The Academic Plan of Civil Engineering Department

College of Engineering

Najran University

(2024 -2025)

Curriculum Structure

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Institution Requirements	Required	5	10	6.49%
	Elective	1	2	1.3 %
College Requirements	Required	22	67	43.51%
	Elective			
Program Requirements	Required	21	62	40.26 %
	Elective	2	6	3.4 %
Capstone Course/Project		2	4	2.59 %
Field Training/ Internship		1	3	1.95 %
Residency year				
Others				
Total		54	154	100%

Level 1 (1st Preparatory Year)

Course Title	Course number and code	Actual weekly hours		Credit units			Prerequisite
		Theor.	Practic.	Theor.	Practic.	Total Credit Units	
Compulsory courses							
English Language Skills 1	111–ENG -4	4	-	4	-	4	---
English Language Skills 2	112-ENG-4	4	-	4	-	4	---
Introduction to Mathematics	121-MAT-3	2	1	2	1	3	---
Computer Applications	100-CSC-2	1	2	1	1	2	---
General Physics	141-PHY-3	2	2	2	1	3	---
Total hours		13	5	13	3	16	

Level 2 (1st Preparatory Year)

Course Title	Course number and code	Actual weekly hours		Credit units			Prerequisite
		Theor.	Practic.	Theor.	Practic.	Total Credit Units	
Compulsory courses							
General English	113-ENG-3	3	-	3	-	3	---
English for Engineering Specialities	115-ENG-3	3	-	3	-	3	112-ENG-4
University life skills	151-SKL-2	2	-	2	-	2	---
Introduction to calculus	122-MAT-4	3	1	3	1	4	121-MAT-3
Programming Principles	101-CSC-3	2	2	2	1	3	---
Engineering Drawing	121-GEC-3	2	2	2	1	3	
Total hours		15	5	15	3	18	

Level 3 (2nd Year)

Course Title	Course number and	Actual weekly hours		Credit units			Prerequisite
		Theor.	Practic.	Theor.	Practic.	Total Credit Units	
Compulsory courses							
General Chemistry	101-CHM-3	3	0	3	0	3	Completing the
Introduction to Integral	106-MAT-3	3	0	3	0	3	
Muslim Culture (1)	211-TQF-2	2	0	2	0	2	
Statics	101-GEC-3	3	0	3	0	3	
Advanced Physics	105-PHY-3	2	2	2	1	3	
Engineering Geology	121-CE-2	2	0	2	0	2	
Total hours		15	2	15	1	16	

Level 4 (2nd Year)

Course Title	Course number	Actual weekly hours		Credit units			Prerequisite
		Theor.	Practic.	Theor.	Practic.	Total Credit Units	
Compulsory courses							
Computer Applications in Design (1)	122-ARC-2	0	4	0	2	2	---
Dynamics	205-GEC-3	3	0	3	0	3	101-GEC-3
Advanced Calculus	203-MAT-3	3	0	3	0	3	106-MAT-3
Muslim Culture (2)	212-TQF-2	2	0	2	0	2	---
Arabic Language Skills	101-ARB-2	2	0	2	0	2	---
Strength of Materials	141-CE-3	3	0	3	0	3	101-GEC-3
National Identity	102-NAT-2	2	0	2	0	2	
Total hours		15	0	15	2	17	

Level 5 (3rd Year)

Course Title	Course number and	Actual weekly hours		Credit units			Prerequisite
		Theor.	Practic.	Theor.	Practic.	Total Credit Units	
Compulsory courses							
Computer Programming for Engineers	204-GEC-3	2	2	2	1	3	----
Surveying Engineering	260-CE-3	2	2	2	1	3	203-MATH-3
Probability and Engineering Statistics	324-STA-3	3	0	3	0	3	---
Fluid Mechanics	211-CE-3	2	2	2	1	3	205-GEC-3
Differential Equations	204-MAT-3	3	0	3	0	3	106-MAT-3
Digital Skills	101-CIS-2	2	0	2	0	2	---
Total hours		14	6	14	3	17	

Level 6 (3rd Year)

Course Title	Course number	Actual weekly hours		Credit units			Prerequisite
		Theor.	Practic.	Theor.	Practic.	Total Credit Units	
Compulsory courses							
Properties and Testing of Structural Materials	242-CE-3	2	2	2	1	3	141-CE-3
Numerical Methods	254-MAT-3	3	0	3	0	3	204-MAT-3
Structural Analyses (1)	251-CE-3	3	0	3	0	3	141-CE-3
Geotechnical Engineering	222-CE-4	3	2	3	1	4	121-CE-2
Hydraulics	212-CE-3	2	2	2	1	3	211-CE-3
Total hours		13	6	13	3	16	

Level 7 (4th Year)

Course Title	Course number and code	Actual weekly hours		Credit units			Prerequisite
		Theor.	Practic.	Theor.	Practic.	Total Credit Units	
Compulsory courses							
Reinforced Concrete (1)	352-CE-3	3	0	3	0	3	251-CE-3
Economics and Engineering Management	408-GEC-3	3	0	3	0	3	---
Transportation and Traffic Engineering	331-CE-3	3	0	3	0	3	260-CE-3
Hydrology and Water Resources Management	313-CE-3	3	0	3	0	3	212-CE-3
Water Supply and Wastewater Systems	370-CE-3	2	2	2	1	3	212-CE-3
Elective (university requirement)	XXX-XXX-2	2	0	2	0	2	---
Total hours		16	2	16	1	17	

Level 8 (4th Year)

Course Title	Course number and code	Actual weekly hours		Credit units			Prerequisite
		Theor.	Practic.	Theor.	Practic.	Total Credit Units	
Compulsory courses							
Construction Engineering and Management	381-CE-3	3	0	3	0	3	308-GE-3
Structural Analyses (2)	353-CE-3	3	0	3	0	3	251-CE-3
Foundation Engineering	323-CE-3	3	0	3	0	3	222-CE-4
Reinforced Concrete (2)	354-CE-3	3	0	3	0	3	352-CE-3
Elective course group (1)	3**-CE-3	3	0	3	0	3	---
Graduation Project (1)	391-CE-2	2	0	2	0	2	Complete12 0 credit hours
Total hours		17	0	17	0	17	

Level 9 (5th Year)

Course Title	Course number and code	Actual weekly hours		Credit units			Prerequisite
		Theor.	Practic.	Theor.	Practic.	Total Credit Units	
Compulsory courses							
Steel Structures	455-CE-3	3	0	3	0	3	353-CE-3
Contracts and Specifications	482-CE-3	3	0	3	0	3	381-CE-3
Highway Engineering	434-CE-3	2	2	2	1	3	331-CE-3
Environmental Engineering	472-CE-3	3	0	3	0	3	370-CE-3
Elective course group (2)	4**-CE-3	3	0	3	0	3	---
Graduation Project (2)	492-CE-2	2	0	2	0	2	391-CE-2
Total hours		16	2	16	1	17	

Level 10 (5th Year)

Course Title	Course number and code	Actual weekly hours		Credit units			Prerequisite
		Theor.	Practic.	Theor.	Practic.	Total Credit Units	
Compulsory courses							
Cooperative Training	493-CE-3	0	9	0	3	3	Completion of all plan courses
Total hours		0	9	0	3	3	

The Specialization Elective courses (Group1) (The student selects …. Courses, having …… Credit hours)							
Design of Hydraulics Structures	315-CE-3	3	0	3	0	3	212-CE-3
Improvement of Geotechnical Materials	324-CE-3	3	0	3	0	3	222-CE-4
Remote sensing and GIS Applications in Civil Engineering	361-CE-3	3	0	3	0	3	260-CE-3
Transportation planning	332-CE-3	3	0	3	0	3	331-CE-3
Analysis and Design of Buildings	356-CE-3	3	0	3	0	3	354-CE-3
Construction Cost Estimation	383-CE-3	3	0	3	0	3	308-GEC-3
Environmental Assessment and Management Systems	373-CE-3	3	0	3	0	3	370-CE-3
Total No. of Credit Units		**21**	**0**	**21**	**0**	**21**	

The Specialization Elective courses (Group2) (The student selects …. Courses, having …… Credit hours)							
Selected Topics in Water and Environmental Engineering	474-CE-3	3	0	3	0	3	370-CE-3
Selected Topics in Geotechnical Engineering	425-CE-3	3	0	3	0	3	222-CE-4
Selected Topics in Transportation Engineering	435-CE-3	3	0	3	0	3	331-CE-3
Selected topics in Structural Engineering	457-CE-3	3	0	3	0	3	354-CE-3
Selected Topics in Construction Engineering	484-CE-3	3	0	3	0	3	381-CE-3
Total No. of Credit Units		**15**	**0**	**15**	**0**	**15**	

A set of university elective requirements
(The student selects …. Courses, having …… Credit hours)

Environmental culture	122-cur-2	2	0	2	0	2	
Advanced digital skills	102 -CIS -2	2	0	2	0	2	
Logic and critical thinking	334-PSY- 2	2	0	2	0	2	
Planning principles	110-BUS - 2	2	0	2	0	2	
Integrity values	116-LAW- 2	2	0	2	0	2	
Entrepreneurship	262-BUS - 2	2	0	2	0	2	
Total No. of Credit Units		12	0	12	0	12	

Concise courses description

(Brief summary of each course includes objectives, contents and the most important references)

Courses of level 1

Course number and code: 111–ENG -4 Course name: English Language Skills (1) No. of credit units: 4

Course objectives:

The course aims to bring students to the basic skills of listening and speaking in academic English. It provides students with a solid foundation in English language skills based on a task-based approach and critical thinking with specific activities using digital classroom material which motivate practice in listening and speaking, critical thinking, and enable students to communicate effectively in a variety of everyday situations; and learn how to think in an academic context.

Course content (concise):

This course is taught to preparatory year students (Paths and Specialties). It helps students to build the language skills they need for their studies. It also provides students with the knowledge of two basic skills of the English language: listening, and speaking, as well as grammar through various activities (People, Seasons, Lifestyle, Places, Jobs, Homes and Buildings, Food and Culture, and Transport) based on a task-based approach and critical thinking. It develops students' ability to think critically in an academic context as they start their language learning.

Most important references:

Unlock1 Listening, Speaking &Critical Thinking, Student's book with digital pack, by: N.M. White, Susan Peterson and Nancy Jordan with Chris Sowton, Cambridge University Press

Course number and code: 112–ENG -4 Course name: English Language Skills (2) No. of credit units: 4

Course objectives:

The course aims to bring students to the basic skills of reading and writing in academic English. It provides students with a solid foundation in English language skills based on a task-based approach and critical thinking with specific activities using digital classroom materials which motivate practice in reading and writing, and critical thinking and enable students to learn how to think in an academic context.

Course content (concise):

This course is taught to preparatory year students (Paths and Specialties). It helps students to build the language skills they need for their studies. It also provides students with knowledge of two basic skills of the English language: reading and writing, as well as grammar through various activities based on a task-based approach and critical thinking. It develops students' ability to think critically in an academic context as they start their language learning.

Most important references:

Unlock1 Reading, Writing &Critical Thinking, Student's book with digital pack, by: Sabina Ostrowska and Kate Adams with Chris Sowton, Cambridge University Press

Course number and code: 121-MAT-3 Course name: Introduction to Mathematics No. of credit units: 3

Course objectives:

Students able to build strong and sound understanding of Pre-calculus as a solid foundation for subsequent courses in mathematics and other disciplines as well as for applying in the real life.

Course content (concise):

This course is designed to cover topics in Algebra enhanced with pre-algebra topics such as arithmetic, fractions, and word problems as need, Sets and Real Numbers, Exponents and Radicals, Rational Expressions, Linear Equations and Linear Inequalities in one variable, Equations and Inequalities Involving absolute Value, Quadratic Equations, Functions and graphs, polynomials and Rational Functions, Combining Functions, logarithmic Functions and Exponential Functions, Matrices and determinants, Systems of Linear equations, Arithmetic sequences and series and Geometric sequences and series.

Most important references:

T. Ghazal, O. ALGahtani, K. Kashan, M. Damlakhi and S. Alofei, Pre-calculus, King Saud University, 2nd Edition

Course number and code: 100-CSC-2 Course name: Computer Applications No. of credit units: 2

Course objectives:

Course content (concise):

This course allows students to explore the concept of computing in the field of information technology while learning skills applicable to any professional setting. Through a series of hands-on activities, students will create documents, presentations, and other professional communications. Regular engagement in active learning ensures students can continually refine the skills necessary to prepare them for work. In addition, students will evaluate the qualifications required for specific careers so they can identify opportunities that are of interest to them.

Most important references:

- Yahya Halabi A Talib syre. Introduction to computer and problem solving. Dar wael amman Jordan.
- Gwilys lodwick. The application of computer in diagnostic radiology (2009).
- Russelle V. Application of computer in diagnostic radiology.
- Supportive References Web Sites etc. http://www.computing2014.com/ (Computing Essentials).

Course number and code: 141-PHY-3 Course name: General Physics No. of credit units: 3

Course objectives:

To provide the students with the basic concept of physics

- To demonstrate some physical phenomena.
- To demonstrate some basic physics experiments.
- To build up scientific analytical thinking and skills in the context of physics.
- To develop problem solving skills in a physics context.

Course content (concise):

This course is concerned with the student's knowledge of the basic concepts of physics. In addition, Heat, electricity, optics, sound, and the principle of radiation. The course also covers the experiments related to these branches of physics.

Most important references:

Raymond A. SerwayJohn W. Jewett, Physics of Scientists and Engineers, Sunders College Publication

Courses of level 2

Course number and code: 113-ENG-3 Course name: General English No. of credit units: 3

Course objectives:

The course aims to provide students with a solid foundation in English language skills: Listening, Speaking, Reading, and Writing that enables them to communicate orally and in written forms effectively, confidently, and critically in social, professional, academic, and real-life situations.

Course content (concise):

This is an integrated English-skills and task-based course. It focuses on grammar, vocabulary, speaking, listening, reading, and writing in addition to other communicative tasks and activities. The tasks, while using the authentic materials, present how people use the language in social, professional, academic, and real-life conversations and contexts. The course aims to strengthen and improve students' linguistic and communicative competences through textual and online language inputs and references i.e. vocabulary, reading texts, writing tasks, and other pertinent reviews and practices. The course places a lot of emphasis on providing learners with the grammar's building blocks and the necessary vocabulary they need to communicate confidently, critically, and successfully.

Most important references:

English for 21st Century (Level 2) by Dina O'Driscoll and Jake Hughes (Garnet Education)

Course number and code: 115-ENG-3 Course name: English for Engineering Specialities No. of credit units: 3

Course objectives:

This course aims to provide students with the confidence to communicate fluently, critically, and accurately, using appropriate terminology from their related fields. It also aims to upgrade their listening, speaking, reading and writing skills, current grammatical knowledge and learn numerous practical and engineering terms, expressions and phrases based on both general and specialized vocabulary.

Course content (concise):

English for Engineering provides students enrolled in mechanical, electrical, chemical, architectural or civil engineering with powerful language tools, including knowledge, terminology, communication skills, critical thinking skills, practical grammar, and vocabulary, with a significant emphasis on acquiring, developing, and enhancing the strategies required for effective listening, speaking, reading, and writing. The course also provides opportunities to practice English in practical situations and gives them the language, information, vocabulary, and required skills to grow their confidence. Ultimately, the course contains specialized language and technical and engineering content that a student needs to master in order to study in the respective fields and work as a competent engineer.

Most important references:

Career Paths: Engineering by Charles Lloyd and James A. Frazier – Jr. MS (Express Publishing)

Course number and code: 151-SKL-2 Course name: University life skills No. of credit units: 2

Course objectives:

تنمية المهارات الجامعية لدى الطلاب ومساعدتهم على تطبيق تلك المهارات في حياتهم الجامعية والعملية

Course content (concise):

يتضمن المقرر أربع وحدات الأولى مهارات التعلم والتكيف الجامعي وتشتمل على أربعة موضوعات وهي (مهارات التكيف مع الحياة الجامعية، مهارات الاستذكار الفعال, مهارات معالجة المعلومات وأدوات التعلم, ومهارات إدارة الاختبار)؛ والوحدة الثانية تتناول مهارات البحث العلمي وتشتمل على موضوعات (البحث العلمي (أدواته وأخلاقه), ومجالات البحث العلمي عن المعلومات من مصادرها, وعناصر البحث العلمي وفنيات كتابتها)؛ والوحدة الثالثة تتناول مهارات الاتصال وتشتمل على ثلاثة موضوعات هي (مهارات اكتشاف الذات وإدارتها, مهارات التخطيط للمستقبل, ومهارات العرض والتقديم)؛ والوحدة الرابعة تتناول مهارات التفكير وتشتمل على ثلاثة موضوعات (مهارات التفكير الإيجابي والتفكير الناقد, مهارات التفكير الإبداعي, ومهارات تنويع التفكير واتخاذ القرار).

Most important references:

هنداوي، إبراهيم؛ خضر، محمد.(2019) مهارات الحياة الجامعية الدمام: مكتبة المتنبي

Course number and code: 122-MAT-4 Course name: Introduction to Differential calculus No. of credit units: 4

Course objectives:

Students are expected to have strong and sound understanding of the differentiation calculus in term of its concepts, techniques and theorems. Students are expected to apply them on studying the behavior of functions.

Course content (concise):

This course is designed to cover the Differential Calculus. It includes limits, continuity, derivatives, and the applications of derivatives. The types of functions studied include algebraic, trigonometric, exponential and logarithmic.

Most important references:

1. Alolyan, N. Bin Turki, T. Ghazal, O. Al-Gahtani and K. khashan, Differential Calculus, 4th Edition, King Saud University Press.

Course number and code: 101-CSC-3 Course name: Programming Principles No. of credit units: 3

Course objectives:

The course aims to teach students the basic knowledge and skills to solve problems using computational thinking and apply that by using a programming
language.

Course content (concise):

The course deals with the principles of computational thinking, solving, and analyzing problems, and principle of designing and evaluating algorithm.

Most important references:

Book: Computational Thinking: A Beginner's Guide to Problem-Solving and Programming, Author: Karl Beecher
Publication Year: 2017

Course number and code: 121-GEC-3 Course name: Engineering Drawing No. of credit units: 3

Course objectives:

Mastering the use of various technical drawing tools to produce high quality and neat drawings.
2. Developing the students' skills in producing professional engineering drawings to present their design ideas.
3. Increasing the students' imaginary design thinking and expanding their design visual language proficiency.

4. Learn the principle of using AutoCAD package in the drawing

Course content (concise):

Students in this course will learn how to draw different curves and figures that are used in engineering applications

Most important references:

1. Cecil H. Jensen; Jay D. Helsel; Dennis R. Short, Engineering Drawing & Design (2007), 7th Edition, McGraw Hill.
2. K. Venugopal, Engineering Drawing & Graphics, New Age International, 2007

Courses of level 3

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Course number and code: 211-TQF-2 Course name: Muslim Culture (1) No. of credit units: 2

Course objectives:

معرفة مفهوم الثقافة الإسلامية بمصادرها وخصائصها وموضوعاتها، وأخلاقها الحسنة، وأهم التحديات التي تواجها.

Course content (concise):

مدخل يتضمن مفهوم الثقافة الإسلامية وأهدافها وخصائصها وموضوعاتها، والتحديات التي تواجهها.

Most important references:

مذكرة خاصة بقسم الثقافة الإسلامية

Course number and code: 221-CE-2 Course name: Engineering Geology No. of credit units: 2

Course objectives:

1. Explain geology, earth surface features and processes.
2. Discuss rock formation and rock types.
3. Describe minerals and their physical properties.
4. Recognize structural features of earth crust and engineering considerations.
5. Determine weight-volume relationships,
6. Classify rocks according to engineering systems

Course content (concise):

Introduction to engineering geology, earth surface and physical properties of earth materials, geological processes, types and classification of rocks, physical and mineralogical properties of rocks, basics of structural geology, soil formation and properties, clay minerals, groundwater.

Most important references:

- Mathewson, C.C., Engineering Geology, Bell & Howell Co., Columbus, OH 43216, USA, latest edition.
- Dunn, I.S., Anderson, L.R. and Keifer, F.W., Fundamentals of Geotechnical Analysis, John Wiley and Sons, Inc., N.Y., USA, latest edition.
- Das, B.M., Properties of Soils, Engineering Press, Inc. San Jose, CA, USA., latest edition

Courses of level 4:

Course number and code: 122-ARC-2 Course name: Computer Applications in De No. of credit units: 2

Course objectives:

1. Operate the user interface for Sketch Up and AutoCAD.
2. Complete exercises using the majority of Sketch-Up tools.
3. Produce and edit professional 2D drawings using layers and other tools Plot out.
4. Drawings to scale and other requirements

Course content (concise):

This course provides an overview of all of the essential Sketch-Up skills needed for general modeling, layout, and architecture and at the same time provides an introduction to Computer-Aided Design (CAD). It also introduces drafting concepts pertaining to CAD in general, and in particular to selected drafting packages. Throughout this course, the emphasis is to be placed Sketch-Up 3D tools on another hand Auto CAD two-dimensional drawing techniques.

Most important references:

Aidan Chopra (2012) Introduction to Google Sketch-Up 2nd Edition ISBN-13-978-1118077825

Course number and code: 212-TQF-2 Course name: Muslim Culture (2) No. of credit units: 2

Course objectives:

الهدف الرئيس للمقرر :معرفة مجالات الثقافة الإسلامية، وأهميتها ومصادرها وأسسها ومجالاتها، وأثرها في معالجة التغيرات، ودراسة بعض القضايا الفكرية، والنظم الإسلامية الرئيسة .

Course content (concise):

يتضمن المقرر دراسة مجالات الثقافة الإسلامية، من خلال دراسة مفهومها ومصادرها وأسسها ومجالاتها وأثرها، وبيان النظم الإسلامية الرئيسة

Most important references:

مذكرة أعدها القسم

Course number and code: 101-ARB-2 Course name: Arabic Language Skills No. of credit units: 2

Course objectives:

أن يتجنب الطلاب الأخطاء اللغوية والأخطاء الشائعة في الحديث والكتابة، وأن يتمكنوا من التعبير اللغوي السليم في فنون اللغة النثرية

Course content (concise):

يتناول المقرر كل ما يمكن الطالب من قواعد اللغة العربية، والتعبير السليم كتابيا بحيث يكون خاليا من الأخطاء الإملائية والأسلوبية وبعيدا عن الأخطاء الشائعة.

Most important references:

1 - النحو المبسط، محمد ياسين ربابة – دار إحياء علم الدين، دمشق – سورية، الطبعة الرابعة.
2 - التحرير العربي و مهارات الكتابة ، مسفر بن محماس الكبيري ، مكتبة المتنبي ، الدمام ، ط2 ، 2014م

Course number and code: 141-CE-3 Course name: Strength of Materials No. of credit units: 3

Course objectives:

To provide basic knowledge in strength of materials so that the students can solve real Civil Engineering problems and design structural systems.

Course content (concise):

Normal stress and normal strain, Hook's Law, Young modulus, ductile and brittle behavior of materials, allowable stresses, bearing stress, with applications in Civil Engineering problems; Shear stress and shear strain, Poisson's ratio, modulus of rigidity, Torsional of circular bar and rectangular beams of linearly elastic materials, with applications in Civil Engineering problems; Load-shear-moment relationship in beams; Stresses in Beams, bending and shearing stresses on any cross section of the beam; Combined

stresses due to bending, torsion, shear and axial loads; Transformation of stresses using principal stresses concept, and Mohr's circle technique; Column buckling and elastic stability, theory of Euler.

Most important references:

R. C. Hibbeler, "Mechanics of Materials", Pearson/Prentice Hall, Last Edition.

Courses of level 5:

Course number and code: 260-CE-3 Course name: Surveying Engineering No. of credit units: 3

Course objectives:

- Familiarize students with the fundamental concepts, terminology, and various methods used in surveying, including definitions and measurement units.
- Provide an overview of linear measurements, covering techniques such as tape measurements, electronic distance measurement, and angular measurements.
- Explore levels and leveling operations, including contouring, cross-sections, and volume calculations, as well as area computations.
- Introduce students to Total Stations, including their functions and applications.
- Cover traverses, which involve the measurement of a series of connected points, and teach students data collection and setting out techniques related to surveying.

Course content (concise):

The basic surveying theory and practice Principles of measurements of distances, elevation and angles. Basic error theory in measurement and calculations. Topographic surveying and mapping; Area and volume computations; Circular curves

Most important references:

Text Book: Paul, R. Wolf & Charles D. Ghilani, " Elementary Surveying: An Introduction to Geomatics 15th Edition " Pearson; 15th edition (January 24, 2017)

Course number and code: 211-CE-3 Course name: Fluid Mechanics No. of credit units: 3

Course objectives:

By the completion of the course, the students should be able to:

1. Apply the basics of fluid mechanics.
2. Know fluid characteristics in static and dynamic states and the stability of floating bodies.
3. Know the basic of fluid energy.

Course content (concise):

Introduction and basic concepts of fluid mechanics, fluid properties, pressure and fluid statics in immersed surfaces, stability of floating bodies, fluid kinematic, energy equation, momentum equation, flow measurements, and dimensional analysis. Bernoulli's equation and dimensional analysis.

Most important references:

Joseph B. Franzini, E. John Finnemore, Fluid Mechanics with Engineering Applications, (2001). Tenth edition, McGraw-Hill

Courses of level 6:

Course number and code: 243-CE-3 Course name: Properties and Testing of Structural Materials No. of credit units: 3

Course objectives:

1. Study properties, types, testing and test techniques for the performance of structural materials.
2. Study the concept of fundamental material science and solid mechanics concepts to understand, explain, characterize, and predict the performance of structural materials.
3. Study the behavior of composite materials, aggregate, Portland cement and Portland cement concrete.
4. Study types and mechanical properties of reinforcing steel.

Course content (concise):

Testing of aggregates including sieve analysis, density, absorption, and abrasion of sand and concrete. Design and testing of concrete mixes for required workability, normal consistency, setting times, compressive, tensile, flexure strength and modulus of elasticity at various ages. Nondestructive testing using Schmidt hummer and ultrasonic waves. Tensile test for reinforcing steel, and calculation of elastic modulus. Tests on isotropic and anisotropic materials, including timber and polymer.

Most important references:

Mamlouk, M.S., Zaniewski, J. P, Materials for Civil and Construction Engineers, 3rd Edition, Pearson, Prentice, Hall ISBM -13 978-0-13-611058-3

Course number and code: 251-CE-3 Course name: Structural Analyses (1) No. of credit units: 3

Course objectives:

- To understand the difference between determinate and indeterminate Structure.
- To provide a thorough understanding and practical applications of structural analysis theories.
- To develop the skills to analyze the behavior and response of structures to various loads and constraints of determinant structures.
- To establish foundation knowledge and skills in preparation for structural design, concrete and steel design

Course content (concise):

Types of structures, structure elements, supports and loads. Idealization of structures and loads. Geometric stability and determinacy. Reaction computations of determinate structures. Reactions of cantilevered structures, three hinged arches. Analysis of Trusses and Cables. Shear force and bending moment diagrams for determinate structures (beams, frames and three hinged arches). Differential equation of elastic curve. Computation of rotation and deflections of beams by methods of double integration, moment-area, conjugate-beam, and virtual work. Influence lines of determinate structures (beams and trusses).

Most important references:

Russell C. Hibbeler, "Structural Analysis", Person Education South Asia Pte Ltd, last edition.

Course number and code: 222-CE-4 Course name: Geotechnical Engineering No. of credit units: 4

Course objectives:

1. Understand the formation and classification of soils.
2. Understand compaction of soils
3. Understand stress and strain in soil masses
4. Analysis of stress distribution and apply principle of effective stress.
5. Analysis of consolidation behavior
6. Analysis of shear strength of soils and slope stability.
7. Analysis of seepage of soils and lateral earth pressure.

8. Analysis of slope stability
9. Conduct experiment, analyze and interpret data

Course content (concise):

Soil formation and identification; consistency limits and classification of soils; weight-volume relationships; soil compaction; effective stresses; permeability and seepage; compressibility and consolidation; stress in soils; shear strength of soils; introduction to lateral earth pressure and slop stability.

Most important references:

Principles of Geotechnical Engineering by Braja M. Das, 9th Edition

Course number and code: 212-CE-3 Course name: Hydraulics No. of credit units: 3

Course objectives:

Enable students to understand and apply the fundamental principles of flow in pipes and open channel to the design of engineering systems. This course represents a stepping stone in the professional development; it is intended to aid students in developing the skills they will need for systematic decomposition and solution of real-world problems

Course content (concise):

Concepts of fluid flow through pipe, Characteristics of flow through pipes, energy losses, analysis of pipe flow networks, concept of flow in open channel, comparison between pipe flow and open channel flow, geometric properties of channel sections, specific energy and its application in open channel flow problem, uniform flow and its applications, hydraulic jump, gradually varied flow, hydraulic machines: pumps and turbines

Most important references:

1. Fundamentals of Hydraulic Engineering Systems, Robert J. Houghtalen, A. Osman H. Akan and Ned H. C Hwang., Pearson Prentile Hall, 4th Edition,2010.
2. Open Channel Hydraulics, Ven-Te-Chow, McGraw-Hill Book Co.,2009

Courses of level 7:

Course number and code: 352-CE-3 Course name: Reinforced Concrete (1) No. of credit units: 3

Course objectives:

- To Recognizing the General principals of flexure analysis of reinforced concrete beam based on ACI code requirements.
- To recognize the concept and the modes of failure for beams under bending.
- To design reinforced concrete beams for singly and doubly reinforced members and "Flange" beams.
- To design concrete beams for shear (diagonal tension)
- To compute development length of reinforcing steel.

- To understanding the need for compute crack control in reinforced concrete beams
- To design one-way solid slab.
- To understanding the reinforcement layout and detailing.

Course content (concise):

Fundamentals and design theories based on ultimate strength design and elastic concept using ACI code. ACI Code requirements. Load factors. Analysis and design of reinforced concrete members subject to flexure, shear and diagonal tension in accordance to ACI strength method. Development length of reinforcement, deflection and crack controls in reinforced concrete members.

Most important references:

Arthur H. Nilson, David Darwin, Charles W. Dolan, Design of concrete structures, McGraw-Hill, Last Edition.

Course number and code: 331-CE-3 Course name: Transportation and Traffic Engineering No. of credit units: 3

Course objectives:

1. Identify basic concepts and stream components of traffic, traffic flow characteristics and transportation systems.
2. Compute highway capacity and travel demand.
3. Design intersections signalization.
4. Analyze and design traffic flow characteristics and parking facilities.
5. Apply modern techniques for transportation systems management.
6. Compute trip generation, mode choice and route choice parameters given typical models for each.
7. Identify current technologies being used in traffic management and control

Course content (concise):

Transportation systems; vehicle characteristics and human reactions; traffic flow characteristics; highway capacity analysis; intersection control and design; public transportation; urban transportation planning; parking and terminal facilities; transportation safety; intelligent transportation systems and computer applications; introduction to railways, waterways, airports, and pipelines

Most important references:

Traffic and highway Engineering, Nicholas Garber and lester Hoel, 5th Edition, PWS Publishing Company, 2014

Course number and code: 314-CE-3 Course name: Hydrology and Water Resources Management
No. of credit units: 3

Course objectives:

The main objective of this course is to gain a solid understanding of the following fundamentals and Principles:

1. Hydrologic cycle and its components.
2. precipitation processes, surface water flow, and hydrographs.
3. Rainfall-runoff modeling and applying the Rational method for designing culverts and channels.
4. Groundwater flow and Darcy's law.
5. Flow through confined and unconfined aquifers.
6. Flood risk and water resources planning and management.

Course content (concise):

The hydrologic cycle, Fundamentals of meteorology: Temperature, humidity, wind, Precipitation, Evaporation, Transpiration, and Infiltration, Stream flow and runoff, Stream flow hydrograph and Unit hydrograph. groundwater aquifers and wells , river Basin modelling and flood Management.

Most important references:

- Lineley, "Hydrology for Engineers", McGraw-Hill Book Co.
- K Subramanya "Engineering Hydrology" Tata McGraw-Hill Publishing,2008
- Loucks, Daniel P. and Eelco van Beek, Water Resources Systems Planning and Management: An Introduction to Methods, Models and Applications, UNESCO, Paris, 2005 (Available free online: https://ecommons.cornell.edu/handle/1813/2798

Course number and code: 370-CE-3 Course name: Water Supply and Wastewater Systems
No. of credit units: 3

Course objectives:

Enable students to understand the definition of sanitary engineering with particular reference to water and wastewater sources, treatments, and standards. This course represents a stepping-stone in professional water and wastewater systems. It is intended to aid students to be able to use the techniques and skills within fields usually employed for the primary goal of disease prevention within human beings by assuring a supply of healthy drinking water, and treatment of wastewater. It enables students to evaluate environmental problems of urbanization, identify, and elucidate the physical, chemical, and biological properties of water. It also helps to explain the physical, chemical and biological characteristics of sewage and design of wastewater collection system.

Course content (concise):

Introduction, Source of water supply, Water Demands, Quality of water supply and wastewater and drinking water standards, Water treatment system (Sedimentation; and Coagulation-flocculation, Filtration, Disinfection, Softening, and Iron and manganese removal), Collection and Distribution of water, Characteristics of wastewater, Wastewater Treatment and effluent standard, Wastewater collection networks & sewer system.

Most important references:

Husain, S.K. (2006). "Text book of water supply and sanitary engineering", Oxford & Ibh 3rd edition.

Courses of level 8:

Course number and code: 381-CE-3 Course name: Construction Engineering and Management
No. of credit units: 3

Course objectives:

To define and identify construction engineering and management

- Give an overview of basic construction management techniques and principles.
- To train the students with the latest and the best in the rapidly changing fields of Construction Engineering, Technology and Management.
- To prepare the students to be industry leaders who implement the best engineering and management practices and technologies in the construction industry.

- To continually work with industry to enhance the program's effectiveness and the opportunities for innovation in the construction industry.

Course content (concise):
An overview of principles of construction management and construction engineering; professional responsibilities, ethics, liabilities and licensing; contracts and project delivery systems; business ownership; project planning and scheduling; cost estimation, cost control, resource leveling, introduction to construction economics, equipment productivity and selection; construction productivity and safety; construction types, equipment, materials, and foundation; concrete form design; contemporary issues in Construction Engineering; field projects and life-long learning.

Most important references:
- Construction Management: Daniel W. Halpin and Bolivar A. Senior, 5th Edition, Wiley, 2017.
- Construction Methods and Management: S. W. Nunnaly, Prentice Hall.

Course number and code: 353-CE-3 Course name: Structural Analyses (2) No. of credit units: 3

Course objectives:
1. To review the concept of the determinate and indeterminate Structure.
2. To provide a thorough understanding and practical applications of structural analysis theories concerning composite and indeterminate Structure (classical and matrices theories).
3. To develop the skills to analyze the behavior and response of structures to various loads and constraints conditions, such as supports settlements and sidesway in analysis of frames.
4. To establish foundation knowledge and skills in preparation for structural design, concrete, steel, and coding computer programs that relates structural analysis and design.

Course content (concise):
Study of analysis of continuous beams and frames using classical methods, such as Slope Deflection Method and Moment Distribution Method, considering supports settlements in analysis of beams, and sidesway in analysis of frames; Study of analysis of trusses, continuous beams and frames using matrices method, such as Stiffness Method (standard and modified) considering sidesway in analysis of frames, and Flexibility Method.

Most important references:
Structural Analysis, last edition, Person Education South Asia Pte Ltd, by Russell C. Hibbeler.

Course number and code: 323-CE-3 Course name: Foundation Engineering No. of credit units: 3

Course objectives:
By the completion of the course, the students should be able to:
- Plan for site investigation
- Recognize different types of Foundations.
- Determine the bearing capacity and settlement of shallow Foundations.
- Design shallow Foundations
- Determine the bearing capacity of deep foundations
- Design retaining walls

Course content (concise):
Site exploration and selection. Types of foundations. Bearing capacity and settlement of shallow foundations. Retaining Walls. Deep Foundations (single & group piles, piers and caissons.

Most important references:

- Braja M. Das , Latest edition "Principles of Foundation Engineering", CL-Engineering, International Edition

Course number and code: 354-CE-3 Course name: Reinforced Concrete (2) No. of credit units: 3

Course objectives:

Student learn the fundamental, techniques and theory of designing reinforced concrete structures and apply and use national and international codes such as ACI-318 Code to design reinforced concrete members and structures such as beams, slabs, footings and column.

Course content (concise):

Design of one-way, two-way, ribbed and flat slabs floor systems. Design for "torsion" and "combined shear and torsion" by the strength method. Design of continuous beams. ACI moment redistribution for minimum rotation capacity. Design of columns under axial and eccentric loadings, short and long columns, staircases, and types of concrete footings.

Most important references:

Arthur H. Nilson, David Darwin, Charles W. Dolan, Design of concrete structures, McGraw-Hill, Last Edition.

Course number and code: 491-CE-2 Course name: Graduation Project (1) No. of credit units: 2

Course objectives:

- To independently work on students' initiative.
- Identify the stages of project preparation and information
- To enthusiastically explore one or more areas of their program in depth.
- To thoroughly gather and manage information in a scientifically rigorous method.
- Develop a project plan and collect the necessary data and information with him
- To competently process and integrate materials in a sustained exercise of intellectual ordering.
- To skillfully produce coherent, literate official documents.
- To constructively appreciate and incessantly involved in life-long learning.
- To initiate students their path of success in the future industrial careers.To consider sustainability, environmental, issues and determine optimum solution and design.
- To consider sustainability, environmental, issues and determine optimum solution and design.

Course content (concise):

Choosing the topic, establishing the project, literature review, preparing for/or preliminary conducting the experiments, collecting the field data & developing the mathematical / computer model if applicable, writing the first part of the project along with any preliminary findings.

Most important references:

A selection of books, scientific research and graduation projects.

Courses of level 9:

Course number and code: 455-CE-3 Course name: Steel Structures No. of credit units: 3

Course objectives:

- Understand the advantages and disadvantages of steel Structures.
- Understand the main concept of LRFD and ASD approach, and the related factors that affect the design.
- Understand the design of critical sections within the constraints of code design, criteria of safety, serviceability and economy using fundamental principles as well as design aids
- Work out all stages involved in designing different elements in typical steel structures, and to present the work involved in a professional way.
- Continue to follow up any developments and changes that occur to the related codes.
- To understanding the reinforcement layout and detailing.

Course content (concise):

Introduction to steel structures design, methods of design, specifications, codes and loads. Design of tension and compression members, Design of beams, column under eccentric loadings, Design of Connections.

Most important references:

Jack McCormac, Stephen F. Casernac, "Structural Steel Design" Prentic Hall, Last edition

Course number and code: **482-CE-3** Course name: **Contracts and Specifications** No. of credit units: 3

Course objectives:

By the completion of the course, the students should be able to:

- Explaining the behavior of saturated and unsaturated soils
- Deal with specific problems in geotechnical aspect specified by the instructor
- Using software for geotechnical applications
- Appling the fundamental of soil dynamic and geo-environmental

Course content (concise):

Basics of construction law are covered, including types and selection of construction contracts. Topics include ingredients of engineering contracts, responsibilities and rights for the Contract Parties. International and Saudi standard contracts are presented to familiarize the students of the way Engineering Projects are administered time, cost and quality wise

Most important references:

1. Collier, Keith (2001). Construction Contracts. 3rd Edition, Prentice-Hall, Inc., Upper Saddle River, New Jersey
2. Saudi Public Works Contract
3. FIDIC Construction Model Contracts
4. www.fidic.org, www.saudieng.gov.sa

Course number and code: 434-CE-3 Course name: Highway Engineering No. of credit units: 3

Course objectives:

To plan, describe, design, evaluate and maintain various components of highway structure

Course content (concise):

Highway pavement materials and structural design of pavement thickness, Pavement distress and maintenance, evaluate the performance of asphalt mixtures, Highway planning and capacity (cross sectional elements), Geometric alignment and design (sight distances, horizontal and vertical alignments), Lab. Experiments on pavement materials (aggregate, binder and asphalt mixture).

Most important references:
Mannering, Fred L., and Scott S. Washburn. Principles of highway engineering and traffic analysis. John Wiley & Sons, 2020.

Course number and code: 472-CE-3 Course name: Environmental Engineering No. of credit units: 3

Course objectives:
By the end of this semester, students will be able to:

- Identify the causes and effects of global environmental issues.
- Apply material balance equation in civil engineering projects.
- Estimate the quantity of clean energy from construction project.
- Define engineering techniques to reduce carbon emissions in various climatic conditions. and propose effective solutions accordingly
- Evaluate construction material in terms of its energy efficiency by calculating R-value and/ or U-value .
- Define units and tools used to report air & noise pollution data.
- Calculate average mass of solid waste and construct a MSW landfill, and propose sustainable solution to reduce waste (e.g waste to energy).
- Utilize environmental tools (e.g LEED) to evaluate building performance in terms of its environmental impact.
- Perform a detailed and critical analysis of a given construction project that was complied with environmental and sustainable dimensions and criteria.

Course content (concise):
This course has various subjects including: **Environment chemistry:** greenhouse gas, causes of global warming and climate change. **Energy and matter:** classification of material flow, material balance. **Carbon footprint reduction:** clean energy, energy efficiency, innovative techniques to control CO_2 emissions. **Pollution:** water pollution, air pollution, and noise pollution, measurements, causes & effects and control. Solid waste management: reduce, reuse, and recycle, MSW landfill. **Environmental assessment:** method definition, importance, main features, well-known tools, case study in Saudi Arabia.
Most important references:
Mackenzie L Davis, David A Cornwell, "Introduction to Environmental Engineering", McGraw-Hill, Last Edition.

Courses of level 10:

Course number and code: **493-CE-3** Course name: **Cooperative Training** No. of credit units: **3**

Course objectives:

Course content (concise):

Most important references:

The Specialization Elective courses (Group1)

Course number and code: **315-CE-3** Course name: **Design of Hydraulics Structures** No. of credit units: **3**

Course objectives:

1- Develop the understanding of basic principles and concepts of analysis and design of hydraulic structures.
2- Analyze and design different dams and select the proper dam for any practical problem.
3- Design of various energy dissipation structures and highway culvert.

Course content (concise):

Advantages and functions of hydraulic structures. Classification of hydraulic structures according to use Seepage under hydraulic structures. .Flow through orifices. Culverts. Under gates. Over weirs and spillways. Energy dissipation below hydraulic structures. Hydraulic design of culverts, Weirs, Spillways and dams.

Most important references:

1- Novak, P., Moffat, A. Nalluri, C. and Narayanan, R., Hydraulic Structures, 3ed Ed., 2001.
2- Garg. S.K.Irrigation Engineering and Hydraulic Structures, Khanna publisher 2006.

Course number and code: **324-CE-3** Course name: **Improvement of Geotechnical Materials** No. of credit units: **3**

Course objectives:

By the completion of the course, the students should be able to:

- Enhancing soil Engineering Performance
- Recognizing mechanical & Chemical stabilization methods of soils
- Designing earth reinforcement

Course content (concise):

Improving performance of soils for engineering applications. Analysis of methods of stabilizing soils and rocks including topics on: Mechanical and chemical stabilization and earth reinforcement.

Most important references:

Moseley, M.P. "Ground Improvement", Blackie Academic & Professional.

Course number and code: **361-CE-3** Course name: **Remote sensing and GIS Applications in Civil Engineering** No. of credit units: **3**

Course objectives:
Covers the basic concepts of remote sensing and geographic information systems, the methods and software used to implement them, and their applications for environmental and urban applications. Data collection using GPS and other tools.
Course content (concise):
The basic surveying theory and practice Principles of measurements of distances, elevation and angles. Basic error theory in measurement and calculations. Topographic surveying and mapping; Area and volume computations; Circular curves.

Most important references:

- Michael Kennedy, " The Global Positioning System and GIS: An Introduction", T & F Books UK (2007).
- Edward M. Mikhail, James S. Bethel, and J. Chris McGlone," Introduction to Modern Photogrammetry", Publisher: Wiley, last version

Course number and code: **323-CE-3** Course name: **Transportation planning** No. of credit units: **3**
Course objectives:

1- Obtain an understanding of travel demand, and transportation network, and their interactions.
2- Learn basic techniques used to model, plan, and design transportation systems.
3- Apply main skills to small problems and case study applications

Course content (concise):
Theoretical foundations of transportation planning, design, and analysis methods. Theory and application of aggregate and disaggregate models for land use development, trip generation, and destination, mode, and route choice. Transportation network analysis. Planning, design, and evaluation of system alternatives.

Most important references:
Ortuzar & Willumsen (2011). Modeling Transport. 4th Edition, John Wiley & Sons, Inc.

Course number and code: **356-CE-3** Course name: **Analysis and Design of Buildings** No. of credit units: **3**

Course objectives:
To understand and identify the principles of designing buildings and structures taking into account modern achievements in the field of calculation and design requirements for buildings and structures, theorems and principles of mechanics.

Course content (concise):
Structural design process of RC buildings, preliminary design and selection of appropriate structural system. Integration and implementation of analysis and design process through a term-long design project of real structures utilizing modern computer software and including: idealization and modeling of structures, estimation of gravity and wind loads, results validation and verification, preparation of structural drawings and details.

Most important references:
Arthur H. Nilson, David Darwin, Charles W. Dolan, Design of concrete structures, McGraw-Hill, Last Edition

Course number and code: **383-CE-3** Course name: **Construction Cost Estimation** No. of credit units: **3**

Course objectives:
Objective of Construction cost estimating is the process of forecasting:

- The cost of building a physical structure.
- Project owners use cost estimates to determine a project's scope and feasibility and to allocate budgets.
- Contractors use them when deciding whether to bid on a project.

Course content (concise):
Overview of the estimating and bidding process, fundamentals of the quantity take off for earth, concrete, and masonry works, and putting costs to the estimate. The estimating process. Conceptual estimation. Range estimation. Detailed estimate. Quantity take-off from plans and specifications. Earthwork. Concrete. Masonry. Carpentry and steel. Mechanical and Electrical estimating. Heavy construction. Profit and bonds. Labor productivity. Construction Cost Control Methods, Earned Value Method (EVM). Computers in estimating.

Most important references:
Stephen and Roger W. Liska, "Building Construction Estimation", McGraw-Hill.

Course number and code: **373-CE-3** Course name: **Environmental Assessment and Management Systems** No. of credit units: **3**

Course objectives:
By the end of this semester, students will be able to:

- Define National and international of environmental policy.
- Explain methods, matrices and checklist of environmental impact identification.
- Outline environmental indices and indicators for describing the effected environment
- Conduct a predication and assessment of impact on specific environmental system.
- Perform a critical and analytical study based on case study

Course content (concise):
Knowledge for principle of environmental impact assessment includes the definition, historical background, laws and tools related to environmental impact assessment. The principles of environmental impact assessment focus on physical, biological and human use to achieve quality of life with case studies and examples.

Most important references:
Canter, Larry W., “Environmental Impact Assessment” ”, McGraw Hill

The Specialization Elective courses (Group2)

Course number and code: **474-CE-3** Course name: **Selected Topics in Water and Environmental Engineering** No. of credit units: **3**

Course objectives:

Enable students to understand the principles of groundwater hydrology, hydraulics of different kinds of wells, sources and movement and character of groundwater, steady and unsteady groundwater flow problems, groundwater recharge and saline water intrusion. The course also aims to provide students with basic knowledge to understand the practice of waste management in modern society and how to tackle the problems of solid and hazardous waste minimization, generation, treatment and disposal

Course content (concise):

Different selected Water and Environmental Engineering topics that are not covered in other courses such as; principles underlying groundwater hydrology which include; groundwater flow, pumping tests, groundwater exploration, well design and hydrology of coastal aquifers. Also, it includes aspect of solid waste collection, recycling, reuse and disposal.

Most important references:

ii. Freeze, A., and J. Cherry. "Groundwater," Prentice Hall, USA, 1979, ISBN-10:0133653129, ISBN-13: 9780133653120.
iii. Raghunath H.M. (2007) Groundwater, 3rd edition, New Age International Publishers.
iv. P. T. Williams, "Waste Treatment and Disposal," 2nd Edition, John Wiley & Sons Ltd., Chichester, 2005, pp. 171-244

Course number and code: **425-CE-3** Course name: **Selected Topics in Geotechnical Engineering** No. of credit units: **3**

Course objectives:

By the completion of the course, the students should be able to:

1. Explaining the behavior of saturated and unsaturated soils
2. Deal with specific problems in geotechnical aspect specified by the instructor.
3. Using software for geotechnical applications.
4. Appling the fundamental of soil dynamic and geo-environmental engineering

Course content (concise):

Soil behavior. Computer applications in geotechnical engineering. Seepage and consolidation. Soil dynamics. Principles of unsaturated soil mechanics. Geo-environmental engineering.

Most important references:

1. Problematic Soils and Geoenvironmental Concerns, (2018), Madhavi Latha Gali, Proceedings of IGC.
2. Soil Dynamics and Earthquake Geotechnical Engineering, Lecture Notes in Civil Engineering, (2016), Boominathan Adimoolam and Subhadeep Banerjee, IGC, Volume 3.

Course number and code: **435-CE-3** Course name: **Selected Topics in Transportation Engineering** No. of credit units: **3**

Course objectives:
To study and cover a modern topic in transportation engineering

Course content (concise):
The objective of this course is to provide students with a general background in transportation engineering topics that are not covered in other courses such as; sustainable transportation, transportation safety, pedestrians, bicyclists, and public transportation, application of various statistical and econometric analysis techniques, traffic system engineering, traffic flow and air transportation

Most important references:
Mannering, Fred L., and Scott S. Washburn. Principles of highway engineering and traffic analysis. John Wiley & Sons, 2020

Course number and code: **457-CE-3** Course name: **Selected topics in Structural Engineering** No. of credit units: **3**

Course objectives:
Cover different selected structural engineering topics.

Course content (concise):
Different selected structural engineering topics that are not covered in other courses such as; fundamentals of structural dynamics. Introduction to seismic design. Design of different systems of slabs, shear walls, tanks, and silos, Pre-stressed Concrete Design.

Most important references:
J. K. Wight and J. G. MacGregor, "Reinforced Concrete: Mechanics and Design" Latest Edition.

Course number and code: **484-CE-3** Course name: **Selected Topics in Construction Engineering** No. of credit units: **3**

Course objectives:

- Cover unique topics of current interests in construction engineering and management.
- Cover the contemporary and present theories and tools that will be beneficial for the students.

Course content (concise):
This course will cover the contemporary and present theories and tools that will be beneficial for the students. This course covers unique topics of current interests in construction management. The course may feature a detailed look at a single topic or a series of focused topical presentations.

Most important references:

1. Managing The Construction Process: Estimating Scheduling, And Vproject Control, *Frederick E. Gould*, Pearson Prentice Hall 2010.
2. Construction Planning And Scheduling, *Jimmie W. Hinze*, 3rd Edition

Appendices: (In the case of new programs or those that have been substantially modified).

**Attach the program specification according to NCAAA template.
**Attach external reviewer report for the program / study plan.
**Attach a response report on external reviewer comments.
**Attach the courses and field experience specifications according to NCAAA template Hard or Soft.
**Attach a report on survey for the community and job market needs.
**Attach a report on benchmarking (comparative study) to beer programs, nationally and internationally.