about new materials that used in construction and also new constructed techniques.

CIV002 Engineering Geology (3-2-1-2)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course introduces the students to the Fundamental engineering geology and their applications in civil engineering. This course covers the following topics:- Introduction and Overview: engineering geology vs. geology, engineering geology and civil engineering, Introduction and Architecture of the earth surface, Minerals properties, Rocks: major rock groups Igneous, sedimentary and metamorphic, Engineering Properties of Rocks, Structural Geology and Strike and dip, Folds, Faults: types and structures, Joints, Topographic and Geologic maps, and Ground-water Geology.

Recommended Textbook(s):

- West, T. R. (1995). Geology Applied to Engineering. 1st Edition. Waveland Pr Inc.
- Bell, F. G. (2007). Engineering Geology. 2nd Edition. Butterworth Heinemann is an imprint of Elsevier.

Prerequisites: None

Course Topics:

1. Introduction and Overview: engineering geology vs. geology
2. Minerals properties
3. Igneous Rock
4. Surface Processes and Sedimentary Rocks
5. Metamorphic rocks
6. Engineering Properties of Rocks
7. Structural Geology
8. Topographic and Geologic maps
9. Ground-water Geology

Lab Section:

1. Lab 1: Minerals description
2. Lab 2: Minerals classification
3. Lab 3: Rocks description
4. Lab 4: Rocks classification
5. Lab 5: 6. Volume & Density measurement of rocks
6. Lab 6 Specific Gravity & porosity measurement of rocks
7. Lab 7: Uniaxial Compressive Strength
8. Lab 8: Drawing Engineering Geological Maps

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Demonstrate an understanding of the concepts and language of geology and engineering geology.
2. Demonstrate an understanding of architecture of the earth surface.
3. Demonstrate an understanding of minerals properties.
4. Demonstrate an understanding of Rocks: major rock groups Igneous, sedimentary and metamorphic.
5. Demonstrate an understanding of Engineering Properties of Rocks.
6. Demonstrate an understanding of Structural Geology and Strike and dip, Folds, Faults: types and structures, Joints.
7. Demonstrate an understanding of Topographic and Geologic maps and Ground-water Geology.

CIV010 Fluid Mechanics (3-2-1-2)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course introduces the student to fluid mechanics' concepts and fundamentals. The course also includes the topics such as Properties of fluids, Fluid Statics, Momentum and energy equations and applications. Bernoulli equation and applications, Dimensional analysis and similitude, Introduction to viscous flows and boundary layers, internal flows, laminar and turbulent flows, Head loss and friction factor, Flow over immersed bodies (external flow), and Lift and drag.

Recommended Textbook(s):

- Fluid Mechanics (Arabic) by Ni'ama Imara
- Fluid Mechanics by Streeter

Prerequisites:

- CIV006 Dynamics, ENG001 Physics

Course Topics:

1. Introduction in Fluid Mechanics
2. Dimensions and Units systems
3. The fundamental properties of fluids
4. Fluids in Statics
5. Pressure measurements and Manometers
6. Hydrostatic forces on flat surfaces
7. hydrostatic forces on curved surfaces
8. Fluid Kinematics
9. Derive, describe and apply Bernoulli's equation.
10. State the applications of Momentum equation.
11. Define friction and friction factor, pipe head loss, apply the Moody Diagram and determine minor losses.
12. Solve problems involving pipe networks and pumps
13. Derive a relationship among different parameters related to Fluid, Flow, and geometric properties by Dimensional Analysis.
14. Describe the open channels and types of flow.

Lab Section

1 Burden Gauge
2 Centre of pressure
3 Flow through Venturi-meter
4 Flow types in Pipes
5 Flow through an Orifice
6 Impact of Jet
7 Flow over Weirs

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Describe the SI unit system and convert units & explain the fundamental properties of fluids.
2. Understand Fluid Statics, pressure measures and hydrostatic forces.
3. Derive, describe and apply Bernoulli's equation and Momentum equation.
4. Understand the dynamics of fluid flows and the governing parameters.

5. Define friction and friction factor, pipe head loss, apply the Moody Diagram and determine minor losses.

CIV006 Dynamics (3-3-1-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course includes fundamental concepts of kinematics and kinetics with application of particles and plane motion of rigid bodies, Rectilinear and curvilinear motion of particles. Newton's second law, impulse and momentum methods, impact, Dynamics of systems of particles, Kinematics of rigid bodies. Plane motion of rigid bodies: Forces and accelerations.

Recommended Textbook(s):

- R.C. Hibbeler, Engineering Mechanics: Dynamics, Prentice Hall, 14th ed., 2016.

Prerequisites:

- ENG001 Physics, ENG006 Engineering Mechanics (Statics)

Course Topics:

1. Kinematics of a Particle:
   - Continuous and Erratic Rectilinear Kinematics
   - General Curvilinear Motion + Motion of a Projectile
   - Absolute Dependent Motion Analysis of Two Particles + Relative-Motion of Two Particles Using Translating Axes
2. Planar Kinematics of a Rigid Body:
   - Translation and Rotation about a Fixed Axis
   - Absolute Motion Analysis
   - Relative-Motion Analysis: Velocity and Acceleration
3. Kinetics of a Particle:
   - Newton's Second Law of Motion and The Equation of Motion (Rectangular Coordinates, and Normal and Tangential Coordinates)
   - The Work of a Force and Principle of Work and Energy
   - Power and Efficiency + Conservative Forces and Potential Energy
   - Conservation of Energy
   - Principle of Linear Impulse and Momentum
   - Conservation of Linear Momentum for a System of Particles
   - Impact

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Use rectangular, normal-tangential, and polar coordinate systems to describe the motion (kinematics) of a particle, system of particles, and rigid bodies.
2. Use Newton's Second Law, Work-Energy, and Impulse-Momentum principles to determine the kinetics of particles, systems of particles, and rigid bodies.
3. Understand and solve introductory vibration problems.
4. Apply the above principles, continue to develop a systematic, orderly procedure for solving engineering problems and design mechanical device using their knowledge in Dynamics.

CIV004 Strength of Materials I (3-3-1-0)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course covers, internal loading and stresses, axial and shear stresses, thin-walled pressure vessels, material properties, Strains, axial deformation, Hook's law, statically indeterminate members, Stresses due to temperature, Internal forces in beams (S.F.D & B.M.D).

Recommended Textbook(s):

- R.C. Hibbeler, Mechanics of Materials, Prentice Hall, 7th ed., 2007.

Prerequisites:

- ENG006 Engineering Mechanics (Statics)

Course Topics:

1 Introduction
2 Equilibrium
3 Stresses
4 Strain
5 Axial Load.
6 Torsion
7 Shear and bending moment diagrams

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Understanding the concepts of average stress and strain and relation between the two concepts
2. Identify and solve statically determinate and indeterminate problems in axial loading
3. Solve analysis and design problems related to mechanical material properties.
4. Understanding the torsion loading and resulted shear stresses in shafts.
5. Understanding the internal forces and moments and draw their diagrams in beams

CIV008 Strength of Materials II (3-2-1-2)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course covers, Internal forces in beams (S.F.D & B.M.D), bending stresses, Transverse shear stresses, Stress and strain transformations, Deflection in beams, Buckling of Columns.

Recommended Textbook(s):

- R.C. Hibbeler, Mechanics of Materials, Prentice Hall, 7th ed., 2007.

Prerequisites:

- CIV004 Strength of Materials I

Course Topics:

1 Shear and moment diagrams
2 Flexural stresses
3 Transverse stresses
5 Stress and strain transformations
6 Buckling of columns

Lab section:

1 Reactions
2 Tensile test
3 Torsion test
4 Deflection test

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Understand the concepts shear and bending moment diagrams.
2. Identify and solve problems for flexural stresses.
3. Solve problems for transverse shear stresses.
4. Understand the Stress and strain transformations.
5. Understand the buckling of column and impacts on column design.

CIV003 Engineering Surveying I (3-2-1-2)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course introduces knowledge about Chain surveying, Compass surveying, Levelling, Theodolite surveying and Engineering surveys.

Recommended Textbook(s):

- Charles D. Ghilani, Paul R. Wolf, Elementary Surveying, Prentice Hall, 12th ed., 2008.
- Chandra, A. M. Surveying Problem Solution with Theory and Objective Type Questions. New Age International, 2005.

Prerequisites:

- ENG004 Calculus II

Course Topics:

1. Basic Principle of Surveying
2. Distance Measurements Using Tape
3. Leveling—Theory and Methods
4. Distance Measurements Using Trigonometric & EDM
5. Angles, Azimuth, and Bearing
6. Traversing

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Develop an ability to solve surveying problems utilizing fundamental principles of Science and Engineering;

2. Expose students to the latest computational and measurement tools. This will be done as individuals and as members of student field survey teams;

3. learn to use equipment similar in type and quality to those professional surveyors use in their businesses;

4. Exhibit an understanding of the role of engineering surveyors in the civil and environmental engineering profession.

Lab Section

1. Measuring distances using pacing and conventional taping
2. levelling with an auto level and high rod
3. profile levelling
4. Measuring angles
5. total station

CIV007 Engineering Surveying II (3-2-1-2)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course introduces knowledge about areas and volumes. Then, it moves to horizontal curves and types of horizontal curves. In addition, this course demonstrates photogrammetry, GPS measurements and GIS.

Recommended Textbook(s):

- Charles D. Ghilani, Paul R. Wolf, Elementary Surveying, Prentice Hall, 12th ed., 2008.
- Chandra, A. M. Surveying Problem Solution with Theory and Objective Type Questions. New Age International, 2005.

Prerequisites:

- CIV003 Engineering Surveying I

Course Topics:

1. Areas
2. Volume computations.
3. Horizontal curves.
4. Vertical curves
5. Global Position System (GPS)
6. Basic principle of remote sensing
7. Introduction to Geographic Information System (GIS).

Lab section

1 Measuring distances using total station.
2 Area computation using total station.
3 Area computation (map)
4 Total station application.
5 Volume computation using total station.
6 Laying out of circular curve by deflection angles method.
7 GPS applications.

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Establish an ability to solve plane surveying problems by proper mathematics.
2. Provide the knowledge and skill in curve ranging.
3. Learn to apply total stations and other surveying equipment to make observations.
4. Develop an understanding of the basic principles of photogrammetry, geographic information system GIS and global position system GPS.

CIV011 Structures I (3-3-1-0)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course covers internal stresses in two-dimensional linearly elastic statically determinate structures and deflections of those structures. The concepts of shear force and bending moments in transversely loaded moment-carrying members are revisited and formalized. The construction of shear and moment diagrams for the relevant structures is studied. The analysis of statically determinate trusses is also taught, in detail, along with the classification of those particular structures. The concept of an influence line is introduced, and the construction of influence lines for different statically determinate structures is studied. The geometrical and the energy methods of calculating deflections of statically determinate structures are, also, studied.

Recommended Textbook(s):

- R.C. Hibbeler, Structural Analysis, Prentice Hall, 8th ed., 2007.
- Kenneth M. Leet, Chia-Ming Uang, Anne M. Gilbert, Fundamentals of Structural Analysis, McGraw-Hill, 4th ed., 2011.

Prerequisites:

- ENG006 Engineering Mechanics (Statics), CIV004 Strength of Materials I

Course Topics:

1. Basic concepts of equilibrium, stability and determinacy of structures
2. Analysis of statically determinate beams and frames
3. Analysis of statically determinate trusses
4. Influence lines of statically determinate structures
5. Deflections of statically determinate structures

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Understand the concept of axial force, shear force, and bending moment in the context of statically determinate structures, e.g. beams, frames and trusses.
2. analyze statically determinate beams and frames for internal forces.
3. analyze statically determinate trusses for internal forces.
4. Understand the concept of an influence line and construct influence lines for various structural functions of statically determinate structures.
5. Use influence lines to find maxima of those functions of interest to the structural engineers corresponding to different loading scenarios of statically determinate structures.
6. analyze statically determinate structures for deflections and rotations using geometrical and energy methods.

CIV016 Structures II (3-3-1-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

Structures II involves learning the basic principles and techniques of the analysis of linearly elastic statically indeterminate structures. The course commences by introducing the classical force methods, exemplified by the consistent deformation method, followed by the prominent classical slope-deflection equations and the iterative recast of which, the moment distribution method. Then the course closes by a primer in matrix structural analysis involving the matrix direct stiffness method for trusses and continuous beams. The course is entirely of engineering interest since engineering work for structural engineers involve a cycle of preliminary design, analysis and redesign of structural systems.

Recommended Textbook(s):

- R. C. Hibbeler, "Structural Analysis", 10th Edition in Si Units. Published by Pearson Education, Inc. or its affiliates, 2020.
- Kenneth M. Leet, Chia-Ming Uang, Anne M. Gilbert, Fundamentals of Structural Analysis, McGraw-Hill, 4th ed., 2011.

Prerequisites:

- CIV011 Structures I

Course Topics:

1. Deflections by virtual work method
2. Analysis of statically indeterminate structures by the force method
3. Analysis of statically indeterminate structures by the slope deflection method
4. Analysis of statically indeterminate structures by the moment distribution method

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. use the consistent deformations method (a force method) to analyze statically indeterminate linearly elastic structures.
2. use the slope-deflections equations (a displacement method) to analyze statically indeterminate linearly elastic structures.
3. use the moment distribution method (a displacement method) to analyze statically indeterminate linearly elastic structures.

CIV012 Reinforced Concrete Design I (3-3-1-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course introduced Material properties, Flexural theories, Un-cracked section, working stress method, Ultimate strength, Design and analysis of Singly Rectangular, doubly, T- section, irregular section beams, Shear analysis and design, Continuous beams, one way slab, short columns, long columns, Bond, anchorage, development length, Cracked and deflection.

Recommended Textbook(s):

- Arthur H. Nilson, David Darwin, Charles W. Dolan, Design of Concrete Structures, McGraw-Hill, 14th ed., 2004.

Prerequisites:

- ENG006 Engineering Mechanics (Statics), CIV004 Strength of Materials I
- Concurrent requirement with CIV011 Structures I

Course Topics:

1. Introduction and revision, materials and properties of concrete and reinforcing bars. ACI safety code provisions
2. Analysis and design of singly reinforced concrete beams.
3. Analysis and Design of doubly reinforced concrete beams
4. Analysis and design of T and L reinforced concrete beams
5. Analysis and design of beams for shear and diagonal tension
6. Analysis and Design of continuous beam for flexure using ACI coefficients method.
7. Design of singly reinforced irregular concrete beams.
8. Analysis and design of Reinforced Concrete solid one-way slabs.
9. Serviceability requirements of RC members

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. How to analyze the RC section using working stress method
2. How to design reinforced concrete beams for flexure and shear according ultimate strength method.
3. How to design reinforced concrete one-way and two-way slabs.
4. Achieve the serviceability requirements of RC members
5. Use ACI 318-19 code specifications in various design problems.

CIV017 Reinforced Concrete Design II (3-3-1-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course introduces knowledge about short column analysis and design, analysis and design of two-way slabs, Direct design method of two-way slabs, Equivalent frame method of two-way slabs.

Recommended Textbook(s):

- Arthur H. Nilson, David Darwin, Charles W. Dolan, Design of Concrete Structures, McGraw-Hill, 14th ed., 2004.

Prerequisites:

- **CIV012** Reinforced Concrete Design I

Course Topics:

1. Short Reinforced Concrete Compression Members
2. Short Concrete Columns
3. Design of Spiral Reinforcement
4. Reinforced Concrete Columns (Uniaxial Bending Design)
5. Reinforced Concrete Columns (interaction diagrams)
6. Reinforced Concrete Columns (Biaxial Bending)
7. Design of two-way slabs
8. Analysis and design of Two –way slabs
9. Lateral Moment Distribution by DDM
10. Equivalent Frame method
11. The yield line theory

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. learn how to analyze and design short column, two-way slabs.
2. learn the direct design and Equivalent Frame method,
3. learn the yield line theory

CIV013 Construction Management (3-3-0-0)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course inculcates the fundamental principles of construction planning and management as applicable in Civil Engineering Projects.

Recommended Textbook(s):

- كتاب إدارة المشاريع الانشائية للمؤلف احسان العطار ((عربي))
- principles of construction management – Roy Pilcher.

Prerequisites:

None

Course Topics:

1. Engineering Management
2. Construction Project Management
3. Control system in construction project
4. Programming construction projects ((project scheduling))
5. Method Of Planning/ Bar Chart Method
6. Net Work Analysis Method/ Activity on Arrow (A.O.A)
7. Net Work Analysis Method/ Activity on Nods (A.O.N)
8. Line Of Balance Method
9. Program Evolution Review Techniques Method
10. Time Grade Method
11. Crash Program
12. Resource Allocation

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Introduce a concepts of projects formulation
2. Impart the idea about planning and scheduling of activities.
3. Introduce the concepts of resource planning, allocation and control.
4. Provide a bird's eye view of optimization techniques.

CIV020 Engineering Economy (3-3-0-0)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course inculcates the fundamental principles of Engineering Economy as applicable in Civil Engineering Projects.

Recommended Textbook(s):

- Engineering Economy – R. Panneerselvam
- الادارة والاقتصاد الهندسي. د. انور نعيم قصيرة و د. جورج يوسف حلبي وحيدر اسماعيل اللعيبي

Prerequisites:

- ENG004 Calculus II

Course Topics:

1. Concept of Engineering Economics
2. Cash flow
3. Break-Even Analysis
4. Time Value of Money
5. Interest Formulas
6. Present worth method of comparison
7. Future worth method
8. Annual equivalent method
9. Rate of return method
10. Replacement and maintenance analysis
11. Depreciation
12. Inflation adjusted decisions

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Learn the basics of engineering economics.
2. Recognize the concepts of economic materials.
3. Expand understanding, knowledge and economic analysis.
4. Develop creative and critical thinking skills.

CIV014 Soil Mechanics I (3-2-1-2)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course introduces the students to the Fundamental engineering properties of soil and their applications in geotechnical engineering.

Recommended Textbook(s):

- Braja M. Das, Fundamentals of Geotechnical Engineering, Cengage Learning, 3rd ed., 2008
- Braja M. Das, Soil mechanics laboratory manual, Oxford University press, 6th ed, 2002

Prerequisites:

- CIV002 Engineering Geology, CIV004 Strength of Materials I, CIV010 Fluid Mechanics

Course Topics:

1 Origin of soil and grain size
2 Weight-volume relationships, plasticity, and structure of soil
3 Engineering classification of soil
4 Permeability and seepage permeability
5 In situ stresses
6 Stresses in soil mass
7 Consolidation of soil
8 Shear strength of soil
9 Soil compaction

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. understand the origin, formation, parameters and basic fundamental behavior of soils and have the knowledge of soil classification and be able to classify the soil using Unified Soil Classification System
2. understand the principles of soil compaction and the factors affecting soil compaction.
3. understand soil permeability and seepage theory and be able to analyze a seepage problem by flow net
4. understand the effective stress concept and be able to calculate effective stress in non-seepage and seepage problems and be able to calculate the vertical stress in soils caused by various types of loading
5. do the experiments and determine the Engineering and index properties of soils applied in field problems

Lab Section

1 General and safety instruction, how to prepare a report and its format
2 Water content determination (Oven drying method).
3 Grain size distribution – Sieve analysis.
4 Determination of Specific gravity by Pycnometer and density bottle method.
5 Determination of Liquid and Plastic limit (Casagrande method).
6 Determination of Shrinkage limit of soil
7 Determination of Permeability by Constant head method.
8 Determination of Permeability by Variable head method.
9 Determination of Compaction characteristics by standard test.
10 Determination of Compaction characteristics by modified test.
11 Determination of Field test

CIV018 Soil Mechanics II (3-2-1-2)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course introduces the students to the compressibility and shear strength of soil and their applications in geotechnical engineering

Recommended Textbook(s):

- Coduto D.P., Kitch W. A. and Yeung A. R., 2016, "Foundation design: Principles and practices", 3rd edition, USA, Pearson, ISBN 0-13-341198-3.
- Han J., 2015, "Principles and Practices of Ground Improvement", John Wiley & Sons, Inc., Hoboken, New Jersey.

Prerequisites:

- CIV014 Soil Mechanics I

Course Topics:

1. Introduction
2. One-dimensional consolidation theory
3. Calculation of settlement from one-dimensional
4. primary and secondary consolidation
5. Problems on consolidation
6. Time rate of consolidation
7. Problems on time rate of consolidation
8. Shear strength of soil and Mohr-Coulomb failure criteria
9. Determination of shear strength parameters from direct shear test and triaxial compression test
10. Pore water pressure parameters
11. Problems on shear strength

Lab section

1 Identification of problematic soils
2 Liquid and plastic limit of expansive soils
3 Shrinkage factors of cohesive soil
4 Laboratory compaction characteristics of soil
5 Density of soil in place by the sand replacement method
6 Unconfined compressive strength of improved soil
7 One-dimensional swell or collapse of soils
8 Direct shear test of improved soil under consolidated drained conditions

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. apply one-dimensional consolidation theory to calculate settlement and pore pressure as a function of time during consolidation.

2. apply the principles of shear strength of soils to various laboratory tests

3. perform experimental work and determine the compressibility and shear strength properties of soils applied in field problems

CIV015 Hydrology (3-3-1-0)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course is intended to provide the engineering student with the basic tools required to understand Hydrologic cycle, precipitation and runoff data, groundwater hydraulics, infiltration, peak runoff calculations, application to water resources problems.

Recommended Textbook(s):

- 1-Warren vissman , Introduction to hydrology, 5th ed, 2003.
- Ven Te Chow, Applied hydrology.
- Em. Wilson, Engineering hydrology

Prerequisites:

- CIV010 Fluid Mechanics. ENG010 Engineering Statistics

Course Topics:

1. Application of Hydrology in Engineering & Hydrologic cycle
2. Hydrologic cycle, return periods and water balance
3. Precipitation, types of precipitation and stream flow measurements
4. Precipitation, types of precipitation and stream flow measurements
5. Estimation of missed data, checking data consistency & Rainfall frequency analysis
6. Estimation of missed data, checking data consistency & Rainfall frequency analysis
7. Losses from precipitation, Evaporation, Factors affecting Evaporation, Measurement and estimation of Evaporation process
8. Losses from precipitation, Evaporation, Factors affecting Evaporation, Measurement and estimation of Evaporation process
9. Infiltration, Factors affecting infiltration, Measurement and estimation of infiltration process
10. Infiltration, Factors affecting infiltration, Measurement and estimation of infiltration process
11. Runoff, Classes of Runoff, Rainfall-Runoff Correlation, Estimating Runoff Volume, Estimation of Flood Peak Discharge
12. Hydrographs, Introduction and Unit Hydrographs

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Recognize hydrologic cycle, precipitation, streamflow measurements, return periods, aquifer and groundwater, design floods, and their relationships to engineering designs.
2. Understand the basics of statistical theories, the history of normal distribution, and their applications in frequency analysis for hydraulic designs.
3. learn the water infiltration and evaporation theory and their effects on estimating available water and flood analysis.
4. understand theories of unit hydrograph and applications on flood forecasts including peak discharge and time of peak occurrence.
5. learn theories of flood routing including reservoir and channel routing in flood forecasting.

CIV019 Traffic Engineering (3-3-1-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

Introduction of basic components of the traffic system and fundamentals of traffic engineering; analysis of traffic stream characteristics, levels of service and capacity of urban and rural highways; study of warrants for traffic control devices; design and analysis of traffic signals and timing plans; and analysis of urban and highway traffic characteristics.

Recommended Textbook(s):

- Nicholas J. Garber and Lester A. Hoel, Traffic and Highway Engineering, Cengage Learning, 4th ed. 2009 and 2010.

Prerequisites:

None

Course Topics:

1. Principles of Traffic Engineering
2. Traffic Stream Parameters
3. Macroscopic Parameters
4. Road Users Characteristics and Sight Distance
5. Primary Elements of Traffic Flow
6. Traffic Flow Theory
7. Speed Studies
8. Road Intersections
9. Intersection Control
10. Capacity and Level-of Service for Highway Segments
11. Traffic Signal

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Describe the character, elements and impacts of human factors and vehicle characteristics on traffic operations and safety;
2. Conduct and analyze the results of volume, speed, and delay studies to assess the performance of transportation infrastructure;
3. Design and analysis different traffic facilities.
4. Conduct a full traffic impact study resulting in the assessment and design of on and off-site mitigation.

CIV021 Hydraulic Structures (3-3-0-0)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course introduces the students to the Fundamental engineering design of hydraulic structures. This course covers the following topics: Importance and classification of hydraulic structures according to use, Type of dams, Selection of type of dam, Gravity dams, and Arch dams. Types of spillways, Ogee type spillway. Energy Dissipation. Channel diversion, Cross and Head regulators. Cross structures, Aqueducts and transitions, Culverts, Bridges and other Structures such as flow measurement structures.

Recommended Textbook(s):

- Novak, P., Moffat, A. Nalluri, C. and Narayanan, R., *Hydraulic Structures*, 4th Ed., 2007.
- Varshney, R., Gupta, S. and Gupta, R., *Theory and Design of Irrigation Structures*, 1982.
- Ray, K., et al, *Water Resources Engineering*, McGraw-Hill, 1992.

Prerequisites:

- CIV010 Fluid Mechanics, CIV015 Hydrology

Course Topics:

1. Classification of HS according to use
2. Storage structures
3. Dams and Reservoirs
4. Diversion and conveyance structures
5. Pipelines, open channel flow
6. Culverts
7. Control Structures
8. Barrages
9. Regulators
10. Energy Dissipation Structures
11. Hydraulic Jump stilling basins

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Use and integrate the fundamental and basics studied towards the goal of selecting, analyzing and designing hydraulic structures.
2. Recognize the different types of hydraulic structures, to understand its purpose and function and to select the most appropriate structure and location for a specific problem.
3. Design, analyze and prove that the hydraulic structure is safe and economical.

CIV022 Foundation Engineering I (3-3-1-0)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course introduces the students to the fundamental concepts of foundation analysis and design.

Recommended Textbook(s):

- Foundation Design – Principles and Practice, Third Edition, by Donald P. Coduto, 2014, Pearson Education, Inc .
- Principles of Foundation engineering, 9th edition, by Braja M. Das, 2019.

Prerequisites:

- CIV018 Soil Mechanical II

Course Topics:

1. Introduction
2. Subsurface Exploration (Site Investigation)
3. Bearing Capacity of Shallow Foundation
4. Foundation of settlement
5. Geotechnical Design and analysis of Shallow Foundations
6. Design and analysis of Mat Foundation
7. Slope Stability

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Apply math and science principles in the design and analysis process.
2. Analyze and interpret field and laboratory data to obtain design properties.
3. Design major geotechnical structures from a geotechnical perspective.
4. Develop semester-long interaction with students on homework and design submittals.
5. Consider public safety in design for every major structure type and the impacts of the structures on society and environment.
6. Conduct external research for design and creation of design tools.
7. Use spreadsheets, mathematical assistants and CAD along with using current state of practice design concepts.

CIV023 Highway Engineering (3-2-2-2)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course introduces various components of Highway Engineering, highway alignment (horizontal and vertical curves), design of geometric elements of highways, skill on blending of aggregate fractions by using graphical and mathematical methods and asphalt concrete mix evaluation. In addition, it includes design of flexible and rigid pavements by studying AASHTO1993 structural design method to find rigid pavement slab thickness and different layer thicknesses for flexible pavement taking in consideration studying the effects of traffic loading, environmental, and materials properties. Furthermore, an attention will be given to the pavement distress so that candidates will be able to distinguish between causes and failure of each mode.

Recommended Textbook(s):

- Garber, N. J. and L. A. Hoel (2009). Traffic and highway Engineering, Cengage

Prerequisites:

- CIV007 Engineering Surveying II

Course Topics:

1. Highway location
2. Design speed, factors affecting design, highway types, cross section elements
3. Sight distances and horizontal alignment design
4. Horizontal alignment design
5. Vertical alignment design
6. Intersections and interchanges
7. Highway construction, Pavement materials (including aggregate combination)
8. Pavement design – General
9. Pavement design – flexible pavement
10. Pavement design- rigid pavement
11. Pavement distress and Maintenance
12. Selected topics

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Recognize the various components of Highway Engineering.
2. Identify highway planning, engineering surveys for highway alignment,
3. Design of Geometric Elements of Highways (Horizontal and Vertical curves)
4. Learn the desirable properties of highway materials and various practices adopted for construction.
5. Develop skills in evaluation of the pavements and deciding appropriate types of maintenance.
6. Know asphalt concrete mix production in asphalt plants and constructing flexible pavement layers in the site.
7. provide hands-on training in the determination of desirable properties of highway materials

Lab Section

1	Introduction
2	Soil: Sieve Analysis, Lab Density Test
3	Field Density Test
4	California Bearing Ratio Test
5	Bitumen and Tar: Flash point, Penetration, Ductility, Viscosity
6	Softening point, thin film oven, and Loss on Heating Tests.
7	Aggregate: Specific Gravity, Crushing, Abrasion
8	Impact Tests, Water absorption, Flakiness and Elongation indices and Stone polishing value test
10	Asphalt Mixtures- Marshal test, Analysis and Binder Recovery, Testing of Bituminous Mixtures, Specific Gravity, and Temperature.

CIV026 Sanitary and Environmental Engineering (3-3-1-2)

Designation as a 'required' or 'elective' course:
This is a required course for the Civil Engineering Program.

Course Description:

This course introduces fundamental concepts in the field of water treatment plants and the design of units' operations associated with conventional water treatment plants.

Recommended Textbook(s):

- Warren Viessman Jr., Mark J. Hammer, Elizabeth M. Perez, Paul A. Chadik, Water Supply & Pollution Control, Prentice Hall, 8th ed., 2009.
- Water and wastewater engineering, by Davis, 2010, Mc. Graw-Hill.

Prerequisites:

- ENG002 Chemistry, CIV010 Fluid mechanics

Course Topics:

1. Introduction - water resources, Water demand and Population forecasting, and Water pollution.
2. Introduction to WTP
3. Water-intakes design and screens
4. Pumping station
5. Flash-mixer and flocculation units' design
6. Sedimentation tank design
7. Filtration unit design
8. Disinfection and storage tank design

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Study the various sources and characteristics of water.
2. Qualify water demand and population forecasting.
3. Study the types and sources of water pollution.
4. Understand the properties and the design criteria of the conventional water treatment plant (WTP).

Lab Section

1. Measurement of pH
2. Measurement of Total Dissolved salts
3. Measurement of Conductivity
4. Estimation of Alkalinity
5. Estimation of Hardness by EDTA
6. Estimation of Residual Chlorine.
7. Estimation of Optimum Coagulant Dose by Jar Test
8. Estimation of Ammonia Nitrogen
9. Estimation of Sulphate
10. Estimation of Chlorides
11. Estimation of D.O. by Wrinkler's methods
12. Estimation of Suspended, Settleable, Volatile and fixed solids.
13. BOD test for water and waste water.
14. COD test for water and waste water.
15. Determination of Turbidity by using Nephlometer.

CIV027 Method of Construction and Estimation (3-3-1-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

Introduction to the various construction techniques, practices and the equipment needed for different types of construction activities. It also covers the various aspects of estimating of quantities of items of works involved in buildings, water supply and sanitary works, road works and irrigation work, the rate analysis, valuation of properties and preparation of reports for estimation of various items.

Recommended Textbook(s):

- S. W. Nunnally, Construction Methods and Management,8th Edition by, 2010
- Frank R. Dagostino and Steven J. Peterson, Estimating in Building Construction, Prentice Hall, 7th ed., 2011.

Prerequisites:

- ENG008 Calculus III, CIV001 Building Materials

Course Topics:

1. Construction Practices
2. Sub Structure Construction
3. Super Structure Construction
4. Repair And Rehabilitation
5. Construction Equipment
6. The Production of Equipment
7. Introduction to Estimates
8. Estimate of Buildings
9. Rate Analysis of Different Items for Construction Work
10. Estimate of Other Structures
11. Estimate of Earthwork
12. Specification and Tenders
13. Valuation in Construction

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. have a reasonable knowledge about the various construction procedures for sub to super structure
2. have a reasonable knowledge about the equipment needed for construction of various types of structures from foundation to super structure.
3. estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents
4. prepare value estimation.

CIV024 Steel Structure I (3-3-1-0)

Designation as a 'required' or 'elective' course:

This is a required course for the Civil Engineering Program.

Course Description:

This course introduces design of steel structures including the application of LRFD methods using the AISC manual of steel construction.

Recommended Textbook(s):

- McCormac, Jack C.-Structural steel design-(2018)
- William T. Segui. Steel Design, 6th ed, 2018
- American Institute of Steel Construction AISC, Steel Construction Manual 15th Edition-AISC (2017)

Prerequisites:

- CIV011 Structures I, CIV016 Structures II

Course Topics:

1. Structural Design Philosophy, an introduction to the LRFD method.
2. Properties and behavior of structural steel.
3. Strength of tension members, design by codes and specifications.
4. Strength of compression members, design by codes and specifications.
5. Strength of beams in bending, design by codes and specifications.
6. Bending and axial forces in beam-columns, design by codes and specifications.
7. Introduction to plastic hinges, collapse mechanism.
8. Steel member connections, design by codes and specifications.
9. Design of a complete steel structure.

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Identify various loading conditions that are important in structural design and determine/select the critical loading.
2. Perform the appropriate structural analysis based on the loading determined above and design the overall structure, determining the required member sizes capable of supporting the loads.
3. Apply the knowledge they acquired in the prerequisite courses such as determining maximum moments and forces and finding the strength of each member.
4. Be knowledgeable with the national, regional, and local codes and engineering standards and be familiar with the professional practice and requirements of structural engineers.

Elective Courses

CIV033 Computer Applications in Civil Engineering (2-1-1-2)

Designation as a 'required' or 'elective' course:
This is elective course for the Civil Engineering Program.

Course Description:

This course is the second part of our standard computer applications sequence. It includes using computers to solve problems related to civil engineering such as building, highways and so on.

Recommended Textbook(s):

- دكتور جمال عبد الواحد. تحليل وتصميم الأبنية باستخدام برنامج ETABS 2015
- Online resources from internet

Prerequisites:

- UOA007 Computer Science I

Course Topics:

1. Learn how to use the ETABS program as windows program.
2. Identify the using of grid based on our building dimensions
3. Define the building materials and frame section (beams and columns) as well as slabs.
4. Drew beams, columns and slabs, also give the restraint for reactions.
5. Run the Analysis
6. Display the results for analysis
7. Run the design and display the results
8. Learn about using different types of slabs such as one- and two-way ribbed slab, slab with drop panel and waffle slab
9. Learn about using different types of coordinate systems such as Cartesian and cylindrical systems.
10. Analysis and design steel structures

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Learn how to use engineering software programs.
2. Understand the way that is used to find and display the output data after analysis and design the structures.
3. Solve and analyze problems related to theory of civil engineering structures such as concrete and steel structures using computer software.
4. Use engineering software to analyze and design buildings based on different codes such as ACI code.

CIV034 Reinforced Concrete Design III (2-2-2-0)

Designation as a 'required' or 'elective' course:

This is elective course for the Civil Engineering Program.

Course Description:

Flexural strength of reinforced concrete elements. Flexural ductility of unconfined and confined members with axial loads. Shear and torsional behaviors. Strength of reinforced concrete ductile frames and shear walls. Reinforced concrete detailing.

Recommended Textbook(s):

- Design of Reinforced Concrete. Jack McCormac, Fifth Edition, Wiley,2008.
- Reinforced Concrete a Fundamental Approach, E.G. Nawy, Fifth Edition, Prentice Hall2005.

Prerequisites:

- CIV017 Reinforced Concrete Design II

Course Topics:

1. Design and detailing of footings and retaining walls
2. Design and detailing of beam-column joints (ACI special provisions for seismic design)
3. Design of lateral load resisting systems; shear walls, and dual systems
4. Serviceability and deflection considerations
5. Strut and tie model
6. Design of deep beams,
7. Deign of columns under bidirectional
8. Design of corbels.
9. Design of conventional stairs

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. analyze, design and detail reinforced concrete frames

2. Apply advanced knowledge and engineering to the analysis and design of reinforced concrete Members.

3. undertake problem identification, formulation and solution

4. undertake time dependent problems.

5. design with detailing the RC stairs, corbels, and deep beams.

CIV028 Steel Structure II (2-2-2-0)

Designation as a 'required' or 'elective' course:
This is elective course for the Civil Engineering Program.

Course Description:

Design of Steel Structures including the application of LRFD methods using the AISC Manual of Steel Construction.

Recommended Textbook(s):

- McCormac, Jack C.-Structural steel design-(2018)
- William T. Segui. Steel Design, 6th ed, 2018
- (15th) AISC - Steel Construction Manual 15th Edition-AISC (2017)

Prerequisites:

- CIV024 – Steel Structure I

Course Topics:

1. Introduction; Analysis and Design of Beams, Analysis of zone 1, Analysis of zone 2, Analysis of zone 3, Chart design, Noncompact sections, Shear and deflection of beams
2. Introduction- Members Subjected to Bending and Axial Force, Members Subjected to Bending and Axial Tension, First-Order and Second-Order Moments, The Approximate Method of Analysis, Magnification Factors, Moment Modification or Cm Factors
   Beam-Columns in Braced Frames, Beam-Columns in Unbraced Frames
   Design of Beam-Columns in Braced and Unbraced Frames
3. Bolted Connections
   Types of bolts, and high strength bolts, Snug- tight joints, pretension joints, slip-critical joints, fully pre-tensioning methods, bearing type connections, slip-critical connections, Sizes of bolt holes, Spacing of bolts, and Edge distances. Load transfer, lap joints, butt joints, failure of bolted joints
   Shearing strength for bearing-type connections (load pass through centre of gravity of connection), Bearing strength of bearing-type connections (load pass through centre of gravity of connection), Bearing strength of bearing-type connections (load pass through centre of gravity of connection)
4. Eccentricity Loaded Bolted Connections
   Bolts subjected to eccentric shear, Elastic analysis method, reduced eccentricity method, instantaneous centre of rotation method, AISC-Part7 Tables
   Bearing-type connections subjected to shear and tension, slip-critical connections subjected to shear and tension
5. Weld Connections
   Introduction, welding advantages, types of welding, classification of welds, type of weld, type of joints, fillet welds, plug and slot welds, welding symbols, strength of welds, AISC requirements, size and length limitations of fillet welds,
   Design of simple fillet welds, Strength of fillet welds loaded transversely, Design of welded connections with both longitudinal and transverse fillet welds.

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Identify various loading conditions that are important in structural design and determine/select the critical loading.
2. Perform the appropriate structural analysis based on the loading determined above and design the overall structure, determining the required member sizes capable of supporting the loads.
3. Apply the knowledge they acquired in the prerequisite courses such as determining maximum moments and forces and finding the strength of each member.
4. Be knowledgeable with the national, regional, and local codes and engineering standards and be familiar with the professional practice and requirements of structural engineers.

CIV031 Design of Prestressed Concrete (2-2-2-0)

Designation as a 'required' or 'elective' course:
This is elective course for the Civil Engineering Program.

Course Description:

This course introduces students to the behavior and design of prestressed concrete structures and provides them the background needed to design various prestressed concrete members. Course topics include an overview of prestressing technology, loss of prestress, axially loaded prestressed members, flexural and shear behavior/design of prestressed members, and deflections.

Recommended Textbook(s):

- Nawy, Edward G. Prestressed concrete. A fundamental approach. 5th edition 2006.

Prerequisites:

- CIV005 Concrete Properties, CIV012 Reinforced Concrete Design I

Course Topics:

1. Introduction to Prestressed Concrete
2. Methods of Prestressing. Forces Imposed by Prestressing (Straight, Draped and Kinked Tendon Profiles). Load Balancing. Introductory Examples. Design Requirements: Strength and Serviceability. Material Properties.
3. Design for Serviceability. Design For Shear. Effect of Prestress on Shear)
4. Stress limits. Serviceability criteria. Determination of prestress and eccentricity. Cable profiles
5. Cracked section analysis. Effect of cracking at service loads. Short-term cracked section analysis.
6. Losses
7. Limit State Design. Rectangular Stress Block. Ultimate Moment Capacity. Effect of Non-Prestressed Steel
8. Indeterminate prestressed concrete design
9. Design For Shear. Effect of Prestress on Shear. Flexure-Shear
10. Design of Post-Tensioned Members and Pretensioned Members
11. Deflection and crack control
12. prestressed compression and tension members
13. Two-way prestressed concrete floor systems
14. Transfer Strength: Limit State Design

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Describe the basic properties of prestressed concrete constituents.
2. Analyze the flexural behavior of simple beams.
3. Calculate prestress losses for simple prestressed concrete girders.
4. Design prestressed concrete girders for flexure using current design procedures (ACI Standard).
5. Recognize the effects of transfer and development length on flexural and shear strengths.
6. Construct moment-curvature and load-deflection curves for a prestressed concrete beam.
7. Analyze and design prestressed concrete members for shear.

CIV029 Foundation Engineering II (2-2-2-0)

Designation as a 'required' or 'elective' course:
This is elective course for the Civil Engineering Program.

Course Description:

This course introduces the students to the fundamental concepts of foundation analysis and design. Topics include lateral earth pressure and retaining walls; sheet pile walls; braced cuts slope stability, and foundations on difficult soils.

Recommended Textbook(s):

- Donald P. Coduto, "Foundation Design – Principles and Practice", 3rd Edition, 2014, Pearson Education, Inc.
- Braja M. Das, "Principles of Foundation engineering", 9th edition, 2019.

Prerequisites:

- CIV022 Foundation Engineering I

Course Topics:

1. Chapter 1: piles foundation
2. Definition, types of piles and their structural characteristics
3. Estimating Pile Length, Point bearing piles, Friction piles, Installation of piles, Load transfer mechanism
4. Pile capacity in cohesionless soils, Pile capacity in cohesive soils (Lambda and alpha equations)
5. Examples on item of third week, Pile capacity for (c-ϕ) soils
6. Determination of pile capacity from in situ tests (SPT), Negative skin friction, Tension piles
7. Group of piles: capacity (two modes of failure: single and block) and efficiency
8. Examples on item of sixth week, Pile groups subjected to moments, Pile load test
9. Settlement of pile and pile groups
10. Chapter 2: lateral earth pressure theory
11. Introduction to lateral earth pressure theory, active lateral pressure by Rankine theory for (horizontal surface), Problems
12. passive lateral pressure by Rankine theory for (horizontal surface), Active and Passive lateral pressure by Rankine theory for (inclined surface), Problems
13. Coulomb theory for active and passive lateral pressure, Problems
14. Chapter 3: retaining walls
15. Definitions and types of retaining walls, Geotechnical proportioning of Retaining walls, Application of lateral earth pressure theories to design, stability of retaining walls against overturning,
16. Stability of retaining walls against sliding, overturning, Problems
17. Chapter 4: sheet piles
18. Introduction, types of sheet piles, Applications, Construction methods, Cantilever sheet piling penetrating sandy
19. Cantilever sheet piling penetrating clay, Problems

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Apply math and science principles in the design and analysis process.
2. Analysis and design of piles foundation.
3. Understand and determine lateral earth pressures to analyze some typical earth retaining walls.
4. Analyze retaining walls and design (gravity and Cantilever Walls)
5. Analyze sheet-pile walls and design (cantilever and anchored sheet piles).

CIV035 Earth Retaining Structures (2-2-2-0)

Designation as a 'required' or 'elective' course:
This is elective course for the Civil Engineering Program.

Course Description:

This course introduces the fundamentals and working tools needed for the design and analysis of earth retention systems. Specifically, this course covers the selection, design, and performance of earth retaining structures used for support of fills and excavations. The theory regarding earth pressures and soil-reinforcement interaction are covered in detail. It also includes case histories illustrating the selection, design and performance of various earth retaining structures

Recommended Textbook(s):

- Muni Budhu, Foundations and Earth Retaining Structures, John Wiley & Sons, 2008.

Prerequisites:

- CIV014 Soil mechanics I

Course Topics:

1. Introduction
2. Types of earth retaining systems
3. Earth pressure theory
4. Design of externally stabilized fill walls
5. Reinforcing elements
6. Design of internally stabilized fill walls
7. Design of internally stabilized cut walls
8. Design of externally stabilized cut walls
9. Advances in earth retention systems
10. Advances in soil reinforcement

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Identify the types, advantages, and disadvantages of the different earth retaining systems (e.g. gravity structures, geosynthetic-reinforced soil structures, earth anchored systems, soil nailing).
2. Quantify the lateral earth pressures associated with different earth retaining systems.
3. Evaluate the mechanical properties of geosynthetics used for soil reinforcement, including aspects related to time-dependent response, long-term performance, and cost-effectiveness.
4. Select the most technically appropriate and cost-effective type of retaining wall for a given project based on a clear understanding of the many available systems.
5. Complete the design of fill walls using appropriate design methods, factors of safety, and field verification methods.
6. Complete the design of cut walls using appropriate design methods, factors of safety, earth pressure diagrams and field verification methods.
7. Master the use of design tools for the analysis of both external and internal stability, including the use of hand calculations as well as state-of-the-practice computer programs.

CIV036 Selected Topics in Geotechnical Engineering (2-2-2-0)

Designation as a 'required' or 'elective' course:
This is elective course for the Civil Engineering Program.

Course Description:

Stability of slopes, design of dewatering systems, characteristics of desert problematic soils (swelling soil, dune sand, salt-bearing soil "Sabkha", liquefiable sand), soil improvement methods (mechanical, chemical), description and use of geosynthetics, design of liner systems for liquid containments and solid waste landfills.

Recommended Textbook(s):

By topics

Prerequisites:

- CIV014 Soil Mechanics I

Course Topics:

1. Stability of slopes,
2. design of dewatering systems,
3. characteristics of desert problematic soils (swelling soil, dune sand, salt-bearing soil "Sabkha", liquefiable sand),
4. soil improvement methods (mechanical, chemical),
5. description and use of geosynthetics,
6. design of liner systems for liquid containments and solid waste landfills.

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. familiarize the student with the procedures used to analysis the stability of slopes
2. Provide the students with a basic understanding of the dewatering systems
3. develop an understanding of the behavior of problematic soils for engineering structures and to gain knowledge of the design methods that can be applied to practical problems.
4. provide the student with soil improvement techniques
5. introduce basic of geosynthetics engineering
6. develop understanding to the design of liner systems.

CIV037 Environmental Impact Assessment (2-2-2-0)

Designation as a 'required' or 'elective' course:
This is elective course for the Civil Engineering Program.

Course Description:

The purpose of this course is to help decision-makers make well-informed decisions related to proposed projects/activities; Predict environmental impact of actions; Find ways and means to reduce adverse impacts; Shape the actions to suit local environment; Present the predictions and options to the decision-makers.

Recommended Textbook(s):

- Y. Anjaneyulu & Valli Manickam, Environmental Impact Assessment Methodologies, 2nd ed, 2007.
- David Liu, Environmental Engineers; Handbook, 2000.

Prerequisites:

- CIV026 Sanitary and Environmental Engineering

Course Topics:

1. Fundamental Approach to Environmental Impact Assessment (EIA).
2. EIA Methodologies.
3. Environmental Laws and Regulations
4. Prediction and Assessment of Impacts on Soil and Ground Water Environment.
5. Prediction and Assessment of Impacts on Surface Water Environment.
6. Prediction and Assessment of Impacts on Biological Environment.
7. Prediction and Assessment of Impacts on the Air Environment.
8. Prediction and Assessment of impacts of Noise on the Environment.
9. Application of Remote Sensing and GIS for EIA.

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. know the basics and fundamentals of Environmental Impact Assessment;
2. know the importance of Environmental Impact Assessment and its laws and regulations to control all types of the environmental pollutions;
3. know how to analyze the project and estimating type of pollutants and the quantities of pollutants would be generated from projects;
4. learn how to make a link between software like GIS or remote sensing and environmental impact assessment.

CIV038 Hydraulic Application in Environmental Engineering (2-2-2-0)

Designation as a 'required' or 'elective' course:

This is elective course for the Civil Engineering Program.

Course Description:

Introduction to open channel flow, Concept, Definitions and Diffusion Equation., Advection Diffusion Equation, Mixing in River, Turbulent Diffusion and Dispersion, Solution to Advective Reacting Diffusion Eq.

Recommended Textbook(s):

- Hydraulics ln Civil and Environmental engineering, Chadwick, Morfett and Borthwick, 2004, U.K
- Civil Engineering Hydraulics, Martin Marriott, London, 2010.

Prerequisites:

- CIV010 Fluid Mechanics, CIV015 Hydrology

Course Topics:

1. Uniform and steady flow in open channel.
2. Specific energy diagram
3. Fundamental equations of mass and heat transport
4. Evaluating transport coefficient in the environment.
5. Turbulent dispersion and mixing.
6. Dispersion coefficient.
7. Sediment Transport

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. know the basic environmental fluid mechanics
2. understand the fundamental of open channel hydraulics
3. know advective and diffusion phenomena.
4. estimate the longitudinal dispersion coefficients
5. know storm management model

CIV039 Water quality Modeling and Control (2-2-2-0)

Designation as a 'required' or 'elective' course:
This is elective course for the Civil Engineering Program.

Course Description:

The course introduces the fundamental concepts in the field of Environmental pollution and control, and the techniques used to overcome each type of pollutions.

Recommended Textbook(s):

- Philippe Quevauviller, Olivier Thomas,Andr´e van der Beken,Wastewater Quality Monitoring and Treatment,2006
- E. Roberts Alley, Water Quality Control Handbook, 2007.

Prerequisites:

- CIV026 Sanitary and Environmental Engineering

Course Topics:

1. Introduction – The Environment, Water Quality, General Classification of Pollutants.
2. The Theory and Quantification of Water Pollution.
3. Sources of Water Pollution.
4. Pollutant Classification.
5. Water Quality.
6. Water Quality Management.
7. Environmental Management.
8. Water Pollution Regulations
9. Regulatory Standards
10. Water Pollution Control-Techniques Used
11. GIS and Remote Sensing Application in Water Quality Modelling

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. know the basics and fundamentals of Water Quality and its Control;
2. know all types of the Environmental Pollutions and the ways for treatment;
3. know how to analyze and the pollutants would be generated from projects and to determine them in laboratory;
4. learn how to make a link between software like GIS or Remote Sensing and Water Quality.

CIV040 Pavement Design (2-2-2-0)

Designation as a 'required' or 'elective' course:
This is elective course for the Civil Engineering Program.

Course Description:

Analysis of different type of stresses, strains, and deflections that occurred in flexible and rigid pavement. Studying the AASHTO1993 structural design method to find rigid pavement slab thickness and different layer thicknesses for flexible pavement in addition to study the effects of traffic loading, environmental, and materials properties. Studying the concepts of serviceability and reliability in AASHTO1993 method.

Recommended Textbook(s):

- AASHTO Guide for design of pavement structures 1993.
- Pavement design and materials. By A.T. Papagiannnakis and E. A. Masad, published by Johen Wiley &sons, USA ,2008.

Prerequisites:

- CIV019 Traffic Engineering, CIV023 Highway Engineering.

Course Topics:

1. Introduction
2. Pavement material properties
3. Layers theory and stresses in flexible pavement.
4. Type of stresses in rigid pavement:
5. Stress due to sub grade friction.
6. Stress due to temperature gradients.
7. Stresses due to load locations.
8. Slab thickness design of rigid pavement
9. AASHTO1993 structure design method procedure for flexible pavement.
10. American Asphalt Institute method.

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Know the different between flexible and rigid pavement (construction materials, type of stresses, theory of analysis and design, and method of construction).
2. Understand in details the AASHTO1993 design method.

CIV032 Highway Materials (2-2-2-0)

Designation as a 'required' or 'elective' course:
This is elective course for the Civil Engineering Program.

Course Description:

This course includes soil properties and classifications, materials used in constructing of embankment, sub grade, subbase, and, in detail, materials used in flexible and rigid pavement. Standard tests, which can be, used to exam the validity, compatibility, applicability of these materials, such as asphalt, aggregates, and filler, and then comparing their results with local road agency specifications. Engineering properties of each material, which used before and after construction? Layer construction methods, which can be apply to achieve necessary requirements.

Recommended Textbook(s):

- Athanassios Nikolaides, "Highway Engineering Pavements, Materials and Control of Quality", 2015, Taylor & Francis Group.
- James G. Speight, "Asphalt Materials Science and Technology", 2016, Elsevier Inc.
- Course supplements will be used to present extra information not covered in the textbook.

Prerequisites:

- CIV014 Soil Mechanics I, CIV023 Highway Engineering

Course Topics:

1- Types of highway material
2- Soil classifications
3- Unbounded material types and their engineering properties and standard tests of
4- Bounded materials (Hydraulically) and their engineering properties
5- Asphalt cement sources, and production
6- Standard tests of asphalt cement. Rational and Superpave tests
7- Methods of Blending of aggregate fractions
8- Asphalt concrete mix (Marshall mix design)
9- Type of asphalt plants (asphalt concrete mix production)
10- Flexible pavement construction and maintenance

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Understand the practical concepts of highway materials and their interaction with engineering properties of each highway structure layer.
2. Apply the knowledge of highway layer materials and how they are tested and constructed.
3. Use the standard test method and specification to construct the road embankments and hot mix asphalt courses.
4. Do mix design of HMA according to Marshall and Superpave mix design methods.

Lab section

1. Types of highway material, and Soil classifications
2. Unbounded material types and their engineering properties and standard tests, and Bounded materials (Hydraulically) and their engineering properties
3. Asphalt cement sources and production, Rational Standard tests of asphalt cement.
4. Superpave Standard asphalt cement tests
5. Methods of Blending of aggregate fractions
6. Asphalt concrete mix (Marshall mix design)
7. Type of asphalt plants (asphalt concrete mix production), and Flexible pavement construction and maintenance.

CIV041 Transportation Planning (2-2-2-0)

Designation as a 'required' or 'elective' course:
This is elective course for the Civil Engineering Program.

Course Description:

Forecasting future travel demand involving extensive data gathering and mathematical modeling from the analysis of travel movement within into and out of the urban area and an integral of traffic engineering

Recommended Textbook(s):

- Modeling Transport by Juan Dois & Luis-1995
- Traffic and Highway Engineering by Garber 2010

Prerequisites:

- CIV019 Traffic Engineering, ENG010 Engineering Statistics

Course Topics:

1. Characteristics of transport problems
2. Characteristics of transport demand
3. Characteristics of transport supply
4. Issues in transport modeling
5. Aggregate and disaggregate modeling
6. Data Collection method
7. Network and zoning system
8. Trip Generation modeling
9. Trip distribution modeling
10. Modal split
11. Route assignment

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Know how to collect and analysis traffic and land use data
2. Develop trip generation and distribution model
3. Assign the traffic volume on existing transport network and modes
4. Develop a policy for future transport system

CIV042 Project Management (2-2-2-0)

Designation as a 'required' or 'elective' course:

This is elective course for the Civil Engineering Program.

Course Description:

This course expands discussion of change management, managing conflict, communication plans, monitoring project performance it covers concepts and skills that are used by manager to propose, plan, secure resource, budget, and lead project teams to successful completions of their project, it cover cost and managing the risk and discuss the earned value

Recommended Textbook(s):

- Cliffored F Gray and Erik W Larson, Project management 2006

Prerequisites:

- CIV013 Construction Management

Course Topics:

1. Modern project management
2. Organization structure
3. Estimating project time and costs
4. Developing a project plan
5. Managing risk
6. Earned value rules
7. Reducing project duration
8. Leadership: being an effective project manager
9. Progress and performance measurement and evaluation

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Know the importance of project management
2. Help them understand why organization have developed formal project management plan
3. the discussion of earned value has been completely revised to make it easier for students to understand strategies for reducing project duration
4. Know the project managers are eager to implement their ideas and manage their staff to
5. successfully complete their project
6. Determine what data to be collect, how, when and who will collect the data analysis the data and reporting

CIV043 Operation Research (2-2-2-0)

Designation as a 'required' or 'elective' course:

This is elective course for the Civil Engineering Program.

Course Description:

This course discuss the formal activities of operation research and the situation of the decision making problem whose solution requires three components alternatives, restrictions and objective criterion for evaluating the alternatives ,the technique is used in a wide range of applications including industry, transportation n ,economics, , the transportation model can be extend to other areas of operation ,including among others inventory control ,employment scheduling and personnel assignment the course include the solution methods of nonlinear programming can be classified direct or indirect algorithms

Recommended Textbook(s):

- Hamdy A Taha operation research 2007

Prerequisites:

- ENG011 Engineering Numerical Methods, ENG008 Calculus III

Course Topics:

1. Introduction to linear programming
2. Graphical linear programming solution
3. Simplex method
4. Primal – dual relationship
5. Decision Making under Certainty, under Risk, under Uncertainty
6. Sensitivity analysis of linear programming
7. Integer linear programming
8. Transportation model
9. Nonlinear programming

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. know the transportation model can be solved as regular linear programming
2. study how the elements of the optimal simplex tableau are recomputed to reflect new change
3. Understand integer programming in which the variable assumes integer values
4. Know nonlinear programming in which the functions of model are nonlinear

CIV044 Quality Management (2-2-2-0)

Designation as a 'required' or 'elective' course:

This is elective course for the Civil Engineering Program.

Course Description:

This course discuss Monitoring quality costs is essential when implementing a quality management system as this gives relevant information about the balance between efforts and investments, the quality costs are Prevention costs, Appraisal costs, Internal failure costs, external failure costs, it covers seven tools of quality control and the term six sigma refers to a statistical measure with no more than 3.4 defects per million and also it covers Iso 9001 2008.

Recommended Textbook(s):

- Total quality management 2009

Prerequisites:

- ENG010 Engineering Statistics

Course Topics:

1. Improve Productivity and Reduce Cost
2. Total Quality management
3. Cost of Quality
4. Six Sigma
5. Control Charts and Their Role in Quality Systems
6. Quality Management System
7. ISO Standards

Program and Course Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Know Management's role in TQM is to develop a quality strategy that inflexible enough to be adapted to every department, aligned with the organizational business objectives, and based on customer and stakeholder needs.
2. Know Continuous quality improvement came into existence in organization as a different approach to quality and quality systems
3. Study Six sigma which is a statistically oriented approach to process improvement that uses variety of tools, including statistical process control.
4. develop business performance priorities.