وزارة التعليم العالي والبحث العلمي

جـــهاز الإشـــراف والتقـــويم العلـمي

دائرة ضمان الجودة والاعتماد الأكاديمي

استمارة وصف البرنامج الأكاديمي للكليات والمعاهد

الجامعة : جامعة واسط

الكلية/ المعهد: كلية الهندسة

القسم العلمي : قسم الهندسة المدنية

تاريخ ملء الملف : 2024/7/24

التوقيع:

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التاريخ:

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المعاون العلمي: أ. م. د. حسين رزاق صباح

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دقق الملف من قبل: شعبة ضمان الجودة والأداء الجامعي

اسم مدير شعبة ضمان الجودة والأداء الجامعي:

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مصادقة السيد العميد

أ. د. علي ناصر حلو

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 2312 - Strength of Materials (I), (4.0, Required), Asst. Prof. Jasim Mahmood

2. Catalog Description:

Strength of Materials is a heavy course load that requires long instruction hours. Therefore, the strategy of the course to deliver this module depends mainly on the module instructor in the class, where the material should be delivered with practical examples. Moreover, class tutorials and homework assignments would help the students to practice solving analysis Composition and resolution of forces issues more efficiently. Practical and test videos should also be occasionally used to facilitate connecting the given course elements. Visits to structural building construction sites are also another tool to combine the delivered theoretical material with its practical application.

3. Prerequisite(s):

Engineering Mechanics II

4. Textbook(s) and/or other required materials:

1. Mechanics of Materials, 10th edition (SI version), by: R. C. Hibbeler, 2017
2. Mechanics of Materials, 2nd edition (SI version), by: E. Popov, 1990

5. Course Objectives:

1. Understand the use of appropriate materials in civil structures.
2. Identify the types of structural members and their supports and calculate the reactions.
3. Structural analysis of structural members and finding internal forces.
4. Calculating the stresses, and strains generated in the materials and comparing them to the permissible limits to indicate the suitability of the materials used.

6. Topics:

1. Introduction (element of structure ,kinds of supports , classification of structure)
2. Axial force , shear force and bending moment A) Method of section
3. Axial force , shear force and bending moment A) Method of section
4. Axial force , shear force and bending moment B) Area summation method
5. Axial force , shear force and bending moment B) Area summation method
6. Tutorial + First Quiz
7. Deformation of member under axial loading
8. Simply stress ,shear stress , Shearing deformation , Thermal strain
9. Tutorial + Second Quiz
10. Bending (flexure) stress

11. Bending (flexure) stress
12. Tutorial + Third Quiz
13. Mid Term Exam
14. Combined stress
15. Composite section
16. Preparatory week before the final Exam

7. Relationship to GOs:

1,2

8. Prepared by:

Asst. Prof. Jasim Mahmood

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 2314 - Engineering Surveying I, (5.0, Required), Dr. Jareer Mohammed

2. Catalog Description:

The Engineering Surveying module in the Civil Engineering Department aims to provide students with a comprehensive understanding of fundamental principles and concepts in surveying. It focuses on theory, measurement techniques, and the application of instruments and equipment used in surveying. Through hands-on experience, students will develop practical skills in accurately measuring distances, angles, and heights for civil engineering projects. The module enhances spatial awareness and the ability to interpret complex engineering plans, maps, and spatial data. It equips students with data analysis and interpretation skills using software and statistical techniques. Teamwork and communication skills are fostered through group projects and presentations. The module prepares students for professional practice by covering professional ethics, standards, and regulations in surveying. It promotes critical thinking and problem-solving, applying surveying principles to real-world engineering challenges. Students gain an appreciation for surveying's role in project planning, design, construction, and maintenance, ensuring safety, accuracy, and efficiency. Overall, the module provides a solid foundation of knowledge, skills, and competencies for a successful career in civil engineering surveying.

3. Prerequisite(s):

Mathematics II , Engineering Drawing

4. Textbook(s) and/or other required materials:

Bruce R. Harvey SURVEY COMPUTATIONS The University of New South Wales 2013.

5. Course Objectives:

1. Introduce fundamental principles
2. Develop practical skills
3. Enhance spatial awareness
4. Promote data analysis and interpretation
5. Foster teamwork and communication
6. Prepare for professional practice

6. Topics:

1. General concepts and principles of surveying.
2. Linear measurements: Taping methods, measuring obstructed distances, measuring and setting out horizontal angles.

3. Leveling; Introduction of Datum planes, Elevations of points, Level.
4. Differential leveling; methods of computing elevations of points.
5. Errors of leveling; Systematic and Observational error, Earth Curvature.
6. Closed leveling, Adjustment of differential leveling.
7. Profile leveling; adjustment of profile leveling, computation of cut and fill.
8. Angles and Directions; Types of Angles and Directions, Converting angles and Directions.
9. Angles Additions and computing Directions of line.
10. Traversing; elements of traverse, types of traverse, Angular misclosure.
11. Traverse Computations; Departures and Latitudes, Traverse misclosure.
12. Adjustment of traverse; Compass Rule.
13. Rectangular Coordinates; Forward and Inverse Computations.
14. Application of Traversing.
15. Setting out points by coordinates.

7. Relationship to GOs:

1,3,7

8. Prepared by:

Dr. Jareer Mohammed

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 2316 – Fluid mechanics (I) (5.0, Required), Dr. Nuralhuda Aladdin Jasim

2. Catalog Description:

To present a mathematical representation of fluid flow and other continuous media in order to acquaint students with the effective utilization of mathematics in this field of modeling. This session is designed for students with limited or no prior knowledge in fluid mechanics. To analyze the fundamental principles of fluid flow that are applicable to many civil engineering applications. In addition, to equip students with the necessary skills and knowledge to pursue advanced subjects in the future.

3. Prerequisite(s):

Mathematics II

4. Textbook(s) and/or other required materials:

1. Hydraulics & Fluid Mechanics by Dr. P. N. Modi and Dr. S. M. Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic Machines by McGraw Hill Education (India).

5. Course Objectives:

1. to introduce a mathematical description of fluid flow and other continuous media to familiarize students with the successful applications of mathematics in this area of modelling, and the module has been developed for students who have little or no experience in fluid mechanics.
2. To examine the principles of fluid flow relevant to a wide range of civil engineering application
3. To prepare students for future study of advanced topics.
4. By the end of the module, students will:
5. be able to solve novel and/or complex problems in Fluid Mechanics.
6. Have a systematic and coherent understanding of theoretical mathematics in the field of Fluid Mechanics.
7. Have acquired a coherent body of knowledge of these subjects demonstrated through one or more of the following topic areas:
8. Kinematics and dynamics of fluid flows, compressible flow, hydrodynamic stability, and dynamics of viscous fluids.
9. Equations of motion and their derivation for fluids.

6. Topics:

- Introduction: Distinction between solids, liquids & gases
- Definition of a fluid. Nature of fluid motion. The continuum hypothesis.
- Fluid properties. Relevance of subject and applications.
- Flow visualization. Newtonian versus non-Newtonian behavior

- Units and dimensions. Dimensional consistency. Dimensional analysis. Model testing and scaling: geometric and dynamic similarity.
- Fluid Properties, Density, specific weight, Viscosity.
- Compressibility; surface Tension.
- Fluid Statics: Pressure.
- Atmospheric properties; hydrostatic equation.
- Pressure measurement devices.
- Forces on immersed surfaces
- Hydrostatic pressure variation. Manometry.
- Forces on submerged bodies including applications to dams.
- Buoyancy and Archimedes' principle.
- Accelerated fluid masses and rigid body motion.
- Fluid Dynamics :Definitions of flow types.
- Continuity equation.
- Euler's and Bernoulli's equations.
- Applications on Bernoulli's equation.
- Momentum conservation equation.   Bernoulli's equation: energy interpretation. Static, stagnation, and dynamic pressure. Flow meters. Pi tot- and static-pressure tubes.

7. Relationship to GOs:

1,2,3,7

8. Prepared by:

Dr. Nuralhida Aladdin Jasim

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 2318 - Building Construction I (2.0, Required) Dr. Buroog Basheer Mahmood

2. Catalog Description:

The program provides students with a rigorous understanding of the principles, practices and ethics in a world-wide context involved in building construction up to first degree level standard.

The program reflects the academic underpinning necessary to prepare students for a career as a Chartered Builder, Construction Manager, and other related international professional bodies.

Also, introduce civil engineering first stage students to the fundamentals, basic principles and applications of Building construction.

These include varies of building materials and equipment. The course combines theory with drawing a number of sheets as a class and home work.

The importance of building elements and the relationships between architects and civil engineer responsibility.

Also, provides students with progressive development of knowledge and skills over three levels of study. The program is designed to ensure that graduates have a stimulating and challenging education, which prepares them for their professional career, and produces capable individuals with the potential to progress to professional status and prepare for advancement to master's level qualification. Students will develop a broad range of skills which are transferable across other industries.

Emphasis is placed on the management of schedule throughout the construction cycle, and also upon project planning.

3. Prerequisite(s):

Building Materials II

Co-requisite

Concrete technology I

4. Textbook(s) and/or other required materials:

1. Fundamentals of Building Construction: Materials and Methods .2019. 7th Edition. by Edward Allen, Joseph Iano.
2. انشاء المباني زهير ساكو ١٩٨٧

5. Course Objectives:

Indicative content includes the following.

1- Reviewing related topics from previous courses including building material.

2- Principles of the a earth and foundations works.

3- Defining the construction stages and its philosophy based on the recommendations and limitations of the piles and concrete works.

4- Analysis of work methods for the brick and block works .

5- Detailed study of the Beams and Columns work methods for the project, with an explanation of the modernization work mechanism and curing and treatment.

6. Topics:

1. Definition of building construction
2. Earth Works
3. Foundations Works
4. Foundations Works
5. Piles Works
6. Piles Concrete Works
7. Concrete Works
8. Brick and Block Works
9. Brick and Block Works
10. Masonry Works
11. Forms and Scaffoldings
12. Forms and Scaffoldings
13. Beams and Columns
14. Beams and Columns

7. Relationship to GOs:

1,2,5,7

8. Prepared by:

Dr. Buroog Basheer Mahmood

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE2320 – Concrete Technology (I) (4.0, Required), Dr. Hussam A. Goaiz

2. Catalog Description:

To learn students about the most important material in structures. Material constituent of the concrete are first studied in different aspects, and after that, students will learn how to deal with the concrete itself in terms of workability, slump, compaction, ect.

3. Prerequisite(s):

Building Materials II

Co-Requisite:

Building Construction I

4. Textbook(s) and/or other required materials:

1. Guide to Concrete Construction
2. Concrete, Mindess, S and Young, JF, Prentice-Hall, 1981 (620.136/34)
3. Properties of Concrete, Neville, AM, Wiley, 1996 (620.136/10)
4. Engineering Materials - An Introduction to their Properties and Applications, Ashby, MF and Jones, DRH, Oxford; Boston: Butterworth-Heinemann, 1996 (620.11/159)

5. Course Objectives:

1. Define and explain principles of engineering properties for concrete composition, cement, aggregate and water.
2. Introduce more Supplementary Cementitious Materials such as fly ash, Ground Granulated Iron Blast Furnace Slag and Amorphous Silica.
3. Educate basic fresh properties of concrete and the manufacturing process details such as mixing, handling, pouring and finishing.
4. Educate the most important laboratory tests on concrete and their mathematical operations.

6. Topics:

1. Introduction to Concrete
2. Cement Manufacturing
3. Chemical Composition of Cement
4. Properties of Cement
5. Types of Cement
6. Supplementary Cementitious Materials
7. Aggregates in Concrete
8. Types of Aggregates
9. Properties of Aggregates
10. Water used in concrete

11. Fresh Concrete
12. Workability of Concrete
13. Compaction and finishing of Concrete

7. Relationship to GOs:

1,2,7

8. Prepared by:

Dr. Hussam A. Goaiz

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 2107 - English Language III (1.0, Required), Dr. Muqdad Al Hanmami

2. Catalog Description:

"Academic English Language (AEL) introduces non-native speakers of English to the linguistic and cultural skills necessary for academic success in English-speaking universities. Emphasizing proficiency in reading, writing, listening, and speaking, this course covers essential grammar, vocabulary, and academic discourse strategies. Students develop their abilities through interactive activities, authentic texts, and assignments designed to enhance critical thinking and communication skills. By the end of the course, students should be prepared to engage effectively in academic contexts, demonstrating proficiency in both spoken and written English."

3. Prerequisites:

Academic English Language I

4. Textbook(s) and/or other required materials:

- "Academic Writing for Graduate Students: Essential Tasks and Skills" by John M. Swales and Christine B. Feak.

Course Objectives:

1. Developing Academic Writing Skills: Enhance students' ability to write clear, coherent, and well-organized academic texts appropriate for graduate-level coursework and research.
2. Understanding Academic Genres: Familiarize students with different genres of academic writing such as research papers, literature reviews, and essays, and teach them how to effectively structure and format these genres.
3. Improving Language Accuracy: Help students improve their language accuracy, including grammar, vocabulary, and academic style, to ensure clarity and precision in their writing.
4. Building Research Skills: Equip students with the skills to conduct effective academic research, including integrating and citing sources appropriately using academic conventions (e.g., APA, MLA).
5. Enhancing Critical Thinking: Develop students' critical thinking skills through engagement with academic texts and by encouraging them to analyze, evaluate, and synthesize information from various sources.
6. Promoting Academic Integrity: Educate students about the importance of academic integrity and ethical practices in academic writing, including proper citation and avoiding plagiarism.
7. Preparing for Academic Communication: Prepare students to participate effectively in academic discussions, presentations, and debates, thereby improving their overall academic communication skills.

8. These objectives aim to provide graduate students with the necessary skills and knowledge to excel in their academic writing tasks and contribute meaningfully to their respective fields of study.

6. Topics:

1. Understanding Academic Genres: Different types of academic writing such as research papers, literature reviews, essays, and abstracts.
2. Structure and Organization: How to effectively structure academic writing to present arguments and findings logically and coherently.
3. Critical Thinking and Analysis: Techniques for critically analyzing and evaluating scholarly literature and incorporating critical analysis into writing.
4. Research and Citation: Conducting academic research, evaluating sources, and integrating information ethically and effectively using citation styles like APA and MLA.
5. Language and Style: Developing academic language proficiency, including vocabulary appropriate for academic writing, sentence structure, and clarity.
6. Writing Conventions: Understanding academic writing conventions, including tone, formality, and academic voice.
7. Editing and Revision: Strategies for editing and revising drafts to improve clarity, coherence, and conciseness.
8. Avoiding Plagiarism: Understanding plagiarism and techniques for properly citing sources and avoiding unintentional plagiarism.
9. Writing for Specific Disciplines: Tailoring writing to meet the expectations and conventions of specific academic disciplines.
10. Writing Proposals and Research Reports: Guidelines and examples for writing research proposals, reports, and other forms of academic communication.
11. These topics are essential for graduate students aiming to improve their academic writing skills and succeed in their academic endeavors.

7. Relationship to GOs:

4,5,6

8. Prepared by:

Dr. Muqdad Al Hanmami

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 2311 Mathematics (IV) (4.0, Required), Israa M. Mohsin

2. Catalog Description:

This course will provide students with a sufficient knowledge on doing calculations, integrations, and dealing with different functions and their graphs. And help students to analyze equations using the matrix method. Developing students' skills in the calculation of the area between curves and volume of revolution.

3. Prerequisite(s):

Mathematics (III)

4. Textbook(s) and/or other required materials:

Thomas' Calculus: (George B. Thomas, Maurice D. Weir and Joel R. Hass , 2011, 12th Ed.

5. Course Objectives:

1. Providing the students with a sufficient knowledge on doing calculations, interpreting results, and dealing with different mathematical functions and their graphs.
2. Providing the students with the necessary skills on dealing with transcendental functions (trigonometric, inverse trigonometric, exponential, and power, natural logarithm, hyperbolic, inverse hyperbolic functions).
3. Strengthen the students' knowledge on the principles of derivatives, their concept and applications in engineering.
4. Providing the students with a sufficient knowledge on the principles of integral (definite and indefinite), its meaning, mathematical techniques such as Trapezoidal and Simpson approximation of integrals and eventually the engineering applications of it.
5. Improvement of the students' skills on the dealing with complex equations and numbers in simple and different mathematical ways.
6. Awarding students the necessary skills of connecting the academic mathematics with real worlds engineering problems.
7. How to solve integrals and differentials equations with different coordinates.
8. Analyze equations using the matrix method.
9. Developing students' skills in the calculation of the area between curves, surface area of revolution, volume of revolution, length of curve.

6. Topics:

- Functions of Several Variables
- Partial Derivatives
- The Chain Rule
- Applications of Partial Derivatives
- Multiple Integrals
- Double and Iterated Integrals over Rectangles
- Double Integrals over General Regions
- Double Integral in polar forms

- Applications of Double Integrals
- Triple Integrals
- Triple Integrals in Cylindrical and Spherical Coordinates
- Applications on Triple Integrals
- Introduction to differential equations
- First order ordinary differential equations

7. Relationship to GOs:

1

8. Prepared by:

Israa M. Mohsin

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 2313 - Strength of Materials (II), (4.0, Required), Asst. Prof. Jasim Mahmood

2. Catalog Description:

Strength of Materials is a heavy course load that requires long instruction hours. Therefore, the strategy of the course to deliver this module depends mainly on the module instructor in the class, where the material should be delivered with practical examples. Moreover, class tutorials and homework assignments would help the students to practice solving analysis Composition and resolution of forces issues more efficiently. Practical and test videos should also be occasionally used to facilitate connecting the given course elements. Visits to structural building construction sites are also another tool to combine the delivered theoretical material with its practical application.

3. Prerequisite(s):

Strength of Materials II

4. Textbook(s) and/or other required materials:

1. Mechanics of Materials, 10th edition (SI version), by: R. C. Hibbeler, 2017
2. Mechanics of Materials, 2nd edition (SI version), by: E. Popov, 1990

5. Course Objectives:

1. Understanding and visualizing shear deformations that occur with simple beams.
2. Understanding and visualizing twist deformations that occur with simple beams.
3. Understanding and visualizing the deflection of simple beams.

6. Topics:

1. Shear deformation, Hooke's law for shear
2. Horizontal Shearing stress in the beams
3. Horizontal Shearing stress in the beams
4. Tutorial + First Quiz
5. Torsion of circular shaft
6. Torsion of circular shaft
7. Tutorial + Second Quiz
8. Combined Shearing stress
9. Combined Shearing stress
10. Plane stress and strain
11. Mohr's circle
12. Tutorial + Third Quiz

13. Mid Term Exam
14. Deflection in beams Double integration method
15. Deflection in beams Double integration method
16. Preparatory week before the final Exam Introduction (element of structure, kinds of supports, classification of structure)

7. Relationship to GOs:

1,2

8. Prepared by:

Asst. Prof. Jasim Mahmood

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 2315 - Engineering Surveying II, (5.0, Required), Dr. Jareer Mohammed

2. Catalog Description:

The Engineering Surveying module in the Civil Engineering Department aims to provide students with a comprehensive understanding of fundamental principles and concepts in surveying. It focuses on theory, measurement techniques, and the application of instruments and equipment used in surveying. Through hands-on experience, students will develop practical skills in accurately measuring distances, angles, and heights for civil engineering projects. The module enhances spatial awareness and the ability to interpret complex engineering plans, maps, and spatial data. It equips students with data analysis and interpretation skills using software and statistical techniques. Teamwork and communication skills are fostered through group projects and presentations. The module prepares students for professional practice by covering professional ethics, standards, and regulations in surveying. It promotes critical thinking and problem-solving, applying surveying principles to real-world engineering challenges. Students gain an appreciation for surveying's role in project planning, design, construction, and maintenance, ensuring safety, accuracy, and efficiency. Overall, the module provides a solid foundation of knowledge, skills, and competencies for a successful career in civil engineering surveying.

3. Prerequisite(s):

Engineering Surveying I

4. Textbook(s) and/or other required materials:

Bruce R. Harvey SURVEY COMPUTATIONS The University of New South Wales 2013.

5. Course Objectives:

7. Introduce fundamental principles
8. Develop practical skills
9. Enhance spatial awareness
10. Promote data analysis and interpretation
11. Foster teamwork and communication
12. Prepare for professional practice
13. Promote critical thinking and problem-solving
14. Foster an appreciation for surveying's role in civil engineering

6. Topics:

1. Areas Computation; Area of uniform and non-uniform figures.

2. Area by rectangular coordinates, Area by departures and latitudes
3. Area of cross sections.
4. Volumes computations
5. Volumes of earth works
6. Horizontal Curves; Types of horizontal curves, Computing the elements of horizontal curve
7. Setting out horizontal curves.
8. Trigonometric leveling.
9. Global Navigation Satellite System GNSS.
10. Topographic Surveying.

7. Relationship to GOs:

1,3,7

8. Prepared by:

Dr. Jareer Mohammed

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 2317 – Fluid mechanics (II) (5.0, Required), Dr. Nuralhuda Aladdin Jasim

2. Catalog Description:

the goal is to acquaint students with the mathematical representation of fluid flow and other continuous media in order to show them how mathematics is effectively used in this field of modelling, and Students with no background in fluid mechanics will find this subject to be an excellent starting point. The goal is to analyze fluid flow principles that are applicable to various civil engineering fields. in order to set them up for success when they go on to more complex subjects.

3. Prerequisite(s):

Fluid Mechanics I

4. Textbook(s) and/or other required materials:

1. Hydraulics & Fluid Mechanics by Dr. P. N. Modi and Dr. S. M. Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic Machines by McGraw Hill Education (India).

5. Course Objectives:

1. To introduce a mathematical description of fluid flow and other continuous media to familiarize students with the successful applications of mathematics in this area of modelling, and the module has been developed for students who have little or no experience in fluid mechanics.
2. To examine the principles of fluid flow relevant to a wide range of civil engineering application
3. To prepare students for future study of advanced topics.
4. By the end of the module, students will:
5. be able to solve novel and/or complex problems in Fluid Mechanics.
6. Have a systematic and coherent understanding of theoretical mathematics in the field of Fluid Mechanics.
7. Have acquired a coherent body of knowledge of these subjects demonstrated through one or more of the following topic areas:
8. Kinematics and dynamics of fluid flows, compressible flow, hydrodynamic stability, and dynamics of viscous fluids.
9. Equations of motion and their derivation for fluids.

6. Topics:

- Momentum Principle: linear Momentum equation.
- Application of momentum equations.
- Dimensional Analysis.
- Similitude.
- Real Fluid Flow: Laminar and turbulent flow.
- Turbulent Flow and the Moody Diagram.

- Turbulent Flow and the Moody Diagram.
- Head losses in laminar flow and turbulent flow.
- Pipe Flow Applications: Flow resistance in smooth and rough pipes.
- Minor losses; analysis of pipelines.
- Three reservoirs problem.
- Three reservoirs problem.
- Pipe networks.
- Open Channel Flow.
- Open Channel Flow.

7. Relationship to GOs:

1,2,3,7

8. Prepared by:

Dr. Nuralhida Aladdin Jasim

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 2319 - Building Construction II (2.0, Required), Dr. Buroog Basheer Mahmood

2. Catalog Description:

The program provides students with a rigorous understanding of the principles, practices and ethics in a world-wide context involved in building construction up to first degree level standard.

The program reflects the academic underpinning necessary to prepare students for a career as a Chartered Builder, Construction Manager, and other related international professional bodies.

Also, introduce civil engineering first stage students to the fundamentals, basic principles and applications of Building construction.

These include varies of building materials and equipment. The course combines theory with drawing a number of sheets as a class and home work.

The importance of building elements and the relationships between architects and civil engineer responsibility.

Also, provides students with progressive development of knowledge and skills over three levels of study. The program is designed to ensure that graduates have a stimulating and challenging education, which prepares them for their professional career, and produces capable individuals with the potential to progress to professional status and prepare for advancement to master's level qualification. Students will develop a broad range of skills which are transferable across other industries.

Emphasis is placed on the management of schedule throughout the construction cycle, and also upon project planning.

3. Prerequisite(s):

Buildings Construction I

4. Textbook(s) and/or other required materials:

1. Fundamentals of Building Construction: Materials and Methods .2019. 7th Edition. by Edward Allen, Joseph Iano.
2. انشاء المباني زهير ساكو ١٩٨٧

5. Course Objectives:

Indicative content includes the following.

1- Reviewing related topics from previous courses including building material.

2- Principles of the a floors and roofs works.

3- Defining the construction stages and its philosophy based on the recommendations and limitations of the arches, lintels and sills works

4- Analysis of work methods for the finishing of walls and ceilings works .

5- Detailed study of the means of moving between levels joints in buildings work methods, with an explanation of the modernization work mechanism and curing and treatment.

6. Topics:

15. Definition of advanced building construction methods
16. Floors and Roofs
17. Floors and Roofs
18. Arches, Lintels and Sills
19. Arches, Lintels and Sills
20. Damp Proofing
21. Damp Proofing
22. Finishing of Walls and Ceilings
23. Finishing of Walls and Ceilings
24. Doors and Windows
25. Doors and Windows
26. Means of Moving Between Levels
27. Joints in Buildings
28. Buildings Service

7. Relationship to GOs:

1,2,5

8. Prepared by:

Dr. Buroog Basheer Mahmood

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 2321- Concrete Technology (II) (4.0, Required), Ihsan Ali & Manal Abdel Sattar

2. Catalog Description:

Introducing students to the materials used in concrete production - their types, characteristics, and standard requirements for each.

3. Prerequisite(s):

Concrete Technology (I)

4. Textbook(s) and/or other required materials:

1. Concrete Technology : Dr. Moayad Nouri Khalaf Dr. Hanaa Abdel Youssef University Technology 1984.
2. Concrete Technology : Neville A.M. & Brooks J.J. second edition, longman -2 group UK limlted 1987.
3. Concrete Technology : by Dr. Mahmoud Al-Imam.

5. Course Objectives:

1- Introducing the student to the materials used in concrete (cement, aggregate) - types, characteristics, and requirements for each.

2. Introducing the student to the properties and tests of fresh concrete and hardened concrete

3. Training the student to design concrete mixes and the basic details of the material

4- Introducing the student to the properties of materials added to concrete mix.

5- Introducing the student to the different types of concrete strengths.

6. Topics:

1-Introduction for fresh concrete

2-Workability and its tests

3-Factors affected workability

4-Segregation

5-Compaction of concrete

6-Concrete Strength

7-Concrete Elasticity

8-Factors affected the strength of concrete

9-Shrinkage and creep and durability of concrete

10-Concrete mix design

7. Relationship to GOs:

1,2

8. Prepared by:

Al-Sarray Ihsan Ali Hussein

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 2108 – English IV (1.0, Required), Ahmed Adel Naji Altameemi

2. Catalog Description:

The main teaching objectives of English IV is to focus on developing language skills relevant to both general and academic contexts, as well as specific civil engineering vocabulary and concepts.

3. Prerequisite(s):

English III

4. Textbook(s) and/or other required materials:

J. Soars and L. Soars, "New Headway Plus: pre-intermediate" Oxford University Press (UK), 2012

5. Course Objectives:

1. Improve students' reading, writing, listening, and speaking skills in English.
2. Expand vocabulary and understanding of grammatical structures.
3. Develop the ability to comprehend and produce intermediate-level English in various contexts.
4. Improve academic writing skills, focusing on clarity, coherence, and proper use of technical terminology.
5. Familiarize students with key civil engineering terms and phrases.

6. Topics:

- Modal verbs; have got, should and may, obligations
- Time and conditional clauses.
- Verb patterns.
- If second conditional.
- Present perfect.
- Discovery and invention.
- Funny way to earn living.
- Reported statements.
- Families that live abroad.

7. Relationship to GOs:

4,5,6

8. Prepared by:

Ahmed A. Naji Altameem

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4111– English for Academic Purposes III (1.0, Required), Ali Waheid Nakemish

2. Catalog Description:

English for Academic Purposes (III) course focuses on helping students to develop an advanced level of academic skills needed for successful entry into tertiary studies where English is the primary medium of instruction. This course covers academic reading, writing, speaking and listening skills at an advanced level.

3. Prerequisite(s):

None

4. Textbook(s) and/or other required materials:

- New Headway Upper Intermediate Student's Book 2014.
- English Grammar in Use by Raymond Murphy.

5. Course Objectives:

Students will:

- Improve their speaking and listening skills through a broad range of interactive classroom activities
- Improve their academic reading and writing skills through engagement with a range of academic texts
- Gain exposure to the types of assessment tasks they encounter during your university degree
- Develop the independent learning skills required to succeed at IELTS.

6. Topics:

- Listening.
- Speaking.
- Reading.
- Writing.
- IELTS Preparation.

7. Relationship to GOs:

4,5,6,7

8. Prepared by:

Ali Waheid Nakemish

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE3322 – Engineering Analysis (3.0, Required), Nabil Al Hakeem

2. Catalog Description:

This course equips students with advanced mathematical tools and engineering analysis methods to solve problems for various engineering topics. This course will provide an introduction to different types of differential equations, with a focus on developing the skills to solve them.

3. Prerequisite(s):

Mathematics (III)**,** Mathematics (IV)

4. Textbook(s) and/or other required materials:

Xie, W. C. (2010). *Differential equations for engineers*. Cambridge university press.

Sharma, G. S., Ahuja, K. L., & Sarna, I. J. S. (1984). *Advanced Mathematics for Engineers & Scientists*. CBS Pub., Delhi.

Chau, K. T. (2019). *Applications of differential equations in engineering and mechanics*. CRC press.

5. Course Objectives:

Providing students with a sufficient knowledge on doing analyzing, brainstorming, discussing ideas, and translating physical and engineering problems into a mathematical model.

The ability to classify, understand the concept, and solve different type of differential equations.

Recognize the applications of differential equations in modeling various phenomena across science and engineering such as deflections of beams, fluid flow, buckling of columns, … etc.

Use proper assumptions to describe the complex behavior of physical and engineering problems and able to read and interpret problem objectives.

Providing the students with a sufficient knowledge and skills to solve Fourier series, and Laplace transform and their applications.

Strengthen analytical thinking and problem-solving abilities.

6. Topics:

- Classification of Differential Equations.
- First Order Ordinary Differential Equations.
- Applications on First Order Ordinary Differential Equations.
- Second and Higher Order Ordinary Differential Equations.
- Applications on Second and Higher Order Ordinary Differential Equations.
- Simultaneous Linear Ordinary Differential Equations and its applications.
- Fourier Series and its applications
- Partial Differential Equations.

- Applications on Partial differential equations

7. Relationship to GOs:

1

8. Prepared by:

Dr. Nabil Al Hakeem

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 3324 - Theory of Structures I (4.0, Required), Dr. Karra Al-Lami

2. Catalog Description:

Structural analysis is a continuation of previously studied courses and aims to provide students with the knowledge to analyze different types of determinate structures. Therefore, students should have a strong background in engineering mechanics and strength of materials. Students are encouraged to review subjects like equilibrium, truss analysis and shear and moment diagrams from previous courses. The course will be in the form of lectures covering the main aspects of the course. In addition, multiple examples will be demonstrated for each subject. Students will be handed homework and asked to solve it. At the end of each part of the course, there will be a review and discussion of the homework. Student evaluation in this course will depend on various criteria including exams, homework, class discussions, and quizzes.

The course will be divided into three main parts. The first part focuses on structural stability, classification, and analysis of different types of determinate structures. It requires 20 hours of structured workload. The second part focuses on moving loads and analyzing various types of structures under these conditions, with 16 hours of structured workload. The final part introduces the virtual work method and evaluates the deflection.

3. Prerequisite(s):

Engineering Mechanics II, Strength of Materials II

4. Textbook(s) and/or other required materials:

1. Structural analysis by R. C. Hibbeler
2. Class notes

5. Course Objectives:

1. Understanding the basic philosophy of structural analysis and distinguishing between various forms of structures such as trusses, beams, frames, and arches.
2. Identify stable structures from unstable and classify structures based on their indeterminacy.
3. Drawing axil, shear, and bending diagram for frames and arches.
4. Understanding the analysis of structures with variable or moving loads such as bridges.
5. Drawing the influence lines for various response function of structures.
6. Applying the principle of influence line to determine the absolute maximum value of a response function that may occur anywhere in a structure.
7. Introducing the principle of virtual work
8. Applying the principle of virtual work method to determine the deflection and rotation in beams, frames, and trusses.
9. Using the Castigliano's second theorem to evaluate the deflection in beams, frames, and trusses.

6. Topics:

Week 1	Introduction and types of structures and loads
Week 2	Determinacy and stability of beams, Frames and Truss
Week 3	Analysis of statically determinant frames
Week 4	Types and Analysis of statically determinant trusses and arches
Week 5	1st Review, discussions of previously given homework and test
Week 6	Influence line for statically determinant beams
Week 7	Influence line for statically determinant floor girders
Week 8	Influence line for statically determinant trusses and composite structures
Week 9	Maximum influence at a point due to a series of concentrated loads
Week 10	Midterm Exam
Week 11	Deflections by virtual work method: Beams
Week 12	Deflections by virtual work method: Frames and arches
Week 13	Deflections by virtual work method: Trusses
Week 14	Deflections of Beams by conjugated-beam method
Week 15	2nd Review, discussion of previously given homework, and test

7. Relationship to GOs:

1,2

8. Prepared by:

Karrar Al-Lami

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE3326 - Soil Mechanics I (5.0, Required), Prof. Dr Asad Hafudh Humaish

2. Catalog Description:

Soil Mechanics is one of the main branch in civil engineering that concerns the application of the principles of mechanics, hydraulics and to smaller extent, chemistry, to engineering problems related to soils. The branch equips a civil engineer with the basis scientific tools needed to understand soil behavior. Thus, the practical example to understand the soil behavior under loads is main core of the module and for the instructor in the class. Then, class tutorial consecutively after few theoretical hours can provide well-understanding to the students' knowledge and improve the professional skills to solve geotechnical problems.

Experimentally, in the soil mechanic laboratory, these are many experimental test that should be done by student's groups and many geotechnical parameters that have to be determined. This labs class push the student to be more practical experience in the future. Some of the experiments should be done by student's group in the field and this stage give them more confidence in geotechnical problems in the future. Finally, the actual site investigation collected specimens can be used by student's groups to do some experimental tests rather than man-made specimens. Short mandatory videos are also used during module to see what we are talking about.

3. Prerequisite(s):

Strength of Materials II

4. Textbook(s) and/or other required materials:

1. Introduction to Geotechnical Engineering, 2nd Edition, Baraja Das, 2014
2. Principles of Geotechnical Engineering, 10th Edition, Baraja Das, 2020.
3. Craig's Soil Mechanics, Knappett J. A and Craig R.F., 8th Edition, 2014.
4. Soil Mechanics Laboratory Manual, 6th Edition, Baraja M. Das, 2002.

5. Course Objectives:

1. An understanding the principles of soil mechanics with the basis scientific tools needed to understand soil behavior.
2. Gain understanding the soil composition and grain size distribution and achieving the minimum requirement of ability to classify soils and grain size distribution.
3. Knowledge the differences of void ratio in both the granular soil and cohesive soil and how this effecting on the density and stiffness of soil.
4. Understanding the principles of compaction and how this effect on the soil strength and settlement.
5. Understanding the Soils are permeable due to the existence of interconnected voids through which water can flow from points of high energy to points of low energy and investigating problems involving the pumping of water for underground construction.
6. An understand of capillary phenomenon and Knowledge of effective stresses .

7. Knowledge the overburden stress and the stresses due to structure loads.
8. Gain understanding the seepage flow with in the soil mass. Flow net and calculation of factor of safety due to seepage flow .
9. Knowledge the seepage flow within the earth dams..

6. Topics:

1. Introduction to Soil Mechanic, Origin of Soil, Soil composition, Soil Formation and Structure of Soil
2. Weight-Volume Relationship
3. Atterberg Limits and Index Properties
4. Soil Classification According to USCS
5. Dry Sieve Analysis and Wet Sieve Analysis
6. Quiz 1 and video show of Related Geotechnical Problems
7. Permeability of Soil
8. Water Flow within The Soil (One Dimensional Flow)
9. Seepage Force, Upward Flow and Downward Flow
10. Effective Stress, Pore Water Pressure and Total Stresses with in the Soil
11. Quiz 2 and video show of Related Geotechnical Problems
12. Stresses within The Soil Mass
13. Two Dimensional Flow within the Soil (Flow Net) .
14. Water Flow within The Earth Dam
15. Quiz 3 and video show of Related Geotechnical Problems
16. Preparatory week before the final Exam

7. Relationship to GOs:

1,2,3,7

8. Prepared by:

Prof. Dr. Asad Hafudh Humaish

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 3328– Reinforced Concrete (I) (4.0, Required), Dr. Sallal Rashid

2. Catalog Description:

Reinforced concrete design is a heavy course load that requires long instruction hours. Therefore, the strategy of the course to deliver this module depends mainly on the module instructor in the class, where the material should be delivered with practical examples from surrounding buildings. Moreover, class tutorials and homework assignments would help the students to practice solving design and analysis issues more efficiently. Practical and test videos should also be occasionally used to facilitate connecting the given course elements. Visits to structural building construction sites are also another tool to combine the delivered theoretical material with its practical application.

3. Prerequisite(s):

Concrete Technology II, Strength of Materials II

4. Textbook(s) and/or other required materials:

- Building Code Requirements for Structural Concrete ACI 318-14 , ACI 318-19
- Design of Concrete Structures (14th Edition) by: A. H. Nilson; D. Darwin & C. H. Dolan
- Reinforced concrete Design (7th Edition) by: C. K. Wang , C. G. Salmon & J.A. Pincheira
- Design of Reinforced Concrete (10th Edition) by: J.C. McCormac & R. H. Brown.

5. Course Objectives:

- Understanding the basic philosophy of reinforced concrete design and distinguishing between different limit-state design criterions.
- Understanding load distributions from surface flexural members (slabs and roofs) to beams and transferring accumulated loads and moments to columns.
- Analyzing shear, moment and torsion in flexural members of small structures, and defining the resulting normal and shear stresses on the structural members.
- Introducing the design of reinforced concrete beams against bending moments, shear forces and torsional moments.
- Defining bond issues between steel and concrete and distinguishing the suitable design procedures to avoid bond failure.
- Defining economical design solutions to save steel reinforcement using cut-off and bent-up techniques.

6. Topics:

- Lecture 0: Review of shear and bending moment diagrams
- Lecture 1: Introduction to reinforced concrete
- Lecture 2: Loading

- Lecture 3: Materials
- Lecture 4: Analysis and design of beams using Working Stress Method WSM
- Lecture 5: Analysis and design of T-beams using Working Stress Method WSM
- Lecture 5.1: Tutorial
- Lecture 6: Ultimate Strength Method USM
- Lecture 7: Analysis of rectangular beams using USM
- Lecture 8: Design of rectangular beams using USM
- Lecture 9: Analysis and design of T-beams using USM I
- Lecture 10: Analysis and design of T-beams using USM II
- Lecture 11: Analysis and design of doubly-reinforced beams using USM
- Lecture 11.1: Tutorial
- Lecture 12: Shear in beams
- Lecture 13: Shear in beams: Examples I
- Lecture 14: Shear in beams: Examples II
- Lecture 15: Selected topics in shear design
- Lecture 16: Design of torsion I
- Lecture 17: Design of torsion II
- Lecture 18: Bond and anchorage length-Tension development length
- Lecture 19: Bond and anchorage length-Tension and compression development lengths
- Lecture 20: Bond and anchorage length-Hooks and bundle bars
- Lecture 21: Bond and anchorage length-Tension and compression Lap splices
- Lecture 22: Bond and anchorage length-Termination of top and bottom bars

7. Relationship to GOs:

1,2

8. Prepared by:

Dr. Sallal Rashid

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 3330 - Project Management (2.0, Required). Dr. Alaa K. Shathar

2. Catalog Description:

Construction management is a significant course that requires focused instruction hours. Therefore, the strategy of the course to deliver this module depends mainly on the module instructor in the class, where the material should be delivered with practical examples from surrounding projects. Moreover, classwork and homework assignments would help the students to practice solving fundamental elements of cash flows of money, time, and interest rates issues more efficiently. Practical and test videos should also be occasionally used to facilitate connecting the given course elements. reports prepared by student may be increase their information in this scope.

3. Prerequisite(s):

Buildings Construction II

4. Textbook(s) and/or other required materials:

1. Construction Management: From Project Concept to Completion Paperback –2017, by Paul Netscher.

5. Course Objectives:

Indicative content includes the following.

1- Reviewing related topics from previous courses including role of the client, designer and contractor.

2- Principles of the a Procurement and contracts selection.

3- Defining the construction stages and its philosophy based on the recommendations and limitations of the Project Management Body of Knowledge (PMBOK).

4- Analysis of productivity to calculate the period required to implement each activity as an input to project planning.

5- Detailed study of the planning and scheduling methods for the project, with an explanation of the modernization work mechanism and delay treatment.

6- Review claims in construction project, to reach successfully the desired results in project. The requirement in first place is to avoid claim through managing alignment of documents, and eventually entertaining an entitlement in an efficient and businesslike manner. Defining the ways to prevent stained relationship of parties, stalemates, delays, disputes, or loss of resources that cause or carry the potential force for litigious and arbitral action of the parties, for resolution in contract.

6. Topics:

1. Definition of construction management
2. Project manager, Project participant and elements.
3. Engineering responsibility
4. Procurement's methods

5. Contracting types and Contract documents
6. Productivity
7. Planning and Scheduling
8. Scheduling methods
9. Bar chart method
10. Resources Managements
11. Critical network method
12. Critical network method
13. Pert methods
14. Claims

7. Relationship to GOs:

1

8. Prepared by:

Dr. Alaa Kharbat Shadhar

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 3332 - Traffic Engineering (2.0, Required), Dr. Muqdad

2. Catalog Description:

The course load for Traffic Engineering is demanding, involving extended instruction hours. As a result, the course's approach relies heavily on the module instructor, who should deliver the content using practical examples. Additionally, assigning tutorials and homework problems aids students in honing their skills in analyzing traffic issues. Supplementing the course with practical and test videos can also enhance the comprehension of various course components. Furthermore, visiting intersections serves as a valuable method to integrate theoretical concepts with real-world application.

3. Prerequisite(s):

None

4. Textbook(s) and/or other required materials:

Traffic and Highway Engineering by: N.S.Garber and Hoel, 2010.
Traffic Engineering, by : Wieliam McShane, 2004

5. Course Objectives:

1. define and explain principles of Traffic Engineering (i.e. Traffic volumes, density, speed…etc.) related to civil engineering domain
2. solve problems of traffic related to civil engineering domain using principles of traffic engineering.
3. Discuss and clarify concepts of principles of Traffic Engineering (i.e. Traffic volumes, density, speed…etc.) for different simple situations.
4. Prepare free body diagrams of real case phenomenon considering traffic engineering point of view.
5. Discern and determine the Level of Service acting on basic intersection.
6. Determine the level of service for an intersection including: a. four legs intersection showing the function of simple intersection design; b. analyze the density of highway roads to determine the impact of congestion towards the life of people.
7. Analyze the impact of land use change on the level of service.

6. Topics:

- Understanding the basic philosophy of traffic theory.
- Understanding Principle of traffic engineering.
- Analyzing level of service of different facilities.

- Introducing the Highway capacity.
- Defining traffic volumes.
- Defining traffic accidents.
- Understanding travel time and delay.

7. Relationship to GOs:

1,2

8. Prepared by:

Dr. Muqdad

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 3335 - Irrigation And Drainage Engineering (4.0, Required), Dr. Laith B. Fathi & Noor Q. Sabri

2. Catalog Description:

To enable students to apply mathematical and fluid mechanics principles to solve a range of hydrological problems. For the second part of this course which is more specified in irrigation and drainage engineering, the aim of this module is to introduce students to basic concepts of soil, water, plants, their interactions, as well as irrigation and drainage systems design, planning and management. It helps students to develop analytical skills relevant to the areas mentioned in above, particularly the design of irrigation and drainage projects.

3. Prerequisite(s):

Fluid mechanics II

4. Textbook(s) and/or other required materials:

-Ward R. and Robinson M. (2000), "Principles of Hydrology McGraw-Hill, London"

- P. Waller, M. Yitayew, 2016. "Irrigation and Drainage Engineering"

- Shaw E.M. (2011) Hydrology in Practice, Spon Press, Oxford

- Wilson E.M. (1990) Engineering Hydrology, MacMillan, Basingstoke

5. Course Objectives:

- How to acquire measurements of river flows, groundwater levels, precipitation and evaporation.

- How to apply fluid mechanics principles to determine relevant equations for describing flow in porous media.

- How to apply thermodynamic principles to estimate evaporation from meteorological data.

- How to apply mass conservation principles to derive fluid flow models for hydrological systems.

- Describe the key hydrological components of the catchment system

- Explain the main controlling factors on hydrological processes occurring within drainage catchments

- Analyze and predict the response of catchments to rainfall events

- Evaluate methods used to measure and predict river flows

- Have the basic knowledge about water intake structures, conveyance, and regulation devices for irrigation water

- Estimate net irrigation water requirements and propose an irrigation schedule

- Design an irrigation system under drip, pressure, or gravity

- Describe the principles underlying the different irrigation techniques - Design an irrigation management scheme and evaluate its functioning

- Master the theoretical concepts underlying the flow of water into drains and design techniques of drainage;

- Assess the value of drainage on the basis of technical, economic,

- Dimension a parallel drainage network using the relevant equations.

6. Topics:

1-Introduction: Definition, Purposes, Sources, Water Cycle, Water Cycle Elements, Irrigation and Drainage Projects Layout.

2- Irrigation Water Budges: water budget and Water budget Examples.

3- Soil-Plant- Water Relationships: Soil Properties, Water Content Measurement, Soil Texture and Structure and Soil Water Potential

4- Flow of Water into and Through Soil: Permeability and Infiltration.

5- Root Zone Depth.

6- Irrigation Crop Water Requirements: Evaporation, Consumptive Use and Duty of water

7- Irrigation Structure and Facilities: 1. Heading Up Structures: Storage Structure and Control Structure, 2- Field Projects Structures: Pumping Structure, Flow Measurements Structure, Conveyance Structure (Canal Terminology, Canal Classification, Canal Constriction, Canal Hydraulic and Canal Curvature), Drop Structure, Maintenance Facilities, Escapes And Spillway, Energy Dissipater Structure, Crossing Structure, On Farm Irrigation Methods (Gravitational Irrigation Systems And Pressurized Irrigation System) and Drainage Engineering.

8- Irrigation Efficiency.

7. Relationship to GOs:

1,2

8. Prepared by:

Noor Qassim

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 3336 - Computer Applications in Civil Engineering I (2.0, Required), Dr. Karra Al-Lami, Asst. Prof. Dr. Hussain Askar Jabir

2. Catalog Description:

The course aims to unlock the full potential of computer-aided design with AutoCAD course. Designed for aspiring professionals and seasoned practitioners alike, this course offers a deep dive into the world of precision drawing and detailed design work. No prior experience with AutoCAD is required, although familiarity with design concepts and basic computer skills are recommended. The course spans over a period of 15 weeks.

3. Prerequisite(s):

Engineering MechanicsII, Computer Programming III, Strength of Materials II

4. Textbook(s) and/or other required materials:

1. Class notes

5. Course Objectives:

The objective of the AutoCAD course is to provide students with a comprehensive understanding and hands-on experience in using AutoCAD software for technical drawing and design. The course aims to:

- **Introduce** the core functionalities and tools of AutoCAD.
- **Develop** proficiency in creating detailed 2D drawings.
- **Apply** AutoCAD techniques in various fields such as architecture, engineering, and construction.
- **Enhance** skills in managing drawing environments, using layers, and setting dimensions.
- **Foster** the ability to interpret and produce technical drawings that adhere to industry standards.

6. Topics:

Week 1	Introduction to Auto CAD Program
Week 2	Coordinate input methods with application
Week 3	Modify menu and its applications
Week 4	Draw menu and its application
Week 5	Hash and dimensions of the drawing
Week 6	Make, insert, edit Block
Week 7	Modify menu and its applications
Week 8	Layers and its application

Week 9	Structural design presentation
Week 10	Drawing of foundations
Week 11	Drawing of reinforced concrete beams and columns
Week 12	Drawing of reinforced concrete slabs
Week 13	Some structural details
Week 14	Printing from model view
Week 15	Printing from Layout view

7. Relationship to GOs:

2,3

8. Prepared by:

Hussain Askar Jabir & Karrar Al-Lami

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE3109 – English for Academic Purposes (I) (1.0, Required), Nabil Al Hakeem

2. Catalog Description:

This course dives into engineering-focused English, where the student will learn to communicate effectively in an engineering environment. The student will be guided through technical vocabulary, Civil Engineering-specific phrases, and English grammar. This course build on students academic English language skills by engaging them in reading, writing, speaking, listening, and grammar learning activities that are related to real word and professional work place environment.

3. Prerequisite(s):

English Language (IV)

4. Textbook(s) and/or other required materials:

Izar Landeta, J. M. (1999). Technical english for civil engineering.
Oshima, A., & Hogue, A. (2007). Introduction to academic writing (p. 3). Pearson/Longman.

5. Course Objectives:

To develop academic literacy skills across reading, writing, listening, and speaking.
Participating confidently group work, and presentations.
To impart reading skills in students and make them comprehend and analyze literary texts.
To enhance students' vocabulary building skills.
To participate in small group vocabulary learning contests.
Finding and evaluating scholarly sources to support your academic work and graduation project.
The student will be guided through technical vocabulary.
To gain confidence using academic vocabulary and conventions of written and spoken English.

6. Topics:

- Learning parts of words.
- Read and comprehend authentic English language publications relating to Civil Engineering.
- Demonstrate a working knowledge of appropriate reading and prereading strategies
- Use adverbs and adjective clauses
- Use gerund and infinitive phrases.
- Apply capitalization and comma use rules.

- Use comparative and superlative forms.
- Compose simple, complex, compound, and compound-complex sentences.
- Reading longer passages.

7. Relationship to GOs:

4,5,6,7

8. Prepared by:

Dr. Nabil Al Hakeem

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE3323 – Numerical Analysis (3.0, Required), Nabil Al Hakeem

2. Catalog Description:

The aim of this course is to teach how to apply computational methodologies to solve engineering problems when no closed-form, analytical solution exists. Emphasis will be placed on understanding the fundamental concepts behind different numerical methods and techniques, implementing basic numerical methods using technical computing. Theory and practical examples using MATLAB will be combined to study a range of engineering topics

3. Prerequisite(s):

Engineering Analysis

4. Textbook(s) and/or other required materials:

1. Al-Khafaji, A. W., Tooley, J. R., & Al-Khafaji, A. W. (1986). Numerical methods in engineering practice (p. 190). New York: Holt, Rinehart and Winston.

2. Griffiths, D. V., & Smith, I. M. (2006). Numerical methods for engineers. Chapman and Hall/CRC.

3. Gupta, Rajesh Kumar. Numerical methods: fundamentals and applications. Cambridge University Press, 2019.

4. Chapra, S. (2011). EBOOK: Applied Numerical Methods with MATLAB for Engineers and Scientists. McGraw Hill.

5. Steven, C. C. (2007). Applied Numerical Methods with Matlab: For Engineers and Scientists. Tata McGraw Hill Education Private Limited.

5. Course Objectives:

1. Develop an understanding of the limitations of exact solutions and the importance of numerical methods.

2. Understand the concepts of accuracy, precision, errors, and stability of numerical methods.

3. Apply numerical methods to solve a variety of mathematical, physical, and engineering problems such as equilibrium, deflection, buckling, fluid mechanics, thermal science, and other engineering applications.

4. Choose, develop, and apply the most efficient and accurate numerical method and technique for a given problem to obtain a specified degree of accuracy.

5. Writ1. Course Codes for simple numerical analysis algorithms.

6. Strengthen analytical and numerical thinking and problem-solving abilities

6. Topics:

- Roots of equations.
- Numerical Solution of Set of Algebraic Equations.

- Numerical Differentiation (Finite Difference Method)
- Numerical Integration.
- Numerical Solution of Ordinary Differential Equations.
- Numerical solution of PDE
- Curve Fitting.
- Introduction to Finite Element Method.

7. Relationship to GOs:

1

8. Prepared by:

Dr. Nabil Al Hakeem

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 3325 - Theory of Structures II (4.0, Required), Dr. Karra Al-Lami

Structural analysis is a continuation of previously studied courses and aims to provide students with the knowledge to analyze different types of indeterminate structures. Therefore, students should have a strong background in engineering mechanics, strength of materials, and structural analysis I. Students are encouraged to review subjects like equilibrium and shear and moment diagrams from previous courses. The course will be in the form of lectures covering the main aspects of the course. In addition, multiple examples will be demonstrated for each subject. Students will be handed homework and asked to solve it. At the end of each part of the course, there will be review and discussion of the homework. Student evaluation in this course will depend on various criteria including exams, homework, class discussions, and quizzes.

This semester focuses on analyzing stable indeterminate structures such as beams and frames. Generally, three methods are going to be adopted this semester. The first method is a force method and known as consistent deformation method while the second and third methods are displacement method and referred as slope-deflection method and moment-distribution method. The workload of this semester will be divided evenly on these three methods. For each method, there will be tutorial sessions and homework. Student evaluation will depend on quizzes, homework, participation, attendance and other activities will be names in the course.

3. Prerequisite(s):

Theory of Structures I

4. Textbook(s) and/or other required materials:

1. Structural analysis by R. C. Hibbeler
2. Class notes

5. Course Objectives:

1. Differentiate determinate structures from indeterminate structures.
2. Introducing the method of consistent deformation to analyze indeterminate structures.
3. Presenting displacement methods as alternative methods to analyze indeterminate structures.
4. Distinguish braced frame from frames with side sway.
5. Applying the slope-deflection method to evaluate indeterminate beams and frames.
6. Utilizing the moment-distribution method to analyze indeterminate structures.

6. Topics:

Week 1	Introduction to indeterminate structures and force method
Week 2	Analysis of statically indeterminate Structures by the force method: Beams
Week 3	Analysis of statically indeterminate Structures by the force method: frames
Week 4	Analysis of statically indeterminate Structures by the force method: Trusses

Week 5	1st Review, discussions of previously given homework and test
Week 6	Analysis of statically indeterminate structures by slope-deflection method: Beams
Week 7	Analysis of statically indeterminate structures by slope-deflection method: braced Frames
Week 8	Analysis of statically indeterminate structures by slope-deflection method: frames with side sway
Week 9	Midterm Exam
Week 10	Analysis of statically indeterminate structures by moment distribution method: Introduction
Week 11	Analysis of statically indeterminate structures by moment distribution method: Beams
Week 12	Analysis of statically indeterminate structures by moment distribution method: braced Frames
Week 13	Analysis of statically indeterminate structures by moment distribution method: Frames with side sway
Week 14	Advanced problems on frames with side sway and support settlement
Week 15	2nd Review, discussion of previously given homework, and test

7. Relationship to GOs:

1,2

8. Prepared by:

Karrar Al-Lami

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE3327 - Soil Mechanics II (5.0, Required), Prof. Dr Asad Hafudh Humaish

2. Catalog Description:

The engineer needs to know two main design steps in the future during the preliminary design stage of foundation of any structures. The settlement of the structure due to layers' consolidation and the shear strength soil layer resistance. The branch equips a civil engineer with the basic scientific tools needed to understand soil behavior under two of the main concepts above. Thus, the practical example to understand the soil behavior under loads (consolidation settlement and shear strength) is the main core of the module and for the instructor in the class. Then, class tutorial consecutively after a few theoretical hours can provide a well-understanding to the students' knowledge and improve the professional skills to solve such important geotechnical problems.

Experimentally, in the soil mechanic laboratory, there are many experimental tests that should be done by student's groups and many geotechnical consolidation and shear strength parameters that have to be determined. This labs class pushes the student to have more practical experience in the future. Some of the experiments should be done by a student's group in detail and this stage gives them more confidence in geotechnical problems in the future. Finally, the actual site investigation collected specimens can be used by student's groups to do some experimental tests rather than man-made specimens. Short mandatory videos are also used during the module to see what we are talking about.

3. Prerequisite(s):

Soil Mechanics I

4. Textbook(s) and/or other required materials:

1. Introduction to Geotechnical Engineering, 2nd Edition, Baraja Das, 2014
2. Principles of Geotechnical Engineering, 10th Edition, Baraja Das, 2020.
3. Craig's Soil Mechanics, Knappett J. A and Craig R.F., 8th Edition, 2014.
4. Soil Mechanics Laboratory Manual, 6th Edition, Baraja M. Das, 2002.

5. Course Objectives:

1. An understanding of the purpose and the importance of consolidation with the basic scientific tools needed to understand clayey soil behavior under loads.
2. Know the assumptions made in Terzaghi's theory of consolidation.
3. Understand the cause of settlement in primary and secondary consolidation
4. Identify the difference between consolidation and compaction.
5. An ability to calculate consolidation settlement at various degrees of consolidation and the time required to achieve a given settlement.
6. Extrapolation of Field Consolidation Curve, Compression Index and Some Empirical Correlations to calculate the consolidation parameters.
7. Knowledge principles of Settlement determination and the vertical displacement brought by this volume change due to water dissipation.

8. Knowledge the rate of stress history and why the clayey soil is being either normally consolidated or over consolidated based on the over consolidation ratio.
9. Understand what are the factors that contribute to the shear strength of soils.
10. Knowledge of Mohr circle and the ability to use Mohr circle to determine the stresses and shear in the soil at given conditions.
11. Identify the difference between consolidated drained, consolidated undrained, and unconsolidated undrained test from the Triaxial tests.
12. An ability to use the result from triaxial test to determine the angle of internal friction and the allowable shear stress of the soil.
13. Get familiar with direct shear tests and the unconfined compression test.

6. Topics:

1. Introduction to the consolidation settlement.
2. Types of settlement, Secondary settlement and primary consolidation settlement
3. Rate of stress history
4. Computation of settlement
5. Determination of consolidation settlement coefficient
6. Quiz 1
7. Practice and exercises on consolidation settlement
8. Determination of void ratio-stress from oedometer test
9. Consolidation settlement under foundation
10. Shear strength of Soil layers
11. Quiz 2
12. Direct shear test and unconfined compression test
13. Triaxial shear tests, Consolidated Drained triaxial test
14. Consolidated Undrained triaxial test and Unconsolidated Undrained triaxial test
15. Quiz 3 and Skempton's pore water pressure parameters
16. Preparatory week before the final Exam

7. Relationship to GOs:

1,2,3,7

8. Prepared by:

Prof. Dr. Asad Hafudh Humais

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 3329– Reinforced Concrete (II) (4.0, Required), Dr. Sallal Rashid

2. Catalog Description:

Reinforced concrete design is a heavy course load that requires long instruction hours. Therefore, the strategy of the course to deliver this module depends mainly on the module instructor in the class, where the material should be delivered with practical examples from surrounding buildings. Moreover, class tutorials and homework assignments would help the students to practice solving design and analysis issues more efficiently. Practical and test videos should also be occasionally used to facilitate connecting the given course elements. Visits to structural building construction sites are also another tool to combine the delivered theoretical material with its practical application

3. Prerequisite(s):

Reinforced Concrete (I)

4. Textbook(s) and/or other required materials:

- Building Code Requirements for Structural Concrete ACI 318-14 , ACI 318-19
- Design of Concrete Structures (15th and 16th Editions) by: A. H. Nilson; D. Darwin & C. H. Dolan
- Reinforced concrete Design (8th and 9th Editions) by: C. K. Wang , C. G. Salmon & J.A. Pincheira
- Design of Reinforced Concrete (10th Edition) by: J.C. McCormac & R. H. Brown

5. Course Objectives:

- Understanding the basic philosophy of reinforced concrete design of slabs and columns.
- Analyzing the moment and load distributions on surface flexural members (slabs) of small structures and transferring of loads to supporting beams or walls.
- Introducing the design of reinforced concrete slab-beam system and slab on bearing walls system using simplified procedures.
- Considering the serviceability issues in the design of slabs and beams including excessive deflections and unfavorable cracking.
- Design of reinforced concrete columns subjected to pure axial stresses or combined axial and flexural stresses

6. Topics:

Lecture 1: Serviceability-deflection control I

Lecture 2: Serviceability-deflection control II

Lecture 3: Serviceability-cracking control

Lecture 5: Analysis and design of one-way slabs I

Lecture 6: Analysis and design of one-way slabs II

Lecture 7: Continuous beams and one-way slabs

Lecture 8: Continuous beams and one-way slabs-continued

Lecture 10: Analysis and design of two-way slabs I

Lecture 11: Analysis and design of two-way slabs II

Lecture 12: Analysis and design of two-way slabs-Design examples I

Lecture 13: Analysis and design of two-way slabs-Design examples II

Lecture 15: Reinforced concrete columns

Lecture 16: Analysis and design of short concentrically loaded columns

Lecture 17: Analysis and design of short eccentrically loaded columns I

Lecture 18: Analysis and design of short eccentrically loaded columns II

Lecture 20: Analysis and design of short biaxially loaded columns

Lecture 22: Long columns

Lecture 23: Analysis and design of long columns I

Lecture 24: Analysis and design of long columns II

Lecture 25: Tutorial

7. Relationship to GOs:

1,2

8. Prepared by:

Dr. Sallal Rashid

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 3335– Water Engineering (3.0, Required), Salah Lafta Farhan

2. Catalog Description:

This module concentrates on the fundamentals of Water Engineering (Introduction of Sanitary Engineering, Basics of Sanitary and Environmental Engineering, Sources of water, the amount of water and sewage, Surface water, quality of water, drinking water standards, Water consumption, Forecasting the population, Pumping design Water treatment(coagulation), Water treatment (flocculation), Water treatment(sedimentation), Water treatment(filtration), Water treatment(disinfection), Water distribution). On successful completion of this module, the students will be able to understanding and sizing of water from many points of view such as: a) water uses, b) future water need, c) management systems, d) Related treatment (Physical, chemical, and biological), c) Disposal facilities, d) Collection.

3. Prerequisite(s):

Fluid mechanics II -mathematics I

4. Textbook(s) and/or other required materials:

Water Supply and Sewerage by E W Steel.

5. Course Objectives:

To enable students:

1. To systematically introduce students to the fundamental principles in the field of sanitary and environmental engineering.
2. To introduced to the science and engineering analysis methods used to study water quality engineering.
3. To provide students with the necessary mathematical tools, skills, and techniques to deal with a variety of design engineering problems.
4. To provide students with the opportunity to actively participate in activities during lectures and classes.
5. To enable students to improve their problem-solving skills through the use of relevant and appropriate mathematical strategies in water engineering sector.

6. Topics:

- Introduction of Sanitary Engineering
- Basics of Sanitary and Environmental Engineering
- Sources of water, the amount of water and sewage
- Surface water, quality of water, drinking water standards
- Water consumption
- Forecasting the population

- Pumping design
- Water treatment(coagulation)
- Water treatment (flocculation)
- Water treatment(sedimentation)
- Water treatment(filtration)
- Water treatment(disinfection)
- Water distribution

7. Relationship to GOs:

1,2

8. Prepared by:

Salah Lafta Farhan

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 3331 - Engineering Economy (20, Required). Dr. Alaa. K. Shadher

2. Catalog Description:

Construction management is a significant course that requires focused instruction hours. Therefore, the strategy of the course to deliver this module depends mainly on the module instructor in the class, where the material should be delivered with practical examples from surrounding projects. Moreover, classwork and homework assignments would help the students to practice solving fundamental elements of cash flows of money, time, and interest rates issues more efficiently. Practical and test videos should also be occasionally used to facilitate connecting the given course elements. reports prepared by student may be increase their information in this scope.

Prerequisites:

Project Managements

the required materials:

2. Engineering Economy, leland blank , anthony tarquin. 2012 seventh edition.
3. Basics of Engineering Economy, leland blank . 2018 2nd edition.

5. Course Objectives:

1. Indicative content includes the following.

1- Reviewing related topics from previous courses including cost types.

2- Analysis of efficiency in both type technical and financial.

3- Principles and fundamental elements of cash flows of money.

4- Studying demand and supply law.

5- Defining and Identifying a break even points.

6- Defining and Identifying an economic measure of worth criterion for decision making.

7- Detailed study Select the best alternative

8- Studying Principles and fundamental elements of Depreciation of machinery and equipment.

6. Topics:

- Concept of engineering economics
- Element of costs and its types.
- demand and supply law
- Break-even analysis
- Break-even analysis
- cash flows of money in projects

- cash flows of money in projects
- Interest formulas and their applications
- Present worth method of comparison
- Future worth method
- Annual and growth equivalent method
- Depreciation
- Depreciation
- Evaluation of public alternatives

7. Relationship to GOs:

1,2

8. Prepared by:

Dr. Alaa Kharbat Shadhar

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 3333 - Geometric Roads Design (2.0, Required), Dr. Muqdad Al Hanmami

2. Catalog Description:

Geometric Roads Design course is rigorous and demands extensive instructional time. Consequently, the course's approach relies heavily on the instructor to deliver the content through practical examples during class. Furthermore, assigning tutorials and homework assignments enables students to practice and improve their analytical skills in traffic-related problem-solving. Occasional utilization of practical and test videos aids in establishing connections between various elements of the course. **3. Prerequisite(s):**

Traffic Engineering

4. Textbook(s) and/or other required materials:

- American Association of State Highway and Transportation Officials 2011**5. Course Objectives:**

1. Identify /recall the key issues in traffic and roads engineering (i.e. sight distance, alignments, interchanges, speeds, volumes, delays, …etc.) related to civil engineering domain
2. Identify /recall the key issues in traffic and roads engineering.
3. Discuss and clarify concepts of principles of traffic and roads design (i.e. Sight Distance, Alignments, Interchanges, speeds, delays, volumes…etc.) for different simple situations.
4. Prepare free body diagrams of real case phenomenon considering traffic and roads design point of view.
5. Discern and determine the best alignments and traffic level of service acting on basic intersections.
6. Determine best design of traffic intersections, sight distance and alignments including; a. highway roads; b. Design the best alignments that should be compatible with design criteria.
7. Design the best selected traffic intersections and interchanges that should be selected according to the best design criteria.

6. Topics:

Understanding the basic philosophy of traffic and roads geometric design.

Understanding and design Principle of speeds and sight distances.

Design best Intersections and alignments for a selected case study.

Select the best travel time for the road users and inspect the anticipated delay

Design and select the best traffic intersections and interchanges.

Basic entrance to the traffic theory

Design of best parking facility

Perform the best analysis for accident safety

Design the best design for Highway capacity.

7. Relationship to GOs:

1,2

8. Prepared by:

Dr. Muqdad Al Hanmami

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 3337 - Computer Applications in Civil Engineering II (2.0, Required), Asst. Prof. Dr. Hussain Askar Jabir and Dr. Karra Al-Lami

2. Catalog Description:

STAAD.Pro, is a leading structural analysis and design software. This specialized course is crafted for civil engineering students aiming to excel in the modern engineering landscape. Dive into the intricacies of STAAD.Pro and emerge with the capability to analyze and design structures that stand the test of time.

A basic understanding of civil engineering principles and structural mechanics is recommended. Familiarity with CAD software will be beneficial but is not mandatory. The course spans over a period of 15 weeks.

3. Prerequisite(s):

Computer Applications in Civil Engineering I

4. Textbook(s) and/or other required materials:

1. Class notes

5. Course Objectives:

- **Grasp Core Concepts:** Understand the fundamental principles of structural analysis and how STAAD.Pro makes complex calculations straightforward.
- **Hands-On Modeling:** Learn to model structures efficiently, from simple beams to intricate high-rise buildings.
- **Advanced Analysis:** Perform various types of analysis, including static, dynamic, and seismic, to ensure your designs can withstand real-world challenges.
- **Design Proficiency:** Develop the skills to design concrete, steel, and timber structures in compliance with international design codes.
- **Practical Application:** Apply theoretical knowledge to practical scenarios, preparing you for the demands of the civil engineering industry.

6. Topics:

Week 1	Introduction to STAAD PRO Program
Week 2	Editor method
Week 3	Order used in editor method
Week 4	Analysis of concrete structures using editor
Week 5	Design of concrete structure using editor
Week 6	Viewing results of concrete design

Week 7	Analysis of steel structures using editor
Week 8	Design of steel structure using editor
Week 9	Viewing results of steel design
Week 10	Analysis of concrete structures using geometry method
Week 11	Design of concrete structure using geometry method
Week 12	Viewing results of concrete design
Week 13	Analysis of steel structures using geometry method
Week 14	Design of steel structure using geometry method
Week 15	Viewing results of steel design

7. Relationship to GOs:

1,2

8. Prepared by:

Hussain Askar Jabir & Karrar Al-Lami

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE3110– English for Academic Purposes (II) (1.0, Required), Nabil Al Hakeem

2. Catalog Description:

This course focuses on the writing process which covers organization, structure and development of types of paragraphs and essays which contains technical vocabulary, Civil Engineering-specific phrases. It also focuses on the structure, outline, unity and coherence of essays. At the end of the course, the style of writing will be introduced briefly.

3. Prerequisite(s):

English for Academic Purposes (I)

4. Textbook(s) and/or other required materials:

Izar Landeta, J. M. (1999). Technical English for Civil Engineering.
Oshima, A., & Hogue, A. (2007). Introduction to academic writing (p. 3). Pearson/Longman.

5. Course Objectives:

To use effective academic vocabulary in the writing.
To be able to write paragraph and essays.
To develop academic literacy skills.
To become familiar with the wording and expectations of college exam questions.
Finding and evaluating scholarly sources to support your academic work and graduation project.

6. Topics:

- Introduction: Process Writing
- The Structure of a Paragraph
- The Development of a Paragraph
- Opinion Paragraphs.
- Comparison /Contrast Paragraphs.
- Problem/ Solution Paragraphs.
- The Structure of an Essay.
- Unity and Coherence
- Outlining an Essay.
- Practice peer editing, self-editing, and revising skills.

7. Relationship to GOs:

4,5,6,7

8. Prepared by:

Dr. Nabil Al Hakeem

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4338 – Foundations Engineering I (3, Required), Dr. Solomon F. Rubay

2. Catalog Description:

The Foundations Engineering course covers foundation importance, soil exploration methods, bearing capacity theories, shallow and mat foundation analysis, and settlement types.

3. Prerequisite(s):

Soil Mechanics I

4. Textbook(s) and/or other required materials:

1. Foundation Analysis and Design" Joseph E.Bowels. McGraw-Hill International Editions, Fifth Edition, 1997
2. "Principles of Foundation Engineering" Braja M. Das, Fifth Edition, 2003. Thomson/Brookscole
3. "Basic and Applied soil mechanics "Gopal Ranjan and ASR Rao, Second Edition New Age International publishers,2000
4. "Soil mechanics and Foundation Engineering" K. R. Arora Standard Publisher Distribution 1997
5. "A Text Book of Soil Mechanics and Foundation Engineering in SI units "V.N.S. Murthy UBS Publishers Distributors Ltd.Fourth Edition 1993.
6. "A Text Book of Foundation Engineering", Dr. R.K.Poudel and R.Neupane, 1st Edition, 2006.
7. "Pile Foundation Analysis and Design" H.G.Poulos and E.H.Davis, John Wiley and Sons, 1980

5. Course Objectives:

The objective of this course is to provide the student with the basic concepts and tools that can be used to determine the structure/ foundation/ soil interactions. The courses include a review of soil mechanics principles and deal with a variety of foundations and retaining walls.

6. Topics:

- **Soil Exploration**
    - Methods of exploration
    - Planning the exploration programme
    - Method of boring
    - Soil sampling and soil samplers
    - Vertical and lateral extent of borings
    - Field tests like Penetration test(Standard Penetration Test, Static Cone Penetration Test, Dynamic Cone Penetration Test) Pressure meter tests, dialatometer test and field Vane shear test.

- Ground water observations
- Borehole logs
- Site investigation reports

- **Bearing Capacity and Settlement of Shallow Foundations**
  - Principle modes of soil failure
  - Bearing capacity by classical Earth pressure theory of Rankine
  - Pauker and Bell's bearing capacity theory of failure
  - Prandtl's theory of failure
  - Terzaghi's method of determining bearing capacity of soil
  - Effect of water table on bearing capacity
  - Extension of Terzaghis bearing capacity theory
  - Recent bearing capacity theories
  - Bearing capacity from In-situ tests (Plate load test)
  - Types of settlement and their relationships.
  - Allowable settlement and allowable bearing pressure
  - Steps involved in the proportion of footings
- **Mat Foundations**
  - Common types of mat foundation
  - Bearing capacity and settlement of mat foundations
  - Compensated foundation
  - Analysis of mat foundation

7. Relationship to GOs:

1,2

8. Prepared by:

Dr. Solomon F. Rubay

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4340 – Asphalt Technology (4.0, Required), Dr. Nabeel Saleem & Abdalmhiman Addahhan

2. Catalog Description:

This course will provide students with a basic understanding of all phases of asphalt technology; describe the fundamental properties and behavior of asphalt cement and emulsions; understand the soil classification system in highway construction; describe the engineering properties and characteristics of mineral aggregate used in asphalt mixtures ; and perform Marshall volumetric mixture design.

3. Prerequisite(s):

CE 3333 Geometric Roads Design

4. Textbook(s) and/or other required materials:

N. J. Garber and L. A. Hoel. (2020). Traffic and Highway Engineering, Enhanced Fifth Edition, SI Edition Cengage Learning, USA.

Mallick, R.B., & El-Korchi, T. (Eds.). (2017). Pavement Engineering: Principles and Practice, Third Edition (3rd ed.). CRC Press. https://doi.org/10.1201/9781315119205.

Islam, M. Rashad, and Rafiqul A. Tarefder. (2020). Pavement Design: Materials, Analysis, and Highways, First Edition (1st ed.). New York: McGraw Hill. https://www.accessengineeringlibrary.com/content/book/9781260458916.

Pavement Analysis and Design by Yang H. Huang, 2nd Edition, Prentice Hall

Principles of Pavement Design by Yoder and Witczak, Wiley-Interscience Engineering

5. Course Objectives:

Provide a basic understanding of all phases of asphalt technology.

Describe the fundamental properties and behavior of asphalt cement and emulsions.

To understand the soil classification system in highway construction.

Knowing bitumen and bituminous materials, determination of the rheological. properties of bituminous materials, being able to determine the material properties of bituminous mixtures.

Describe the engineering properties and characteristics of mineral aggregate used in asphalt mixtures.

Perform Marshall volumetric mixture design.

Analyze and understand the strengths and weaknesses of various performance test methods.

Analyze and model the results from various performance test methods.

To know penetration value, ductility value, softening point, flash and fire point, viscosity, and stripping for the given bitumen grade.

6. Topics:

- Earthwork and Mass haul diagram: estimation of areas and volumes of excavations, understanding the concepts of soil shrinkage and bulking, determining the shrinkage factor and bulking factor, calculation of haul costs of highway construction projects, identifying the best direction of earthwork hauling, and understanding the characteristics of mass haul diagram.
- Soil classification based on AASHTO system: understanding the concept of classifying soils according to the AASHTO system. By doing this, we can guide transportation engineers to select the proper soil type to construct a highway project.
- Bitumen Characterization: sources, Composition of bitumen, Rheology of bitumen, types of bituminous material, properties of bitumen. Properties of Bituminous Mixes: Elastic modulus.
- Aggregate Characterization: Origin, Classification, Types of aggregates; Sampling of aggregates; Mechanical and shape properties of aggregates, Aggregate texture, and skid resistance, polishing of aggregates; Proportioning and Blending of aggregates: gradation, Fuller Equation, 0.45 power maximum density graph.
- Design of bituminous mixes: Marshall's specifications; Introduction to Marshall Mix design procedure, determine the air voids in asphalt mixtures, determine the quality and suitability of pavement compaction, and identifying the types of distresses in pavements.

7. Relationship to GOs:

1,2

8. Prepared by:

Dr. Nabeel Saleem

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4342 – Reinforced Concrete (III) (3.0, Required), Asst. Prof. Dr. Hussain Askar Jabir

2. Catalog Description:

1. Understanding the basic design philosophy of different types of reinforced concrete slabs.
2. Analyzing the moment and load distributions in slabs of small structures in addition to transferring loads to supporting beams, columns and walls.
3. Design of reinforced concrete slab-beam system and slab on bearing walls systems using the ACI-Code procedures.
4. Design of reinforced concrete flat plate and flat slab systems using the ACI-Code procedures.
5. Analyzing one way and two-way shear forces and shear strength of reinforced concrete slabs using the ACI-Code procedures.

3. Prerequisite(s):

Reinforced Concrete I & II

4. Textbook(s) and/or other required materials:

1. Building Code Requirements for Structural Concrete ACI 318-14 , ACI 318-19
2. Reinforced concrete fundamentals by P.M. Ferguson
3. Design of Concrete Structures (15th and 16th Editions) by: A. H. Nilson; D. Darwin & C. H. Dolan
4. Reinforced concrete Design (8th and 9th Editions) by: C. K. Wang , C. G. Salmon & J.A. Pincheira

5. Course Objectives:

1. Understanding design procedures of two-way slab-beam system.
2. Understanding design procedures of flat plate and flat slab systems.
3. Recognizing and understanding of the recommendations and limitations of the American ACI 318 design code.
4. Achieving the capability to design simple structures composed of reinforced concrete slabs on bearing walls, which is the typical housing construction procedure in Iraq.
5. Achieving the ability to use ACI-Code procedure to analyze and design reinforced concrete slabs in different construction systems.
6. Achieving the basic knowledge to use computer program to analyze and design reinforced concrete systems including two- way slabs

6. Topics:

- Introduction to reinforced concrete design and types of slab systems.

- Analysis and design of slabs by Direct Design Method.
- Shear strength of slabs.
- Analysis and design of slabs by Equivalent Frame Method.

7. Relationship to GOs:

1,2

8. Prepared by:

Asst. Prof. Dr. Hussain Askar Jabir

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4348 - Estimation & Specifications (2.0, Required), Dr. Alaa K. Shadher

2. Catalog Description:

Estimation & Specifications is a significant course that requires focused instruction hours. Therefore, the strategy of the course to deliver this module depends mainly on the module instructor in the class, where the material should be delivered with practical examples from surrounding projects. Moreover, classwork and homework assignments would help the students to practice solving estimating issues more efficiently. Practical and test videos should also be occasionally used to facilitate connecting the given course elements. reports prepared by student may be increase their information in this scope..\

Prerequisites:

Engineering Economy

the required materials:

1. Construction Planning , Equipment, and Methods. R.L. Peurifoy
2. التخمين والمواصفات الهندسية. مدحت فضيل فتح الله. الطبعة الرابعة ١٩٨٥.

5. Course Objectives:

- Indicative content includes the following.
- Reviewing related topics from previous courses including Introduction about estimating and earth works with planning and leveling.
- Principles of estimate cost of excavation of foundation.
- Defining the construction stages and its philosophy for building work.
- Review the calculation methods of Casting a concrete for girders and columns works
- Analysis Methods of estimating The productivity of machines and costs.
- Principles and fundamental of estimating finishing works cost.
- Studying estimating Roofing works estimating cost.
- Detailed study an approximate estimating .
- Studying Principles and fundamental of casting molds design.

6. Topics:

Introduction about estimating and earth works with planning and leveling.

Excavation of foundation

Layer of sub-base

Casting lean with width equal to the foundation

layer of block or rock

layer of block or rock

Wall building work - Build by brick and cement mortar and by block

Casting a concrete for girders and columns works

Casting a concrete to the slabs.

Finishing works

Finishing works

Roofing works estimating

Approximate estimating

detailed Estimation

Cost Preparing

7. Relationship to GOs:

1,2,3

8. Prepared by:

Dr. Alaa Kharbat Shadhar

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4350 – Hydraulic Structures (I) (3.0, Required), Prof. Dr. Ali N. Hilo & Lec. Nadheer S. Ayoob

2. Catalog Description:

This course provides students with a sufficient knowledge to differentiate between various types of hydraulic structures. Also, the problem of seepage under hydraulic structures is discussed. Moreover, a brief introduction to the concept of specific energy is explained. Finally, the student is learned how to design different kinds of regulating and conveyance structures.

3. Prerequisite(s):

Fluid Mechanics (II)

4. Textbook(s) and/or other required materials:

1. Chow, V.T., "Open channel hydraulics" McGraw Hill company, 1959.
2. Garg, S.C. "Irrigation engineering and hydraulic structures" Khanna publisher, 4th ed., 1999.
3. Varshney, R.S., Gupta, and R.L. Gupta, "Theory and design of irrigation structures". India, 1985.
4. Grishin, M.M, "Hydraulic structures".
5. Novak, P, Moffat, A.I.B., Nalluri, C., and Narayanan, R. "Hydraulic structures", 3rd ed.
6. Punmia, B.C., and Panda, P.P., "Irrigation and water power engineering''.
7. Pencol engineering consultant, "Design manual for irrigation and drainage "London, 1983.
8. United states dep. Of interior Bureau of Reclamation, "Design of small canal structures". USA, 1974.

5. Course Objectives:

1. Inform the student about different types of hydraulic structures.
2. Understanding the problem of seepage under hydraulic structures and using various methods to solve this problem.
3. Provide a brief explanation about the concept of specific energy, states of flow, and formation of hydraulic jump in open channels.
4. Learn the student how to design regulators, such as head and cross regulators, weirs, and sluice gates.
5. Provide the student the required knowledge about the design of conveyance structures, including culverts and inverted siphon.
6. Explain the types, functions, and design of transitions in open channels.

6. Topics:

- Introduction to hydraulic structures.
- Seepage under hydraulic structures.
- Specific energy and hydraulic jump.
- Design of head regulators.
- Design of cross regulators.
- Design of weirs and gates.

- Design of culverts.
- Design of inverted siphon.
- Transition in open channels.

7. Relationship to GOs:

1,2

8. Prepared by:

Prof. Dr. Ali N. Hilo

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4111– English for Academic Purposes III (1.0, Required), Ali Waheid Nakemish

2. Catalog Description:

English for Academic Purposes (III) course focuses on helping students to develop an advanced level of academic skills needed for successful entry into tertiary studies where English is the primary medium of instruction. This course covers academic reading, writing, speaking and listening skills at an advanced level.

3. Prerequisite(s):

English for Academic Purposes II

4. Textbook(s) and/or other required materials:

- New Headway Upper Intermediate Student's Book 2014.
- English Grammar in Use by Raymond Murphy.

5. Course Objectives:

Students will:

- Improve their speaking and listening skills through a broad range of interactive classroom activities
- Improve their academic reading and writing skills through engagement with a range of academic texts
- Gain exposure to the types of assessment tasks they encounter during your university degree
- Develop the independent learning skills required to succeed at IELTS.

6. Topics:

- Listening.
- Speaking.
- Reading.
- Writing.
- IELTS Preparation.

7. Relationship to GOs:

4,5,6,7

8. Prepared by:

Ali Waheid Nakemish

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4339 – Foundations Engineering II (3, Required), Dr. Solomon F. Rubay

2. Catalog Description:

The Foundations Engineering course includes pile foundations (58%), lateral earth pressure theory (16%), retaining walls (20%), and sheet piles (10%).

3. Prerequisite(s):

Soil Mechanics II, Foundations Engineering I

4. Textbook(s) and/or other required materials:

Braja M. Das and Sivakugan N, (2019) Principles of Foundation Engineering, Ninth edition, SI edition

5. Course Objectives:

The objective of this course is to provide the student with the basic concepts and tools that can be used to determine the structure/ foundation/ soil interactions. The courses include a review of soil mechanics principles and deal with a variety of foundations and retaining walls.

6. Topics:

Chapter 1: Pile Foundation, 58%

Chapter 2: Lateral earth pressure theory (16 %)

Chapter 3: Retaining walls (20%)

Chapter 4: Sheet piles (10%)

7. Relationship to GOs:

1,2

8. Prepared by:

Dr. Solomon F. Rubay

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4341 – Pavement Design (3.0, Required), Dr. Nabeel Saleem & Abdalmhiman Addahhan

2. Catalog Description:

This course will provide students with a basic understanding of all phases of asphalt technology; describe the fundamental properties and behavior of asphalt cement and emulsions; understand the soil classification system in highway construction; describe the engineering properties and characteristics of mineral aggregate used in asphalt mixtures ; and perform Marshall volumetric mixture design.

3. Prerequisite(s):

CE 4340 Asphalt Technology

4. Textbook(s) and/or other required materials:

N. J. Garber and L. A. Hoel. (2020). Traffic and Highway Engineering, Enhanced Fifth Edition, SI Edition Cengage Learning, USA.

Mallick, R.B., & El-Korchi, T. (Eds.). (2017). Pavement Engineering: Principles and Practice, Third Edition (3rd ed.). CRC Press. https://doi.org/10.1201/9781315119205.

Islam, M. Rashad, and Rafiqul A. Tarefder. (2020). Pavement Design: Materials, Analysis, and Highways, First Edition (1st ed.). New York: McGraw Hill.
https://www.accessengineeringlibrary.com/content/book/9781260458916.

Pavement Analysis and Design by Yang H. Huang, 2nd Edition, Prentice Hall

Principles of Pavement Design by Yoder and Witczak, Wiley-Interscience Engineering

5. Course Objectives:

Understand the basic characteristics of each pavement type and the main differences between them.

Describe some of the products, processes, and principles that would enhance the sustainability of flexible and rigid pavements.

Determine and analyze stresses in flexible pavement and traffic loads in terms of equivalent axle load.

Calculate stresses, strains, and deflections in flexible pavements using Boussinesq solutions and layered elastic analysis.

List the types and axle configurations of typical highway trucks and their corresponding standard loads.

To learn about the characterization of material and design factors of pavement.

To learn about pavement design methods and considerations for paved (rigid and flexible) roads.

Identify various types of distresses in different pavement types.

6. Topics:

- Introductory to pavement types: discussing the importance of pavement in human life, history of pavement, requirements of pavements, sustainability in pavement design.

- Stresses in the flexible pavement: discuss stresses and strains in flexible pavements, including the analysis of homogeneous mass and layered systems composed of linear elastic, nonlinear elastic, and linear viscoelastic materials. Simplified charts and tables for determining stresses and strains are also presented.
- Flexible pavement design: discusses the concept of equivalent single-wheel and single-axle loads and the prediction of traffic. It also describes the material characterization for mechanistic—empirical methods of pavement design, including the determination of resilient modulus, and the modulus of subgrade reaction. Plus, the drainage in the pavement system is discussed in addition to pavement performance, including distress, and serviceability.
- Stresses in the rigid pavement: discuss stresses and deflections in rigid pavements due to curling, loading, and friction, plus the design of dowels and joints. Influence charts for determining stresses and deflections are also presented.
- Rigid pavement design: discusses the concept of equivalent single-wheel and single-axle loads and the prediction of traffic. It also describes the material characterization for pavement design. Plus, the drainage in the pavement system is discussed in addition to pavement performance, including distress, and serviceability. Also, it outlines an idealistic mechanistic method of rigid pavement design and presents in detail the AASHTO method. The design of continuous reinforced concrete pavements is also included.

7. Relationship to GOs:

1,2

8. Prepared by:

Dr. Nabeel Saleem

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4343 – Reinforced Concrete (IV) (3.0, Required), Asst. Prof. Dr. Hussain Askar Jabir

2. Catalog Description:

1. Understanding the basic design philosophy of different types of reinforced concrete slabs.
2. Analyzing the moment and load distributions in slabs of small structures in addition to transferring loads to supporting beams, columns and walls.
3. Introducing the analysis of reinforced concrete slabs using yield line theory.
4. Understanding the basic philosophy and flexural analysis of prestressed concrete members.
5. Recognizing and understanding the losses of prestressed reinforced concrete members.
6. Defining the advantages of using prestressed reinforced concrete members in building construction.

3. Prerequisite(s):

Reinforced Concrete III

4. Textbook(s) and/or other required materials:

1. Building Code Requirements for Structural Concrete ACI 318-14 , ACI 318-19
2. Reinforced concrete fundamentals by P.M. Ferguson
3. Design of Concrete Structures (15^{th} and 16^{th} Editions) by: A. H. Nilson; D. Darwin & C. H. Dolan
4. Reinforced concrete Design (8^{th} and 9^{th} Editions) by: C. K. Wang , C. G. Salmon & J.A. Pincheira

5. Course Objectives:

1. Achieving the capability to analyze and design slabs using the yield line theory.
2. Achieving the ability to use the virtual work method to analyze slabs in different construction systems.
3. Understanding and calculating the losses in pre-tensioned and post tensioned prestressed reinforced concrete members.
4. Understanding the analysis and design procedures for the prestressed reinforced concrete members based on the recommendations and limitations of the American ACI 318 design code.

6. Topics:

- Introduction to plastic analysis of slabs.
- Yield line analysis for slabs.
- Introduction to prestressed concrete members.
- Flexural analysis of prestressed concrete members.

- Losses in prestressed concrete members

7. Relationship to GOs:

1,2

8. Prepared by:

Asst. Prof. Dr. Hussain Askar Jabir

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE4347 – Wastewater Treatment (5.0, Required), Ali Jwied Jaeel

2. Catalog Description:

This course will provide students with a sufficient knowledge on wastewater properties, source of wastewater, constituent of wastewater, and how to treat the wastewater, also the course will provide information about biological oxygen demand, chemical oxygen demand, total suspended solids, the students will able to calculate storm water discharge and how to design pipe network for controlling storm water. Developing students' skills in investigation of wastewater disposal to streams and rivers, and how to design the components of wastewater treatment plant.

3. Prerequisite(s):

Hydrology

4. Textbook(s) and/or other required materials:

1. Water Supply and Sewerage by E W Steel

5. Course Objectives:

1. Providing the students with a sufficient knowledge on the meaning of wastewater, its properties, the source of wastewater, the main components in wastewater.
2. Providing the students with the necessary skills on the meaning of biological oxygen demand (BOD) and chemical oxygen demand (COD) and the methods of calculation BOD for wastewater.
3. Strengthen the students' knowledge on the principles of calculation storm water discharge for any catchment area.
4. Providing the students with a sufficient knowledge on the principles of design networks to convey storm water.
5. Improvement of the students' skills on the dealing with disposal of sewage into water streams and rivers
6. Awarding students the necessary skills of controlling sewage disposal into river and how to apply point source disposals model. (Streeter Phelps)
7. Developing students' skills in the elements of wastewater treatment plant WWTP
8. How to design grit chamber and primary sedimentation tank
9. How to design secondary sedimentation tank , tricking filters and activated sludge .

6. Topics:

- Wastewater quantity and quality
- Wastewater properties (physical , chemical and biological)
- Biological Oxygen Demand BOD and the methods of calculations
- Storm water discharge calculations

- Designing storm water networks
- Sewage Disposal to streams and rivers
- Wastewater Treatment Methods
- Wastewater Treatment Plants and its Components

7. Relationship to GOs:

1,2,7

8. Prepared by: Prof. Dr. Ali Jwied Jaeel

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4349 - Construction Methods (2.0, Required), Jassim M. Ridha

2. Catalog Description:

Construction Methods is a significant course that requires focused instruction hours. Therefore, the strategy of the course to deliver this module depends mainly on the module instructor in the class, where the material should be delivered with practical examples from surrounding projects. Moreover, classwork and homework assignments would help the students to practice solving estimating issues more efficiently. Practical and test videos should also be occasionally used to facilitate connecting the given course elements. reports prepared by student may be increase their information in this scope.

3. Prerequisite(s):

Estimation & Specifications, Projects Management

4. Textbook(s) and/or other required materials:

1. Construction Planning , Equipment, and Methods. R.L. Peurifoy
2. التخمين والمواصفات الهندسية. مدحت فضيل فتح الله. الطبعة الرابعة ١٩٨٥.
3. تخطيط ومعدات طرق الانشاء . محمد ايوب صبري العزي . ١٩٨٥

5. Course Objectives:

- Introduction about equipment operation.
- Analysis of productivity elements.
- Detailed study of Factors affecting on equipment productivity.
- Detailed study of Costs of operation equipment with examples.
- Defining operation equipment with examples.
- Identifying a Costs of operation equipment with examples.
- Identifying equipment owning.

6. Topics:

- Availability of equipment
- Equipment owning and operating costs
- Equipment owning and operating costs
- Introduction to The Methods of construction
- Factors affecting on equipment productivity
- Machines Depreciation
- Machines Depreciation
- Costs of operation equipment
- Costs of operation equipment with examples
- Costs of operation equipment with examples
- Engineering fundamentals for choosing construction tools

- Methods of estimating The productivity of machines
- Methods of estimating The productivity of machines and costs
- Casting molds design
- These topics will provide a comprehensive foundation for students, equipping them with the skills needed to succeed in their academic studies and beyond.

7. Relationship to GOs:

1,2,5

8. Prepared by:

Dr. Alaa Kharbat Shadhar

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4351 – Hydraulic Structures (II) (3.0, Required), Prof. Dr. Ali N. Hilo & Lec. Nadheer S. Ayoob

2. Catalog Description:

This course provides students with a sufficient knowledge to design energy dissipation structures, such as drop structures, stilling basins, and chutes. Furthermore, the student is prepared to solve the theoretical problem studied during the course using HEC-RAS and FLOW-3D programs.

3. Prerequisite(s):

Hydraulic Structures (I)

4. Textbook(s) and/or other required materials:

5. Chow, V.T., "Open channel hydraulics" McGraw Hill company, 1959.
6. Garg, S.C. "Irrigation engineering and hydraulic structures" Khanna publisher, 4th ed., 1999.
7. Varshney, R.S., Gupta, and R.L. Gupta, "Theory and design of irrigation structures". India, 1985.
8. Grishin, M.M, "Hydraulic structures".
9. Novak, P, Moffat, A.I.B., Nalluri, C., and Narayanan, R. "Hydraulic structures", 3rd ed.
10. Punmia, B.C., and Panda, P.P., "Irrigation and water power engineering''.
11. Pencol engineering consultant, "Design manual for irrigation and drainage "London, 1983.
12. United states dep. Of interior Bureau of Reclamation, "Design of small canal structures". USA, 1974.

5. Course Objectives:

5. Inform the student about different types of stilling basins and how to deal with S.A.F stilling basin.
6. Explain different types of drop structures and learn the design of vertical drop structures.
7. Learn the student how to design chute structures.
8. Provide the student an introduction to design simple open channels and hydraulic structures using computer software involving HEC-RAS and FLOW-3D.

6. Topics:

- Types of stilling basins.
- Design S.A.F stilling basins
- Design of vertical drop structures.
- Design of Chutes.
- Using computer programs to design simple open channels.
- Using computer programs to design simple hydraulic structure.

7. Relationship to GOs:

1,2

8. Prepared by:

Prof. Dr. Ali N. Hilo

1. Course Code & Title (Credit Hours, Required or Elective), Faculty name:

CE 4352 – Elective Subject (2, Elective), jasim mahmood mhalhal

2. Catalog Description:

For the purpose of developing the engineer's skills in his ability to analyze structures using modern and advanced methods similar to the methods used in structural analysis using structural analysis and design programs, the developed theory of structures is studied.

3. Prerequisite(s):

Depends..

4. Textbook(s) and/or other required materials:

1. Strength of Materials (Fourth Edition) Ferdinand L. Singer , Andrew Pytel .
2. Mechanics of Materials (sixth Edition) Ferdinand P. Beer, E. Russell Johnston, Jr.
3. Mechanics of Materials (Seventh Edition) R.C. Hibbeler.
4. Intermediate Mechanics of Materials (2001) J.R BARBER. Edn., Van Nostrand Reinhold, New York.

5. Course Objectives:

Learning Objectives • To define the stiffness matrix • To derive the stiffness matrix for a spring element • To demonstrate how to assemble stiffness matrices into a global stiffness matrix • To illustrate the concept of direct stiffness method to obtain the global stiffness matrix and solve a spring assemblage problem • To describe and apply the different kinds of boundary conditions relevant for spring assemblages • To show how the potential energy approach can be used to both derive the stiffness matrix for a spring and solve a spring assemblage problem

6. Topics:

The Stiffness (Displacement) Method

This section introduces some of the basic concepts on which the direct stiffness method is based.

- The linear spring is simple and an instructive tool to illustrate the basic concepts.
- 2-Statically indeterminate beams , trusses and freams and derivation of their stiffness matrix.

7. Relationship to GOs:

1

8. Prepared by:

jasim mahmood mhalha