Northern Technical University
Technical Engineering College - Mosul
Building & Construction Techniques Engineering

MODULE DESCRIPTION
وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Construction Materials**			**Module Delivery**	
Module Type	Core			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	BCE 101				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	1	**Semester of Delivery**	1		
Administering Department	BCE	**College**	TEMO		
Module Leader	Waseem T. Mohammed	**e-mail**	Waseem.thabit@ntu.edu.iq		
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	Master degree		
Module Tutor	Waseem T. Mohammed	**e-mail**	E-mail		
Peer Reviewer Name		**e-mail**	E-mail		
Scientific Committee Approval Date	15/10/2024	**Version Number**	2.0		

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course provides full knowledge about the construction materials properties, standards and laboratory tests.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Understanding the characteristics of different construction materials. • The ability of utilizing the proper construction material according to the type of structure. • Understanding the installation methods of construction materials. • Understanding the standards specification of construction materials.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Enable students to identify the physical and mechanical properties of the common construction materials. • Improving the student ability of selecting the suitable material that qualifies the requirements of the desired work. • Enabling the students to work as a laboratory field tester. • Improving the students' skills enabling the establishment of a career based on the academic knowledge.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture method using a whiteboard and a data show. • Forming working groups during the laboratory sessions to conduct the desired tests. • Preparation of seminars by students under the supervision of their lecturer. • Giving students assignments (H.W) to evaluate the students benefit from the lesson. • Conducting a scientific technical visit to an under construction visit • Forming groups to conduct a project during the course. Attending online (web-based) sessions.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	83	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	6	10% (10)	2 and 13	LO #1 - #2, LO #3 - #4,
	Assignments	6	10% (10)	2 and 13	LO #1 - #2, LO #3 - #4,
	Seminar	3	10% (10)	2 and 13	LO #2 - #3, LO #4 -
	Report	4	10% (10)	2 and 13	LO #1 - #3, LO #4 -
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	• Demonstrates knowledge of the Physical properties & standard specification for construction materials. • Ability to identify types of metallic materials, nonmetallic materials.
Week 2	• Demonstrates knowledge of the Physical properties & standard specification for construction materials • Ability to identify types of metallic materials, nonmetallic materials.
Week 3	• Demonstrates **Advantages** & disadvantages of clay bricks
Week 4	• Identifying clay brick types of defects, Standard specification. • Correctly implement Continuity equation.
Week 5	• Demonstrates knowledge of the Sand-lime brick: Properties.

	• Conducts the Standard tests & monitor the specification.
Week 6	• Demonstrates knowledge of the Glass bricks, Concrete bricks: Properties. • Conducts the Standard tests & monitor the specification.
Week 7	• Recognition of laboratory Steady flow in pressure conduits; laminar and turbulent flow; critical flow. • Correctly execute general equation for conduit friction; friction for laminar flow; friction for turbulent flow; pipe roughness.
Week 8	• Ability to identify the Cellular concrete blocks: Properties. • Monitoring and conducting Standard tests & specification.
Week 9	• Demonstrates knowledge and Definition of the Building stone
Week 10	• Demonstrates the classification of the building stones.
Week 11	• Demonstrates the uses and properties of the building stones.
Week 12	• Ability to identify the Bonding materials: Classification, Chemical composition, properties & uses of common bonding materials.
Week 13	• Monitoring and conducting Standard tests & specification (Cement mortar, Cement lime mortar, Gypsum)
Week 14	• Demonstrates knowledge of the Types, Properties of flooring materials (Tiles & concrete flags)
Week 15	• Demonstrates knowledge standards tests & specification of flooring materials.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Recognition of laboratory, Using of balances.**
Week 2	**Able to conduct and identify the Clay brick tests: Density , Dimension , Absorption , Compressive strength , Efflorescence , Analysis of soluble salts , Porosity**
Week 3	**Able to conduct and identify the Sand-lime brick tests: (Density, Absorption, Compressive strength).**
Week 4	**Able to conduct and identify the Concrete bricks & block tests: (Density, Absorption, Compressive strength).**

Week 5	**Able to conduct and identify the Cellular concrete block tests: (Density, Absorption, Compressive strength).**
Week 6	**Able to conduct and identify the Bonding materials (gypsum) tests: Fineness, Standard consistency, Time of setting of gypsum, Compressive strength, Tensile strength of gypsum.**
Week 7	**Able to conduct and identify Tile tests: (Dimension, Total absorption, Face absorption, Modulus of rupture).**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Construction materials reference book by John M. Cimbala.	No
Recommended Texts	• Construction materials their nature and behavior	No
Websites	• www.buildforless.co.uk	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**Plane Surveying**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BCE 102**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		1	**Semester of Delivery**		1
Administering Department		BCE	**College**	TEMO	
Module Leader	Dr. Mohammed Adnan Basher		**e-mail**	mbasher@ntu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Dr. Mohammed Adnan Basher		**e-mail**	mbasher@ntu.edu.iq	
Peer Reviewer Name			**e-mail**	E-mail	
Scientific Committee Approval Date		14/10/2024	**Version Number**		2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Understanding how to determine points, distances, and land areas. • Familiarity with surveying instruments related to the practical aspect. • Understanding the fundamentals of obstacles in field. • Understanding how to calculate the lengths of traverses. • Understanding the mathematical methods for calculations.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Recognize how to use tools in measurement of lengths and angles. • List the various method in measurement. • Summarize what is obstacles and how to avoid it in lengths measurement. • Discuss the errors through the measurement of lengths. • Describe the environmental effects on errors of measurement. • Define the mathematical formula to determine the errors in measurement. • Discuss the theory of fixing traverses in field. • Discuss the various errors in lengths and angles in traverses. • Explain the mathematical formula to determine the area of traverse. • Identify the methods to determine the regular and irregular areas.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to Surveying – Types of surveying, plane surveying, methods of survey and advantages of surveying. Points, Lengths and Angles – Set of points and lines, measurement of lines and angles, types of errors in measurement. Obstacles – Types of obstacles, measurement lines through obstacles. Traverses – Types of traverses, interior angles, lines and corrections Area Measurement – Area measurement, typical area, area formula, trapezoidal method, Simpson's method Area of Traverses – Area of traverse, graphical paper, triangle method

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple

	experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	83	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10,
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to surveying
Week 2	Set of points and straight lines
Week 3	Set of angles and curves
Week 4	Measurement of lines and angles
Week 5	Measurement of curves and errors in tape

Week 6	General view of obstacles
Week 7	Measurement of lines through obstacles
Week 8	Types of traverses
Week 9	Interior angles and lines in traverses
Week 10	Angle correction in traverses
Week 11	Area measurement
Week 12	Mathematical formula of area measurement
Week 13	Trapezoidal and Simpson's methods in area measurement
Week 14	Graphical paper and triangle methods in area measurement
Week 15	Examples on area measurement
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to survey
Week 2	Lab 2: Tools of measurement
Week 3	Lab 3: Obstacles
Week 4	Lab 4: Errors in measurement
Week 5	Lab 5: Fix in field: points, lines and angles
Week 6	Lab 6: Fix of traverse
Week 7	Lab 7: Area of traverse

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	N N Basak (2014). Surveying and Levelling. McGraw Hill Education. p. 542. ISBN 9789332901537	No
Recommended Texts	Brinker, Russell C; Minnick, Roy, eds. (1995). The Surveying Handbook. ISBN 978-1-4613-5858-9	No
Websites	https://www.youtube.com/watch?v=qgwBOVUFDAQ	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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Module Information معلومات المادة الدراسية					
Module Title	**ENGINEERING MECHANICS (STATIC)**			**Module Delivery**	
Module Type	**Core**			**☒Theory** **☒ Lecture** **☐ Lab** **☒ Tutorial** **☐ Practical** **☐ Seminar**	
Module Code	**BCE103**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	
Module Leader	Mohammed Hatim		**e-mail**	Mohammed.hatem@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Mohammed Hatim		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	15/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	To give basic information about force vector, moment and vector algebra. To teach the basic principles of particle and rigid cismen balance in the plane and in space. To give basic information about the stability of ties and conveyor systems. To teach the calculation of bond forces, cages, frames and internal forces in cables.
Module Learning Outcomes	Introduction and Main Principles, Vectors and Forces, Static of Material Points, Rigid Bodies, Equivalent Force Systems, Center of Gravity, Equilibrium of Rigid Bodies, Internal Forces in Plane Rod Elements, Cross-Section Effects, Plane and Space Lattice

مخرجات التعلم للمادة الدراسية	Systems, Cables, Moment of Inertia, Potential Energy, Stable.
Indicative Contents المحتويات الإرشادية	**Guideline Contents for Engineering Mechanics** 1. **Introduction and Basic Principles** • Definition of engineering mechanics and its importance in engineering applications. • Fundamental concepts of forces, moments, and equivalent force systems. 2. **Vectors and Forces** • Introduction to vectors and basic operations (addition, subtraction, dot product, and cross product). • Force analysis in two and three dimensions. 3. **Statics of Material Points** • Equilibrium of particles in planes and space. • Practical applications of force equilibrium. 4. **Rigid Bodies and Equivalent Force Systems** • Definition and properties of rigid bodies. • Reduction of force systems to an equivalent force and moment. 5. **Center of Gravity and Equilibrium of Rigid Bodies** • Determination of the center of gravity and centroid. • Conditions and equations for rigid body equilibrium in two and three dimensions. 6. **Internal Forces in Structural Elements** • Analysis of internal forces in beams, trusses, and frames. • Determination of axial forces, shear forces, and bending moments. 7. **Cross-Section Effects and Structural Stability** • Effects of internal forces on structural members. • Stability analysis of supports and structural connections. 8. **Plane and Space Lattice Systems** • Analysis of planar and spatial truss systems. • Calculation of forces in truss members using the method of joints and sections. 9. **Cables and Suspension Systems** • Equilibrium analysis of cables and tension members.

	• Applications in suspension bridges and cable-supported structures. 10. **Moment of Inertia and Structural Response** • Calculation of moment of inertia for different cross-sections. • Application in beam bending and rotational motion. 11. **Potential Energy and Stability** • Concepts of potential energy in mechanical systems. • Stability criteria for mechanical structures and equilibrium conditions.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Preliminary & Further Study, Assignment (Homework) , Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	91	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	59	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
	Quizzes	8			

Formative assessment	**Assignments**	8			
Summative assessment	**Midterm Exam**	2hr		7	
	Final Exam	3hr		16	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Weeks 1&2	• Demonstrates knowledge about the Introduction to mechanics, Force systems, Scalar & vector quantities, • Able to identify and apply the Parallelogram law, Triangle law, Forces & components.
Weeks 3&4	• Able to identify and apply the Moment of a force , Varignon's theorem, and their Applications
Weeks 5&6	• Demonstrates knowledge of the Couples, • Able to identify Resolution of a force into a force & a couple.
Weeks 7&8	• Demonstrates knowledge and correctly compute the Resultant of force systems, Resultant of concurrent force system, Resultant of parallel force system, Resultant of non-concurrent force system.
Weeks 9&10 &11	• Demonstrates knowledge, identify and correctly compute Equilibrium of force system, Free body diagram, Equilibrium of concurrent force system, Equilibrium of parallel force system, Equilibrium of non-concurrent force system.
Week 12	• Demonstrates knowledge of the Types of beams, Supports, and loads, Equilibrium of beams.
Weeks 13&14 ,15	• Demonstrates knowledge of the Trusses • Able to analyses the trusses, method of Joint, method of section.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• **"Vector Mechanics for Engineers: Statics"** by F.P. Beer, E.R. Johnston, and D.F. Mazurek. • **"Engineering Mechanics: Statics & Dynamics"** by R.C. Hibbeler.	NO
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** – Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	C – Good	جيد	70 – 79	Sound work with notable errors
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	E – Sufficient	مقبول	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**Engineering drawing and descriptive geometry**			**Module Delivery**	
Module Type	**Core**			☐**Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BCE104**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	1 1		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	
Module Leader	Faiza Ibrahim Muhammed		**e-mail**	FaizaIbrahim@ ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Faiza Ibrahim Muhammed		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	15/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	statics and Strength of Materials	**Semester**	
Co-requisites module	Fluid Mechanics and Thermodynamics	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The Module Objectives of an engineering drawing course define the aims or goals that guide the overall structure and content of the module. These objectives outline what the course intends to accomplish and what students

	should be able to do by the end of the module. Below are typical module objectives for an engineering drawing course: • To Introduce Fundamental Concepts of Engineering Drawing • To Develop Proficiency in 2D and 3D Drawing Techniques • To Teach the Use of Engineering Standards and Conventions • To Enable Students to Apply Dimensioning and Tolerancing • To Introduce Sectional and Auxiliary Views for Complex Features • To Develop Skills in Computer-Aided Design (CAD). • To Train Students in Creating Assembly and Detailed Drawings • To Introduce Welding Symbols and Surface Finish Notations • To Teach the Concepts of Limits, Fits, and Tolerances • To Develop the Ability to Read and Interpret Engineering Drawings • To Foster Visualization and Spatial Awareness Skills • To Emphasize Ethical and Professional Responsibility in Engineering Drawing • To Encourage Problem-Solving and Critical Thinking in Drawing • To Introduce the Application of Drawing in Various Engineering Fields
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. The Module Learning Outcomes (MLOs) for an engineering drawing course define what students are expected to achieve by the end of the module. These outcomes focus on both the theoretical understanding and practical application of engineering drawing techniques. Below are typical learning outcomes for a course in engineering drawing. ▪ Understand and Apply Engineering Drawing Standards ▪ Create Accurate 2D Orthographic and Isometric Projections ▪ Dimension and Annotate Drawings Correctly ▪ Interpret and Create Sectional and Auxiliary Views ▪ Develop Assembly and Detail Drawings ▪ Apply Computer-Aided Design (CAD) Tools ▪ Interpret and Create Technical Drawings for Manufacturing ▪ Create Development Drawings for Fabrication ▪ Communicate Engineering Concepts Visually ▪ Understand Ethical and Professional Responsibilities in Engineering Drawing ▪ Develop Problem-Solving Skills in Technical Drawing

	▪ Demonstrate Proficiency in Reading Complex Engineering Drawings

Indicative Contents
المحتويات الإرشادية
	Indicative content includes the following.
	
	The indicative content of an engineering drawing course typically outlines the topics and skills that students will need to master in order to effectively communicate technical ideas through precise drawings. Below is a breakdown of the key areas typically covered in an engineering drawing curriculum, including both traditional manual drawing and computer-aided design (CAD) skills.
	
	• Introduction to Engineering Drawing
	  • Limits, grid, object snap, view menu (zoom, pan).
	  • Draw menu (line, poly line, polygon, rectangle, arc, circle, point, text). [8 hrs.].
	
	• Introduction to Engineering Drawing, modify menu, erase, copy, mirror offset, move, rotate, trim, extend, explode, perspective. [8 hrs.].
	
	• Orthographic projection: Types of Projections
	  • Fundamentals of orthographic projection.
	  • First-Angle vs. Third-Angle Projections: Understanding the difference between these projection methods.
	  • Creation of front, top, and side views (multi-view drawings). [10 hrs].
	• Draw the projection, Draw the projection with the first angle projection, method Draw the projection with the third angle projection method. [10 hrs].
	• Drawing the three projections, Drawing the three projections with the first angle, Drawing the three projections with the third angle projection method. [10 hrs.]
	
	• Configuration of a printing layout and the print, configuration and scale of printing. [8 hrs.]
	
	• 7. Orthogonal projection: I. representation of a point, line, plane, solid
	  ▪ ii. belonging of a point to a line, of a point/line to a plane [8 hrs.]
	
	• particular lays of a line, of a plane. particular lays of a line, of a
	• plane particular lays of a line, of a plane.[8 hrs.]
	
	• Perpendicularity between a line and a plane. v. Perpendicularity
	  ▪ between a line and a plane. Perpendicular between two coplanar lines. Perpendicularity between planes Intersection between two

	planes (not parallel). Intersection between a plane and a line [8 hrs.] • Sections Perpendicularity between planes • Intersection between two planes (not parallel). Intersection between a plane and a line, Sections plane-plane. [8 hrs.] • Intersections Intersections among solids, solids/plane, • Intersections among solids/line [8 hrs.] • Axonometric, Orthogonal axonometry [8 hrs.] • Oblique axonometry [8 hrs.] • Representation of point, line, plane, solids [8 hrs.]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Engineering drawing is a vital communication tool used by engineers and designers to convey design ideas, measurements, and technical information. Given the precision and complexity required, learning and teaching this subject effectively requires a combination of theoretical understanding and practical application. Here are strategies for both learners and educators to enhance the teaching and learning process. • Understanding Fundamentals First • Incremental Learning: Start Simple, Build Complexity • Use CAD Tools Early in Learning • Visualization and Spatial Awareness • Problem-Based Learning (PBL) • Feedback and Iterative Learning • Hands-on Projects and Workshops • Continuous Practice • Assessment through Practical Tests

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	95	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	6	10% (10)	Continuous	All
	Class work	6	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Limits, grid, object snap, view menu (zoom, pan), Draw menu (line, poly line, polygon, rectangle, arc, circle, point, text)
Week 2	erase, copy, mirror offset, move, rotate, trim, extend, explode, perspective
Week 3	First and third angle projection method
Week 4	Draw the projection with the first angle projection method, Draw the projection with the third angle projection method
Week 5	Drawing the three projections with the first angle, Drawing the three projections with the third angle projection method

Week 6	Configuration of a printing layout and the print, configuration and scale of printing
Week 7	Mid-term Exam + I. representation of a point, line, plane, solid, ii. belonging of a point to a line, of a point/line to a plane
Week 8	iii. particular lays of a line, of a plane, iv. Parallelism between two lines, parallelism between two planes, parallelism between a line and a plane.
Week 9	v. Perpendicularity between a line and a plane. Perpendicular between two coplanar lines. Perpendicularity between planes, Intersection between two planes (not parallel). Intersection between a plane and a line
Week 10	Perpendicularity between planes, Intersection between two planes (not parallel). Intersection between a plane and a line, Sections plane-plane
Week 11	Intersections among solids, solids/plane, Intersections among solids/line
Week 12	Orthogonal axonometry
Week 13+14	Oblique axonometry
Week 15	Representation of point, line, plane, solids
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Agilent VEE and PSPICE
Week 2	Lab 2: Thévenin's / Norton's Theorem and Kirchhoff's Laws
Week 3	Lab 3: First-Order Transient Responses
Week 4	Lab 4: Second-Order Transient Responses
Week 5	Lab 5: Frequency Response of RC Circuits
Week 6	Lab 6: Frequency Response of RLC Circuits
Week 7	Lab 7: Filters

Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	• Geometric and Engineering Drawing by K. Morling • Fundamentals of Engineering Drawing by Thomas E. French الهندسة الوصفية ليوسف نيقولا	Yes
Recommended Texts	A Text -Book of Engineering Drawing and Design by Sidney H. Wells	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	Engineering Physics			**Module Delivery**	
Module Type	Support			☒ **Tutorial** ☐ **Lecture** ☒ **Lab** ☐ **Theory** ☐ **Practical** ☐ **Seminar**	
Module Code	BCE105				
ECTS Credits	**3**				
SWL (hr/sem)					
Module Level		1	**Semester of Delivery**		1
Administering Department		BEC	**College**	TEMO	
Module Leader	Mohammed Tariq		**e-mail**	Mohammed.alsafaawe@ntu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Mohammed Tariq		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		15/10/2024	**Version Number**		2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The objectives of this module are to provide students with a comprehensive understanding of fundamental concepts in physics, emphasizing the following key areas: 1. Understand the basic principles of physics and the importance of units and measurements.

	2. Apply concepts of linear and rotational motion to analyze physical phenomena. 3. Utilize Newton's laws to solve problems involving forces and motion. 4. Develop skills in calculating work, kinetic energy, potential energy, momentum, impulse, and collisions. 5. Understand the principles of conservation of energy and momentum. 6. Prepare students for examinations through review and problem-solving sessions. 7.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students will be able to: 1. Identify and convert between different units of measurement and understand the significance of uncertainty and significant figures. 2. Analyze and compute two-dimensional and three-dimensional motion using appropriate equations. 3. Apply Newton's laws to real-world scenarios and solve related problems. 4. Calculate work, kinetic energy, potential energy, and demonstrate an understanding of energy conservation. 5. Compute momentum, impulse, and analyze collisions in one and two dimensions. 6. Describe and calculate rotational motion in rigid bodies, including rotational kinematics and dynamics. 7. Review and consolidate knowledge in preparation for final examinations, demonstrating problem-solving skills.
Indicative Contents المحتويات الإرشادية	• **Scope of Physics I**: Overview of physics and its applications. • **Units and Conversions**: Fundamental and derived units, unit conversions, and the importance of significant figures. • **Uncertainty and Significant Figures**: Understanding measurement uncertainties and how to represent them in calculations. • **Linear Motion**: Concepts of displacement, velocity, acceleration, and the equations of motion. • **2-D and 3-D Motion**: Analyzing motion in two and three dimensions using vector components. • **Newton's Laws**: Introduction to Newton's laws of motion and their applications. • **Applications of Newton's Laws**: Problem-solving involving forces, friction, tension, and other applications of Newton's laws. • **Work and Kinetic Energy**: Definition and calculations of work done by forces, kinetic energy, and the work-energy theorem. • **Potential Energy and Conservation of Energy**: Calculating gravitational potential energy and understanding energy conservation principles. • **Momentum, Impulse, and Collisions**: Understanding momentum, impulse, and analyzing elastic and inelastic collisions.

	• **Rotational Motion of Rigid Bodies**: Calculations involving angular displacement, angular velocity, angular acceleration, and rotational dynamics. • **Rotational Kinematics**: Concepts and equations governing the motion of rotating objects. • **Preparatory Week Before the Final Exam**: Review sessions and problem-solving workshops to prepare for final assessments.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**Interactive Lectures** **Hands-on Experiments and Simulations** **Problem-Based Learning (PBL)** **Exercises and Group Discussions** **Homework Review and Feedback** **Technology-Enhanced Learning** **Assessment and Reflection**

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	50	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	25	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #5, #6

Formative assessment	**Assignments**	2	10% (10)	2 and 12	LO #3, #4 and #5, #6
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #3, #5
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO#1,7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Scope of Physics I, Units, Physical Quantities and Vectors
Week 2	Units and conversions, Uncertainty and Significant Figures
Week 3	Linear Motion
Week 4	compute 2-D and 3-D Motion
Week 5	Newton's Law
Week 6	Applications of Newton's Law
Week 7	Review and solutions of the homework
Week 8	Work and Kinetic Energy
Week 9	Work and Kinetic Energy
Week 10	calculation of the Potential Energy and Conservation of Energy
Week 11	calculation of the Momentum, Impulse and Collisions
Week 12	calculation of the Rotational motion of Rigid Bodies
Week 13	calculation of the Rotational motion of Rigid Bodies
Week 14	calculation of the Rotational Kinematics
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"Conceptual Physics" by Paul G. Hewitt.	Yes
Recommended Texts	"University Physics" by Young and Freedman.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

DEMOCRACY & HUMAN RIGHTS حقوق الانسان والديمقراطية					
Module Title	**Democracy and Human Rights**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**NTU 102**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	1		**Semester of Deliver**	2	
Administering Department	BEC		**College**	TEMO	
Module Leader	Abdulkareem Zuhair		**e-mail**	Abdzuhair93@uomosul.edu.iq	
Module Leader's Acad. Title	Assist Lecturer		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	15/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Increase the student's knowledge of the theoretical conceptual aspect and the historical development of human rights and democracy. • Develop the student's analytical and critical skills regarding the reality and future of human rights and democracy. • Train the student on the importance of active participation in public life, such as promoting respect for the principles of human rights and actively participating in political and cultural life. • Enable students to understand the importance of education and its role in spreading the culture of human rights and democracy in building a civilized society based on good governance, which is fundamentally characterized by faith in human rights, education on them, and active participation in governance through free and fair elections.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Human rights: Definition and objectives. • Human rights in contemporary and modern history. • Regional recognition of human rights. • Modern human rights. • Guarantees for respecting and protecting human rights at the national level. • The term democracy.

Indicative Contents
المحتويات الإرشادية
	• Human rights: Definition and objectives.
	• Human rights in ancient civilizations, especially the civilization of Mesopotamia.
	• Guarantees for respecting and protecting human rights at the international level:
	  • The role of the United Nations and its specialized agencies in providing guarantees.
	  • The role of regional organizations (Arab League, European Union, African Union, Organization of American States, ASEAN). [15 hrs]
	• The role of international and regional non-governmental organizations and public opinion in respecting and protecting human rights.
	• The term democracy: Its origin, significance, and history.
	• Democratic systems in the world / Democracy in the Third World / The challenges facing Arab countries in democratic transition. [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	35	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	15	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	20% (20)	5 and 10	LO #1, #2, and #5, #6
	Assignments	2	10% (10)	6 and 12	LO#3 and #4
	Projects / Lab.	0	0% (0)		
	Report	1	10% (10)	14	LO #5
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #3
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	حقوق الإنسان ، تعريفها ، أهدافها حقوق الإنسان في الحضارات القديمة وخصوصا حضارة وادي الرافدين
Week 2	حقوق الانسان في الشرائع السماوية مع التركيز على حقوق الانسان في الاسلام
Week 3	حقوق الإنسان في التاريخ المعاصر والحديث : الاعتراف الدولي بحقوق الإنسان منذ الحرب العالمية الأولى وعصبة الامم المتحدة
Week 4	الاعتراف الإقليمي بحقوق الإنسان : الاتفاقية الاوربية لحقوق الانسان 1950 ، الاتفاقية الامريكية لحقوق الانسان 1969 ، الميثاق الافريقي لحقوق الانسان 1981 ، الميثاق العربي لحقوق الانسان 1994
Week 5	حقوق الإنسان الحديثة : الحقائق في التنمية ، الحق في البيئة النظيفة ، الحق في التضامن ، الحق في الدين حقوق الانسان ، المنظمات الوطنية لحقوق الانسان)
Week 6	حقوق الإنسان في الدساتير العراقية بين النظرية والواقع
Week 7	Mid-term Exam+ حقوق الإنسان الاقتصادية والاجتماعية والثقافية وحقوق الانسان المدنية والسياسية
Week 8	حقوق الإنسان الحديثة : الحقائق في التنمية ، الحق في البيئة النظيفة ، الحق في التضامن ، الحق في الدين
Week 9	ضمانات احترام وحماية حقوق الإنسان على الصعيد الوطني ، الضمانات في الدستور والقوانين الضمانات في الرقابة الدستورية ، الضمانات في حرية الصحافة والرأي العام ، دور المنظمات غير الحكومية في احترام وحماية حقوق الإنسان
Week 10	ضمانات واحترام وحماية حقوق الإنسان على الصعيد الدولي : • دور الأمم المتحدة ووكالاتها المتخصصة في توفير الضمانات • دور المنظمات الإقليمية (الجامعة العربية ، الاتحاد الأوروبي ، الاتحاد الافريقي ، منظمة الدول الأمريكية ، منظمة آسيان) دور المنظمات الدولية الإقليمية غير الحكومية والرأي العام في احترام وحماية حقوق الإنسان
Week 11	مصطلح الديمقراطية ، نشأته، دلالته، تاريخ الديمقراطية.
Week 12	الإسلام والديمقراطية ومساوئ الحكم الاستبدادي .
Week 13	الانتقادات الموجهة للديمقراطية، ومحاسن النظام الديمقراطي .
Week 14	الأنظمة الديمقراطية في العالم/الديمقراطية في العالم الثالث/ المشاكل التي تواجه البلدان العربية في التحول الديمقراطي
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	حقوق الإنسان والديمقراطية للدكتور محمد عابدالجابري 2006	Yes
Recommended Texts	حقوق الإنسان والديمقراطية اعداد أ.م.د. غسان كريم مجذاب و أ.م. امجد زين العابدين طعمة للعام 2018	No

Websites	" طرق وتعليم وثقافة حقوق الانسان" ، منشور على شبكة المعلومات الدولية (الانترنت) على الموقع الالكتروني **http://ghrorg-learning.blogspot.com**

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 – 100)	**A** – Excellent	امتياز	90 – 100	Outstanding Performance
	B – Very Good	جيد جدا	80 – 89	Above average with some errors
	C – Good	جيد	70 – 79	Sound work with notable errors
	D – Satisfactory	متوسط	60 – 69	Fair but with major shortcomings
	E – Sufficient	مقبول	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية		
Module Title	**English language**	**Module Delivery**

Module Type	**Basic**	☒**Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**
Module Code	**NTU 101**	
ECTS Credits	**2**	
SWL (hr/sem)	**50**	

Module Level	1	**Semester of Deliver**	1
Administering Department	PM	**College**	TEMO
Module Leader	Sundus Falah Mohammed	**e-mail**	sundus.falah@ntu.edu.iq
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	M. Linguistics and English Language Teaching
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	15/10/2024	**Version Number**	2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• To develop problem solving skills mainly speaking, reading, writing and listening skills and to understand the English language as a foreign language through the application of many techniques.

	• To understand the general principles of the English language. • This course deals with the basic concepts of learning the main rules of English grammar and English vocabularies. • This is the basic subject for writing and speaking English well. • To understand how to build a correct English sentence.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• To recognize how to use the main and auxiliary verbs in addition to the possessive pronouns.. • To list the various words associated with questions and many subject pronouns. • To talk about social expressions and personal information mainly about jobs by using affirmative, negative and interrogative sentences. • To discuss how to use adjectives and their positions in the sentence. • To construct the simple present sentence by using I/ we/ you and they and to define the articles. • To describe the present simple tense with using he/ she and to discuss adverbs of frequency. • To identify the basic question words and demonstrative pronouns and their applications. • To discuss the use of there is/ are and many prepositions. • To discuss the structure of simple past sentences and various irregular verbs. • To explain the negative and interrogative structure of the simple past tense sentence in addition to the adverbs of the past tense. • To identify the use of many adverbs and the use of can/ can't in the sentence and to explain requests and offers. • To elaborate the use of like and would you like and the use of some and any in many expressions. • To discuss the use of the present continuous and the difference between present simple and present continuous sentences. • To explain the structures that are used to refer to future plants.
Indicative Contents المحتويات الإرشادية	• An introduction to the importance of English language learning and the role it plays in social communication. • An application of various tenses like present and past tenses. • Demonstrating many main concepts including (offers, requests, future plants, personal expressions and tenses).

	• Using many skills to learn English like listening, reading, writing and speaking skills, moreover; presenting different examples to elaborate any concept or structure.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in this module is associated with the communicative approach which will be applied to develop students' skills to learn English and to enable students to use English in communication, therefore, using authentic materials in the class is so necessary. This approach is important to encourage students' participation in the class and to highlight their motivation in learning English, while at the same time refining and expanding their interactions and skills to achieve at least more success.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	15% (15)	5 and 1	LO #1, #3 and #6, #13
	Assignments	2	15% (15)	2 and 12	LO #2, #4 and 7#, #11
	Projects / Lab.				
	Report	1	10% (10)	13	LO #5, #8 and #9 #10
Summative assessment	**Midterm Exam**	1hr	10% (10)	7	LO #1 - #7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Unit one: Hello Am/are/is. my/your This is with practice in work
Week 2	Unit two: Your world He/she/they, his/her Questions
Week 3	Unit three: All about you Personal information/ social expressions
Week 4	Unit four: Family and friends Possessive adjectives/ possessive 's Have/has , adjective + noun
Week 5	Unit five: The way i live Present simple l/we/you/they An/a , adjective + noun

Week 6	Unit six: Every day Present simple he/she Negatives and questions, adverbs of frequency
Week 7	Unit seven: My favorites Question words, pronouns, this/that
Week 8	Unit eight: Where l live There is/ are, prepositions
Week 9	Unit nine: Times past Was/ were born, past simple and irregular verbs
Week 10	Unit ten: We had a great time Past simple, regular and irregular Questions, negatives, ago
Week 11	Unit eleven: l can do that! Can/can't, adverbs, requests
Week 12	Unit twelve: Please and thank you I'd like, some and any Like and would like
Week 13	Unit thirteen: Here and now Present continuous Present simple and present continuous
Week 14	Unit fourteen: It's time to go! Future plans, writing email and information letter
Week 15	**Revision**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	John and liz Soar. (New Headway Beginner) 4th edition. Oxford: Oxford University Press.	Yes

Recommended Texts		No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**Building Materials**			**Module Delivery**	
Module Type	Core			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	BCE 106				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	1 1		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	Waseem T. Mohammed		**e-mail**	Waseem.thabit@ntu.edu.iq	
Module Leader's Acad. Title	Assistant Lecturer		**Module Leader's Qualification**	Master degree	
Module Tutor	Waseem T. Mohammed		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The course provides teaching students the properties of construction materials, their standard specifications, & their related standard tests.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Understanding the characteristics of different building materials. • The ability of utilizing the proper building material according to the type of structure. • Understanding the installation methods of building materials. • Understanding the standards specification of building materials.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Enable students to identify the physical and mechanical properties of the common building materials. • Improving the student ability of selecting the suitable material that qualifies the requirements of the desired work. • Enabling the students to work as a laboratory field tester. • Improving the students' skills enabling the establishment of a career based on the academic knowledge. **Total Hours = 149 (Time table hrs x 15 weeks)**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture method using a whiteboard and a data show. • Forming working groups during the laboratory sessions to conduct the desired tests. • Preparation of seminars by students under the supervision of their lecturer. • Giving students assignments (H.W) to evaluate the students benefit from the lesson. • Conducting a scientific technical visit to an under construction visit • Forming groups to conduct a project during the course. Attending online (web-based) sessions.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	83	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	6	10% (10)	2 and 13	LO #1 - #2, LO #3 - #4,
	Assignments	6	10% (10)	2 and 13	LO #1 - #2, LO #3 - #4,
	Seminar	3	10% (10)	2 and 13	LO #2 - #3, LO #4 -
	Report	4	10% (10)	2 and 13	LO #1 - #3, LO #4 -
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	• Demonstrates knowledge of the Water proofing materials:
Week 2	• Classification, (Liquid, Rigid & semi-rigid water proofing materials), Types & uses.
Week 3	• Demonstrates knowledge of the Polymers: Definition, Classification, Chemical composition, Uses.
Week 4	• Demonstrates knowledge of the Epoxy: Definition, Properties, Types & uses.
Week 5	• Demonstrates knowledge of the Steel: Composition & classification, Properties, Uses & standard tests.
Week 6	• Demonstrates knowledge of the Metallic materials (nonferrous): Classification & use.

Week 7	• Demonstrates knowledge of the Timber (wood): Classification, Properties, Seasoning, Types of defect • Conducts Standard tests
Week 8	• Demonstrates knowledge of the Insulating materials: Types, Properties.
Week 9	• Demonstrates knowledge of the Acoustical materials: Types, Properties.
Week 10	• Demonstrates knowledge of the Protective coating (paints): Composition, Types
Week 11	• Demonstrates knowledge of the Glass: Classification, Properties, and Uses.
Week 12	Demonstrates knowledge of the Bituminous materials
Week 13	• (Asphalt): Sources & type, Chemical composition, Properties, Uses & conducts tests.
Week 14	• Demonstrates knowledge of the Types, Properties of flooring materials (Tiles & concrete flags)
Week 15	• Demonstrates knowledge of the Plastics: Properties & classification.
Week 16	• Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Identifies and reads Standard specification for glass.
Week 2	Carries out Bituminous materials (Asphalt) tests: Softening point
Week 3	Bituminous materials (Asphalt) tests: Penetration
Week 4	Bituminous materials (Asphalt) tests: Flash point
Week 5	Bituminous materials (Asphalt) tests: RTFO
Week 6	Bituminous materials (Asphalt) tests: Ductility
Week 7	Asphalt mix tests: ITS

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Construction materials their nature and behavior	No
Recommended Texts	A textbook of building construction	No

Websites	• www.buildforless.co.uk

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية			
Module Title	**Surveying 1**	**Module Delivery**	
Module Type	**Core**	☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BCE 107**		
ECTS Credits	**5**		
SWL (hr/sem)	**125**		
Module Level	1 1	**Semester of Delivery**	2
Administering Department	BCE	**College**	TEMO
Module Leader	Dr. Mohammed Adnan Basher	**e-mail**	E-mail

Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	Dr. Mohammed Adnan Basher	**e-mail**	mbasher@ntu.edu.iq
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	14/10/2024	**Version Number**	2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Understanding how to determine level of points, horizontal distances, and elevations of points. • Familiarity with surveying instruments related to the practical aspect. • Understanding how to draw contour map. • Understanding how to sketch cross sections and profiles of construction. • Understanding the mathematical methods of cut and fill volumes.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Recognize how to use tools in measurement of leveling. • List the various method in measurement. • Summarize what is slope areas and how to level that area. • Discuss the errors through the leveling. • Describe the environmental effects on leveling. • Define the method to draw contour lines. • Discuss the theory of fixing traverses using contour maps. • Define profiles and cross sections of construction. • Explain the mathematical formula to determine volumes using contour maps. • Identify the methods to determine volumes of cut and fill.

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to leveling – Local and global levels, leveling tools. [SSWL=5 hrs] Leveling skills in field – Types of Benchmarks, length Measure by level, procedure of Leveling, leveling Table. [SSWL=10 hrs] Leveling skills in field – Error adjustment, obstacles in field, leveling of slopes, close leveling. [SSWL=10 hrs] Contour maps – Contour lines, traverse fixing on contour maps, volume using contour maps. [SSWL=10 hrs] Profiles and cross sections – Types of profiles and cross sections, drawing of profiles and cross sections, leveling in profiles and cross sectionss [SSWL=15 hrs] Cut and fill calculation – Cut and fill on level, engineering application of cut and fill, cut and fill using contour maps, volume formula [SSWL=15 hrs] Volumes of cut and fill – End area method, Prismoidal Method [SSWL=10 hrs] Total hrs = 75 = SSWL - (Exam hrs) = 79 - 4 = 75 hr (Time table hrs x 15 weeks)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**Teaching and Learning Strategies:** • **Active Learning:** Hands-on field exercises and group problem-solving. • **Experiential Learning:** Real-life site visits and case studies. • **Problem-Based Learning:** Real-world engineering problems and solution development. • **Technology-Enhanced Learning:** Use of software and virtual simulations. • **Collaborative Learning:** Team-based projects and peer discussions. • **Inquiry-Based Learning:** Encouraging questions, hypothesis testing, and experiments.

	• **Assessment and Feedback:** Quizzes, presentations, and constructive feedback on practical work.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	83	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to leveling
Week 2	Types of benchmarks
Week 3	Measurement of horizontal distance by level
Week 4	Error adjustment of level
Week 5	Leveling in slope area
Week 6	Contour lines
Week 7	Area of traverse using contour map
Week 8	Profiles of construction
Week 9	Cross sections of construction
Week 10	Area of cross section
Week 11	Cut and fill on level
Week 12	Cut and fill using contour maps
Week 13	Volume of cut and fill
Week 14	End area method
Week 15	Prismoidal Method
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to leveling
Week 2	Lab 2: Fix the leveling instrument
Week 3	Lab 3: Leveling in field
Week 4	Lab 4: Contour lines
Week 5	Lab 5: Contour maps
Week 6	Lab 6: Profiles and cross sections
Week 7	Lab 7: Volume of cut and fill

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	N N Basak (2014). Surveying and Levelling. McGraw Hill Education. p. 542. ISBN 9789332901537	No
Recommended Texts	Brinker, Russell C; Minnick, Roy, eds. (1995). The Surveying Handbook. ISBN 978-1-4613-5858-9	No
Websites	https://www.youtube.com/watch?v=qgwBOVUFDAQ	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information
معلومات المادة الدراسية

Module Title	**Engineering Geology**		**Module Delivery**	
Module Type	**Support**		☒ **Theory** ☒ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BCE108**			
ECTS Credits	**3**			
SWL (hr/sem)	**75**			
Module Level	1 1	**Semester of Delivery**	2	
Administering Department	BCE	**College**	TEMO	
Module Leader	Name Enas Hisham Mohammed	**e-mail**	E-mail	
Module Leader's Acad. Title	Assistant lecturer	**Module Leader's Qualification**	Msc.	
Module Tutor	Name Enas Hisham Mohammed	**e-mail**	E-mail:enas.alhayali@ntu.edu.iq	
Peer Reviewer Name		**e-mail**		
Scientific Committee Approval Date	14/10/2024	**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Understanding geological phenomena: providing students with a comprehensive knowledge of various geological processes that affect the environment, such as erosion, weathering, earthquakes, landslides, and others. • Geological risk assessment: enabling students to identify and evaluate potential geological hazards at engineering project sites, such as landslides, groundwater seepage, and earthquake effects. • Selection of suitable sites: help students to choose the most suitable sites for engineering projects, taking into account geological factors that may affect the performance of these projects.

	• Design of engineering facilities: provide students with the necessary knowledge to design engineering facilities so that they are able to withstand changing geological conditions.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Geological processes: understanding the various geological processes that shape the Earth's surface and affect infrastructure, such as erosion, weathering, earthquakes, and landslides. • Properties of soils and rocks: knowledge of the physical and mechanical properties of soils and rocks, and how these properties affect the behavior of soils and rocks under loads. • Geotechnical hydrology: understanding the behavior of groundwater in soils and rocks, and its impact on the stability of engineering facilities. Geological maps: the ability to read and analyze geological maps and extract geological information from them. • Geotechnical investigations: understand the different methods used in geotechnical investigations, such as drilling, Soundar, and soil tests.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Geological **Processes:** • Weathering and erosion • Mass movements (landslides, rockfalls) • Earthquakes and seismic hazards • Volcanic activity • Fluvial and coastal processes • **Geotechnical Properties of Soils and Rocks:** • Soil classification (e.g., Unified Soil Classification System) • Soil properties (e.g., permeability, compressibility, shear strength) • Rock properties (e.g., strength, durability, weathering susceptibility) • In-situ testing (e.g., standard penetration test, cone penetration test) • Laboratory testing (e.g., particle size analysis, Atterberg limits) • **Groundwater:** • Hydrogeology (occurrence, movement, and quality of groundwater) • Well drilling and testing • Groundwater contamination and remediation • Groundwater-related hazards (e.g., subsidence, liquefaction) • **Site Investigation and Exploration:** • Geological mapping and remote sensing • Geophysical surveys (e.g., seismic, electrical resistivity) • Drilling and sampling techniques • Borehole logging and interpretation • **Foundation Engineering:** • Shallow foundations (e.g., footings, slabs) • Deep foundations (e.g., piles, caissons)

	• Settlement analysis • Bearing capacity evaluation • **Slope Stability:** • Stability analysis (e.g., limit equilibrium methods) • Slope stabilization techniques (e.g., retaining walls, buttresses) • Landslide hazard assessment and mitigation • **Geotechnical Hazards and Risk Assessment:** • Earthquake engineering • Liquefaction • Slope instability • Subsidence • Karst hazards • Coastal erosion • **Environmental Geotechnics:** • Contaminated sites • Waste disposal • Remediation techniques • Sustainability in geotechnical engineering • **Computational Geotechnics:** • Numerical modeling (e.g., finite element analysis, finite difference method) • Computer-aided design and analysis

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	54	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	21	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	6	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	5	10% (10)	2 and 12	LO #3, #4
	Projects / Lab.	0	10% (10)	Continuous	All
	Report	6	10% (10)	13	LO #1, #3
Summative assessment	**Midterm Exam**	1hr	10% (10)	7	LO #1 - #4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Geological processes of internal and external origin.
Week 2	Absolute and relative age of rocks
Week 3	Geological activities of wind and Eolian deposits
Week 4	Sheet erosion, Gullies and Geological work of rivers
Week 5	Glaciers, Glacial till and fluvioglacial

Week 6	limbo glacial deposits
Week 7	Determination of the coefficient of permeability
Week 8	Man-made geological process
Week 9	Fluvioglacial ,marine erosion and faulting
Week 10	Inflow to foundation pits ,limbo glacial deposits
Week 11	Water aggressiveness and Groundwater regime
Week 12	Aquicludes, Groundwater ,capillary fringe and perched water
Week 13	Origin of subsurface water
Week 14	Swamps, Peat depositions
Week 15	marine erosion ,Longshore drift
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	There is no practical material
Week 2	There is no practical material
Week 3	There is no practical material
Week 4	There is no practical material
Week 5	There is no practical material
Week 6	There is no practical material
Week 7	There is no practical material

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Engineering book by F. G. Bell	No
Recommended Texts	Engineering geology principles and practice by M. H. de Freitas	No
Websites	https://www.sciencedirect.com/journal/engineering-geology	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية		
Module Title	**ENGINEERING MECHANICS (DYNAMICS)**	**Module Delivery**
Module Type	**Core**	**☒Theory**

Module Code	**BCE 109**			☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**
ECTS Credits	**6**			
SWL (hr/sem)	**150**			
Module Level	1 1	**Semester of Delivery**	2	
Administering Department	BCE	**College**	TEMO	
Module Leader	Mohammed Hatim	**e-mail**		
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.	
Module Tutor	Mohammed Hatim	**e-mail**		
Peer Reviewer Name		**e-mail**		
Scientific Committee Approval Date	14/10/2024	**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Understanding Kinematics of Particles and Rigid Bodies: • Analyze the motion of particles and rigid bodies in various coordinate systems (rectilinear, curvilinear, polar, etc.). • Solve problems involving velocity and acceleration in different dimensions. • Applying Newton's Second Law of Motion: • Develop the ability to apply Newton's second law to analyze forces and motion in dynamic systems. • Understand the relationship between forces and acceleration in different mechanical systems.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Comprehend and Analyze Kinematics of Particles and Rigid Bodies: • Demonstrate an understanding of the kinematics of particles and rigid bodies in various coordinate systems (rectilinear, curvilinear, etc.). • Accurately calculate displacement, velocity, and acceleration in both 2D and 3D motion. • Apply Newton's Laws to Dynamic Systems: • Effectively apply Newton's second law to analyze forces, accelerations, and motion in both translational and rotational systems. • Solve problems involving the dynamic equilibrium of particles and rigid bodies under the influence of external forces.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Preliminary & Further Study, Assignment (Homework) group Work, Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	76	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	74	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
	Quizzes	8		5 and 10	LO #1- #4

Formative assessment	**Assignments**	8		2 and 12	LO #2, #3
Summative assessment	**Midterm Exam**	2hr		7	LO #2, #3
	Final Exam	3hr		16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1,2,3	• Demonstrates knowledge and conducts the frames Analysis (method of members)
4,5	• Demonstrates knowledge Friction, Theory of friction, Types of friction, Wedges, Applications • Computes Angle of friction
6,7,8	• Computes Centroids of areas & lines, Centroids by integration, Centroids of composite areas, Applications.
9	• Computes Moment of inertia , Polar moment of inertia , Radius of gyration , Transfer formula for moment of inertia , Moment of inertia for composite areas , Product of inertia , Moment of inertia with respect to inclined axes , Mohr` circle for moment of inertia .
10,11	• Demonstrates knowledge of the Principles of dynamics, Kinematics & kinetics, Motion of a particle, • Able to apply Fundamental Equations of kinetics for a particle, Effective force on a particle.
12,13	• Demonstrates knowledge of the Rectilinear translation, Rectilinear motion with constant acceleration, Free falling bodies.
14,15	• Demonstrates knowledge of the Kinetics of rectilinear translation (Analysis as a particle), Dynamic Equilibrium in translation (Analysis as a rigid body).

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes

Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	C - Good	جيد	70 – 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 – 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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Module Information معلومات المادة الدراسية					
Module Title	Calculas1			**Module Delivery**	
Module Type	Core			☐**theory** ☐**Lecture** ☒ **Lab** ☒ **Tutorial** ☐**Practical** ☒ **Seminar**	
Module Code	**BCE110**				
ECTS Credits	**6**				
SWL (hr/sem)					
Module Level	1 1		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	Raghad zidan		**e-mail**	Raghad.zidan@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Lecturer		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**		
Peer Reviewer Name	Name		**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Enhance students' ability to think logically and solve mathematical problems methodically, and apply these skills to engineering problems.

	• Provide a strong foundation in basic mathematical concepts such as calculus, algebra, and analytical geometry, helping in understanding other engineering courses. • Enable students to use mathematical tools to analyze and solve engineering problems, including structural system design and material calculations. • Improve students' ability to use mathematics for drafting engineering diagrams and analyzing geometric shapes.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. • A Cognitive objectives: • Understanding basic mathematical concepts. • Analyze mathematical and engineering problems. • Apply mathematics in practical contexts. • Understand mathematical and engineering relationships. • Develop logical thinking. • Recognize advanced mathematical applications. • Understand the role of mathematics in improving engineering designs. • Ability to interpret engineering data.. • B. Skills-Based Objectives: • Apply mathematical skills to solve engineering problems. • Use mathematical and engineering software. • Perform accurate engineering calculations. • Critical and analytical thinking. • Practical application of algebra and geometry concepts.

Indicative Contents
المحتويات الإرشادية
	Indicative content includes the following.
	
	The course covers a broad range of mathematical topics essential for engineering students, focusing on developing their mathematical reasoning, problem-solving skills, and the application of these concepts to engineering problems. Below is a breakdown of the main topics:
	
	• **Limits and Continuity (4 hours)**
	  • Understanding the concept of limits
	  • Evaluating limits algebraically
	  • Continuity and discontinuities in functions
	  • Real-world applications of limits in engineering
	• **Differentiation (4 hours)**
	  • Concept of differentiation and rates of change
	  • Basic rules of differentiation (product rule, quotient rule, chain rule)

- Applications of differentiation in engineering, including velocity and acceleration
- **Derivatives of Functions (4 hours)**
  - Differentiation of polynomial, trigonometric, exponential, and logarithmic functions
  - Higher-order derivatives
  - Engineering applications of derivatives, including optimization problems
- **Integration (4 hours)**
  - Fundamental theorem of calculus
  - Indefinite and definite integrals
  - Basic techniques of integration (substitution, integration by parts)
  - Applications of integration in calculating areas and volumes
- **Integration of Trigonometric Functions (4 hours)**
  - Integrating sine, cosine, tangent functions
  - Applications of trigonometric integrals in wave motion and electrical engineering
- **Integration of Inverse Trigonometric Functions (4 hours)**
  - Derivation and integration of inverse trigonometric functions
  - Solving problems involving inverse trigonometric functions
- **Integration of Exponential and Logarithmic Functions (4 hours)**
  - Integration of exponential and logarithmic functions
  - Applications of these integrals in growth models and decay processes
- **Applications of Integration (4 hours)**
  - Using integrals to compute areas, volumes, and lengths of curves
  - Engineering applications, including fluid mechanics and material science
- **Basic Integration Formulas (2 hours)**
  - Review of key integration formulas
  - Practice problems to solidify understanding
- **Operations on Matrices (2 hours)**
  - Matrix addition, subtraction, and multiplication
  - Practical applications in solving linear equations
- **Matrices and Determinants (4 hours)**
  - Properties of matrices and determinants
  - Solving linear systems using matrices
- **Solving Linear Systems Using the Inverse of a Matrix and Cramer's Rule (4 hours)**
  - Solving linear systems of equations using matrix inverses
  - Application of Cramer's rule in engineering problems
- **Eigenvalues and Eigenvectors (8 hours)**
  - Finding eigenvalues and eigenvectors
  - Applications in structural analysis and mechanical systems

	Throughout the course, emphasis is placed on practical applications of the mathematical concepts in real-world engineering scenarios. The course also includes frequent problem-solving exercises, practical examples, and theoretical discussions to help students understand the significance of these mathematical tools in engineering contexts.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Explanation using various modern presentation tools. Lecture method and use of interactive whiteboard. Forming discussion groups during lectures. Thinking questions such as what, how, when, and why. Homework assignments that require self-explanations in causal ways.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	74	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	76	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	0	10% (10)	Continuous	All
	Report	0	10% (10)	13	LO #5, #8 and #10

Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	limit and Continuity
Week 2	Differentiation
Week 3	Derivatives of Functions
Week 4	Derivatives of all Functions
Week 5	Integration
Week 6	Integration of Trigonometric Functions
Week 7	Integration of Inverse Trigonometric Functions
Week 8	Integration of Exponential and Logarithmic Functions
Week 9	Applications of Integration
Week 10	Basic Integration Formulas
Week 11	Operations on Matrices
Week 12	Matrices
Week 13	Solving Linear Systems Using the Inverse of a Matrix and Cramer's Rule
Week 14	Eigenvalues and Eigenvectors
Week 15	Eigenvalues and Eigenvectors
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**

Required Texts	Calculus I, Paul Dawkins, 2007	Yes
Recommended Texts	.	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** – Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D – Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E – Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information
معلومات المادة الدراسية

Module Title	**Computer**		**Module Delivery**	
Module Type	**Core**		☐ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**NTU 102**			
ECTS Credits	**3**			
SWL (hr/sem)	**50**			
Module Level	1 1	**Semester of Delivery**	2	
Administering Department	BCE	**College**	TEMO	
Module Leader	Ekhlas N. Alansari	**e-mail**		
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	Master	
Module Tutor		**e-mail**	ekhlasmohammed@ntu.edu.iq	
Peer Reviewer Name		**e-mail**		
Scientific Committee Approval Date	12/10/2024	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Teaching computer principles in civil engineering equips students with the ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

	• Computer principles aid in applying engineering design to produce solutions that meet specified needs with consideration of various factors such as public health, safety, welfare, and environmental impacts. • Learning computer principles helps students effectively communicate with diverse audiences, a vital skill for successful engineering professionals. • Teaching computer principles encourages graduates to engage in lifelong learning through professional training, independent inquiry, and acquiring new knowledge as needed to meet career goals and contribute creative ideas to their profession • Computer education in civil engineering emphasizes recognizing ethical and professional responsibilities in engineering situations, fostering informed judgments considering global, economic,.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Understanding computer hardware components and their functions. • Windows: Proficiency in using the Windows operating system • The student will be able to use the word program such as creating tables in and inserting images into diagrams • The student will be able to use the EXCEL program such as writing functions, preparing tables and inserting charts • The student will be able to create a presentation that includes a number of Slides, using images, tables, diagrams, changing colors Influences • The student will get acquainted with the global network (the internet) and deal with it ,Search and create email
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A - Computer fundamentals</u> Definition of computer- Parts of computer- Devices related to computer, Software and hardware, Windows- Able to use the following items: Start menu, desktop, taskbar , mouse applications, My computer , My documents , drivers , folders , files , cut , copy <u>Part B -Microsoft Word</u> Introduction to Microsoft Word and the Interface, Text Formatting and Tables , Page Layout and References <u>Part C- Excel Microsoft</u> Excel Fundamentals and Data Entry, Formulas and Functions, Charts and Data Analysis <u>Part D -PowerPoint Microsoft</u> Introduction to PowerPoint and Basic Features, Enhancing Your Presentations , Advanced Techniques and Best Practices <u>Part E –Internet</u>

	Introduction to the World of the Internet, Search Engines, Create an email account

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture: Introduce new concepts and demonstrate techniques. Hands-on Activities: Provide guided practice for students to apply what they've learned. Group Work: Encourage collaboration and problem-solving through group activities. Q&A: Facilitate discussion and address student questions

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	39	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	11	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #6
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6
	Class work	8	10% (10)	Continuous	All
	seminar	2	10% (10)	6 and 11	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري والعملي	
	Material Covered
Week 1	Computer fundamentals / Definition of computer- Parts of computer- Devices related to computer
Week 2	Computer fundamentals/ Software and hardware
Week 3	Computer fundamentals/ Windows- Able to use the following items: Start menu, desktop, taskbar , mouse applications, My computer , My documents , drivers , folders , files , cut , copy , ...
Week 4	Microsoft Word / Introduction to Microsoft Word and the Interface
Week 5	Microsoft Word/ Text Formatting and Tables
Week 6	Microsoft Word/ Page Layout and References
Week 7	Excel Microsoft / Excel Fundamentals and Data Entry
Week 8	Excel Microsoft / Formulas and Functions
Week 9	Excel Microsoft/ Charts and Data Analysis
Week 10	PowerPoint Microsoft / Introduction to PowerPoint and Basic Features
Week 11	PowerPoint Microsoft /Enhancing Your Presentations
Week 12	PowerPoint Microsoft / Advanced Techniques and Best Practices
Week 13	Internet/Introduction to the World of the Internet
Week 14	Internet/ Search Engines
Week 15	Internet/ Create an email account
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Computer fundamentals / Definition of computer- Parts of computer- Devices related to computer
Week 2	Computer fundamentals/ Software and hardware

Week 3	Computer fundamentals/ Windows- Able to use the following items: Start menu, desktop, taskbar , mouse applications, My computer , My documents , drivers , folders , files , cut , copy , ...
Week 4	Microsoft Word / Introduction to Microsoft Word and the Interface
Week 5	Microsoft Word/ Text Formatting and Tables
Week 6	Microsoft Word/ Page Layout and References
Week 7	Excel Microsoft / Excel Fundamentals and Data Entry
Week 8	Excel Microsoft / Formulas and Functions
Week 9	Excel Microsoft/ Charts and Data Analysis
Week 10	PowerPoint Microsoft / Introduction to PowerPoint and Basic Features
Week 11	PowerPoint Microsoft /Enhancing Your Presentations
Week 12	PowerPoint Microsoft / Advanced Techniques and Best Practices
Week 13	Internet/Introduction to the World of the Internet
Week 14	Internet/ Search Engines
Week 15	Internet/ Create an email account
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Principles of Computer Security, Fourth Edition 4th Edition	Yes
Recommended Texts		
Websites	• Microsoft Learn: https://www.google.com/url?sa=E&source=gmail&q=https://learn.microsoft.com/ • Office Support: https://www.google.com/url?sa=E&source=gmail&q=https://support.microsoft.com/office • Official Microsoft Channel https://www.youtube.com/microsoft	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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Module Information					
Module Title	Arabic Language			Module Delivery	
Module Type	Basic			☒ Theory ☐ Lecture ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	NTU 103				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	1		Semester of Deliver	2	
Administering Department	BCE		College	TEMO	
Module Leader	Shaimaa Salem Hameed		e-mail	@ntu.edu.iq	
Module Leader's Acad. Title	Assist Lect.		Module Leader's Qualification	M.Sc.	
Module Tutor			e-mail		
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date	01/06/2023		Version Number	1.0	

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	• Enhancing effective communication: Teaching Arabic aims to enable students to communicate effectively in the Arab environment, both in daily life and in academic and professional contexts. • Understanding Arab culture: Learning Arabic is a key to understanding Arab culture and its values, helping students to explore the rich Arab heritage and comprehend the cultural diversity within the Arab world. • Enhancing research and academic skills: Learning Arabic contributes to developing research and academic writing skills for students, enabling them to actively participate in academic discussions and contribute to knowledge production. • Providing job opportunities: Proficiency in Arabic is a valuable skill in the job market, allowing students to .
Module Learning Outcomes	• Effective communication skills: Students acquire listening, speaking, reading, and writing skills in Arabic, enabling them to communicate fluently and understand content accurately. • Understanding texts and culture: Students learn to read and comprehend literary and cultural texts in Arabic, enhancing their understanding of Arab heritage and developing critical analysis of literary works. • Research and academic writing abilities: Students learn how to conduct research and engage in academic writing in Arabic, enabling them to present research papers and academic reports effectively. • Cultural and social interaction: Students are able to actively participate in the Arab community, gaining a deeper understanding of local traditions, values, and customs, fostering cultural understanding and peaceful coexistence.
Indicative Contents	• Introduction to Indicative Contents: Defining indicative contents and understanding their significance in various fields and disciplines. • Types and Formats of Indicative Contents: Exploring different types and formats of indicative contents, such as tables, charts, bullet points, and summaries. • Creating Indicative Contents: Techniques and strategies for effectively creating indicative contents, including selecting key information, simplifying complex concepts, and organizing content for easy comprehension. • Visual Representation of Indicative Contents: Utilizing visual aids, such as infographics, diagrams, and illustrations, to present indicative contents in an engaging and informative manner. • Examples and Case Studies: Analyzing real-life examples and case studies to understand how indicative contents are used in various contexts, such as research reports, marketing materials, and educational resources.

Learning and Teaching Strategies	
Strategies	• Interactive Language Activities: Engaging students in interactive activities such as role-plays, group discussions, and language games to practice and reinforce language skills. • Communicative Approach: Emphasizing real-life communication and providing opportunities for students to actively engage in speaking, listening, reading, and writing tasks to develop their language proficiency. • Authentic Materials: Incorporating authentic materials such as newspaper articles, songs, videos, and literature to expose students to real-world language usage and cultural contexts

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**35**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**2**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**15**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**1**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**4**	**30% (30)**	**3,6,10 and 14**	**LO #1, #2 , #3, and #4**
	Assignments	**2**	**10% (10)**	**4 and 12**	**LO #1and #4**
	Projects / Lab.		**0% (0)**	**0**	**0**
	Report		**0% (0)**	**0**	**0**
Summative assessment	**Midterm Exam**	**1hr.**	**10% (10)**	**7**	**LO #1 - #2**
	Final Exam	**2hr.**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus)		
	Material Covered	
Week 1	مقدمة عن الأخطاء اللغوية	Introduction to Language Errors:
Week 2	–التاء المربوطة والتاء المفتوحة	• Taa Marbuta and Taa Marbuta (Bound and Open Taa): Understanding the rules and usage of the Taa Marbuta and Open Taa in Arabic language.
Week 3	همزة الوصل والقطع	• Hamzat Al-Wasl and Al-Qat' (Hamza of Connection and Hamza of Disconnection): Differentiating between Hamzat Al-Wasl and Al-Qat' and their respective roles in pronunciation.
Week 4	الهمزة المتوسطة والمتطرفة	• Alif Al-Maddooda and Alif Al-Muqassara Writing Rules: Exploring the rules for writing Alif Al-Maddooda (elongated Alif) and Alif Al-Muqassara (shortened Alif).
Week 5	قواعد كتابة الالف الممدودة والمقصورة –	• Solar and Lunar Letters: Identifying the distinction between solar and lunar letters in Arabic pronunciation.
Week 6	الحروف الشمسية والقمرية	• Adad (Numbers): Learning about the numerical system in Arabic and its usage.
Week 7	الضاد والظاء	• Verbs: Understanding verb conjugation and the different verb forms in Arabic.
Week 8	العـــدد	• Parts of Speech: Exploring the different parts of speech, including nouns, verbs, adjectives, adverbs, etc.
Week 9	المفاعيل	• Meanings of Prepositions: Examining the meanings and usage of prepositions in Arabic.
Week 10	أقسام الكلام	• Common Language Errors: Analyzing common language errors and their applications in practical contexts.
Week 11	معاني حروف الجر	• Noon and Tanween: Understanding the usage and pronunciation of Noon and Tanween in Arabic.
Week 12	تطبيقات الأخطاء اللغوية الشائعة	• Taa Marbuta and Taa Marbuta (Bound and Open Taa): Understanding the rules and usage of the Taa Marbuta and Open Taa in Arabic language.
Week 13	النون والتنوين -	• Hamzat Al-Wasl and Al-Qat' (Hamza of Connection and Hamza of Disconnection): Differentiating between Hamzat Al-Wasl and Al-Qat' and their respective roles in pronunciation.
Week 14	مقدمة عن الأخطاء اللغوية	• Alif Al-Maddooda and Alif Al-Muqassara Writing Rules: Exploring the rules for writing Alif Al-Maddooda (elongated Alif) and Alif Al-Muqassara (shortened Alif).
Week 15	الأخطاء اللغوية	• Solar and Lunar Letters: Identifying the distinction between solar and lunar letters in Arabic pronunciation.
Week 16	Preparatory week before the final Exam	

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	• "الكافية" للكندي: يعتبر من أهم الكتب في علم النحو، حيث يشرح القواعد والتراكيب النحوية بأسلوب مبسط وشامل. • "الصرف" لابن مالك: كتاب مشهور يتناول قواعد تصريف الأفعال والأسماء في اللغة العربية، ويعد من أعمال النحو الكلاسيكية. • "المفصل في علم العربية" لابن جني: كتاب شامل يغطي مجموعة واسعة من موضوعات النحو والصرف والبلاغة والأدب	**Yes**
Recommended Texts	• "الألفية" لابن مالك: كتاب مشهور في علم النحو والصرف، يعتبر من أهم المراجع الكلاسيكية في دراسة اللغة العربية. • "المستطرف في كل فن مستظرف" لابن الأنباري: كتاب يشمل العديد من الألفاظ والتعابير العربية المستخدمة في الأدب والشعر. • "البيان والتبيين" لابن حجر العسقلاني: كتاب يتناول موضوعات النحو والصرف والبلاغة، ويعتبر مرجعًا قيمًا في دراسة اللغة العربية.	**No**
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	Concrete Technology I			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**BCE 201**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	2		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	
Module Leader	Eethar Thanon Dawood		**e-mail**	eethardawood@nth.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	By the end of this component, students will be able to: • Understand the historical development and basic composition of concrete. • Identify and describe the functions of concrete constituents including cement, aggregates, water, and admixtures. • Demonstrate understanding of the chemistry and manufacturing process of Portland cement and other types. • Classify various types of cement and explain their appropriate applications. • Evaluate aggregate properties through theoretical understanding and practical analysis. • Assess the role and classification of chemical and mineral admixtures used in concrete. • Understand the effects of material properties on concrete performance and durability.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completing this component, students will be able to: 1. Explain the history, composition, and general properties of ordinary concrete. 2. Describe the manufacturing process, chemical components, and physical behavior of Portland cement. 3. Identify different types of cement and match them with their functional uses. 4. Analyze the properties and types of aggregates and their influence on concrete performance. 5. Perform practical tests on aggregates, including grading and moisture content analysis. 6. Explain the role of water in mixing and curing, and its quality considerations. 7. Identify and describe the functions of various admixtures, including pozzolanic materials and water-proofing agents.
Indicative Contents المحتويات الإرشادية	The course content should be structured as follows: • Overview of concrete history, composition, and properties. • Introduction to concrete ingredients: cement, aggregates, water, admixtures. • Functions of paste and aggregates in concrete. • Portland cement: chemical composition, hydration reactions, manufacturing, and properties. • Classification of cements: OPC, modified, rapid-hardening, low-heat, sulfate-resisting, pozzolanic, slag, fly ash, aluminous, white, hydrophobic, waterproof, etc.

	• Aggregate properties: shape, texture, specific gravity, porosity, absorption, moisture. • Grading and sieve analysis; fineness modulus; gap grading. • Harmful substances in aggregates and reactions (alkali-silica, alkali-carbonate). • Storage and handling of aggregates. • Water for mixing and curing: quality and standards. • Admixtures: purpose and types (chemical, mineral, pozzolanic, water reducers, accelerators, retarders, plasticizers, curing agents, etc.).

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	To achieve the intended learning outcomes for this unit, the following strategies will be used: • **Theoretical Lectures**: Core knowledge about cement chemistry, aggregate properties, and admixtures will be delivered using structured lectures supported with diagrams and animations. • **Laboratory Exercises**: Students will conduct standard experiments such as sieve analysis, aggregate moisture determination, and cement fineness testing to bridge theory with practice. • **Material Samples and Demonstrations**: Real samples of different types of cement, aggregates, and admixtures will be used in class demonstrations to deepen material familiarity. • **Case-Based Learning**: Industry-relevant cases involving cement selection, aggregate compatibility, and admixture choice will be used to develop problem-solving skills. • **Conceptual Mapping and Charts**: Visual tools will be integrated to help students map material relationships and their impact on concrete performance. • **Formative Assessments and Discussions**: Weekly quizzes and peer-discussion sessions will reinforce core concepts and allow early feedback.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	83	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem)	**125**		

الحمل الدراسي الكلي للطالب خلال الفصل	

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and 7
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #5, #6
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #7
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Demonstrates knowledge about concrete, history of concrete, concrete ingredients, composition of concrete; functions of the paste and aggregate; general properties of ordinary concretes.
Week 2	Demonstrates knowledge about concrete – making materials – Portland Cement; basic constitutes of cement; chemical formulas and processes.
Week 3	Correctly implement manufacture of Portland cement; chemical analysis of Portland cement; major compounds in Portland cement. Identify the influence of composition upon characteristics of Portland cement.
Week 4	Correctly implement manufacture of Portland cement; chemical analysis of Portland cement; major compounds in Portland cement. Identify the influence of composition upon characteristics of Portland cement.
Week 5	Able to identify types of Portland cement: Ordinary; Modified; Rapid hardening; low heat; Sulphate resisting. Other types: High–early strength; pozzolana – cement and pozzolana; Slag cement; Blast – Furnace slag; masonry cement ; Expansive cement ; Aluminous cement ; White Portland ; Fly ash ; Anti – bacterial ; Hydrophobic cement ; Waterproof cement ; Natural cement .

Week 6	Able to identify types of Portland cement: Ordinary; Modified; Rapid hardening; low heat; Sulphate resisting. Other types: High–early strength; pozzolana – cement and pozzolana; Slag cement; Blast – Furnace slag; masonry cement ; Expansive cement ; Aluminous cement ; White Portland ; Fly ash ; Anti – bacterial ; Hydrophobic cement ; Waterproof cement ; Natural cement .
Week 7	Able to identify types of Portland cement: Ordinary; Modified; Rapid hardening; low heat; Sulphate resisting. Other types: High–early strength; pozzolana – cement and pozzolana; Slag cement; Blast – Furnace slag; masonry cement ; Expansive cement ; Aluminous cement ; White Portland ; Fly ash ; Anti – bacterial ; Hydrophobic cement ; Waterproof cement ; Natural cement .
Week 8	Demonstrates knowledge about concrete aggregates: Preliminary remarks; general characteristics; data needed for proportioning mixtures; sampling aggregate; particle shape and texture; bond of aggregates; specific gravity; unit weight and voids; porosity and absorption, moisture content
Week 9	Mid term exam
Week 10	Demonstrates knowledge about gradation; sieve analysis; maximum size of aggregates; fineness modulus.
Week 11	Correctly execute practical grading; gap – graded aggregates; oversize and undersize; all – in aggregates; bulking of sand; soundness of aggregates
Week 12	Demonstrates knowledge about Handling and storing aggregates; Deleterious substances: organic impurities; alkali – aggregates reaction; alkali – carbonate reaction; thermal properties of aggregates. Demonstrates knowledge about water and identify Mixing and Curing water on concrete
Week 13	Demonstrates knowledge about Handling and storing aggregates; Deleterious substances: organic impurities; alkali – aggregates reaction; alkali – carbonate reaction; thermal properties of aggregates. Demonstrates knowledge about water and identify Mixing and Curing water on concrete
Week 14	Demonstrates knowledge about admixtures: Admixtures, the purpose of admixtures, chemical and mineral admixtures. Accelerators: Retarders; Water – Reducing Admixture; super plasticizers; Workability admixtures; Air –entraining Admixtures; Expansion –producing Admixtures; Pozzolanic materials; Bonding admixtures; Curing aids; Water Proofers; Colouring agents ; Surface hardeners
Week 15	Demonstrates knowledge about admixtures: Admixtures, the purpose of admixtures, chemical and mineral admixtures.Accelerators: Retarders; Water – Reducing Admixture; super plasticizers; Workability admixtures; Air –entraining Admixtures; Expansion –producing Admixtures; Pozzolanic materials; Bonding admixtures; Curing aids; Water Proofers; Colouring agents ; Surface hardeners

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Measuring of consistency of cement.
Week 2	Lab 2: Measuring of fineness of cement by sieves and Blaine
Week 3	Lab 3: Measuring of setting time of cement
Week 4	Lab 4: Measuring of Soundness and specific gravity of cement.
Week 5	Lab 5: Measuring of compressive strength of cement mortar
Week 6	Lab 6: Measuring of flexural strength of cement mortar
Week 7	Lab 7: Methods of strength activity index of cementitious materials.
Week 8	Lab 8: Method of sampling for fine and coarse aggregate
Week 9	**Mid-term exam**
Week 10	Lab 10: Determination of sieve analysis for fine aggregate
Week 11	Lab 11: Determination of sieve analysis for coarse aggregate
Week 12	Lab 12: Determination of specific gravity for coarse aggregate
Week 13	Lab 13: Determination of specific gravity for fine aggregate
Week 14	Lab14: Measuring of Unit weight of fine and coarse aggregate
Week 15	Lab 15: Determination of materials finer than 0.075 mm in fine and coarse aggregate.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Properties of concrete, Nivelle, 2011	No
Recommended Texts	ASTM, Standard, 2020	Yes
Websites	https://www.astm.org/products-services/bos.html	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية		
Module Title	STRENGTH OF MATERIAL	**Module Delivery**

Module Type	Core			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**
Module Code	**BCE 202**			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	2	**Semester of Delivery**	1	
Administering Department	BCE	**College**	TEMO	
Module Leader	Majid Ali Ghahir	**e-mail**	Majid.algburi@ntu.edu.iq	
Module Leader's Acad. Title		**Module Leader's Qualification**	Ph.D.	
Module Tutor		**e-mail**	E-mail	
Peer Reviewer Name	Name	**e-mail**	E-mail	
Scientific Committee Approval Date	14/10/2024	**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Deepen understanding of fundamental principles of material strength: The course aims to enable students to understand and analyze the behavior of materials under different forces. • Develop the ability to analyze engineering systems: The course aims to enhance students' ability to analyze and design structural systems that meet strength and stiffness requirements. • Stress and Strain Analysis: The course teaches students how to calculate the stresses and strains experienced by materials due to applied forces.

	• Enhance engineering thinking: Students are trained to think logically and systematically to solve engineering problems related to material strength. • Link theoretical concepts with practical applications: The course links theoretical material strength principles with practical solutions in engineering applications
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• know the relations between externally applied loads and their internal effects on bodies (Strains, Deformations, and Stresses). • Define Stresses in Beams • Derivation of flexure formulas, Economic sections, Unsymmetrical beams, Analysis of flexure action, Formula for horizontal shear stress.. • Discuss and draw free body diagrams and moment-curvature diagrams. • Explain the concept of Beams Deflections
Indicative Contents المحتويات الإرشادية	. **1. Stresses in Beams** • **Flexure Formula Derivation** • Assumptions in beam bending theory. • Derivation of the bending stress formula • Section modulus and its significance. • **Economic Sections** • Definition and selection of efficient cross-sections for beams. • Comparison of different beam shapes based on strength and material efficiency. • **Unsymmetrical Beams** • Analysis of bending stresses in non-symmetrical sections. • Principal axes and centroid location for irregular sections. • **Analysis of Flexure Action** • Understanding the internal stress distribution in beams. • Concept of neutral axis and its effect on beam performance. • **Formula for Horizontal Shear Stress** • Derivation of shear stress equation • Shear stress distribution in different cross-sections (rectangular, I-beam, circular). **2. Beam Deflections**

- **Area-Moment Theorem**

- Fundamental principles and assumptions.
- Application to simply supported and cantilever beams.
- Calculation of maximum deflections and slopes.

- **Double Integration Method**

- General equation of the elastic curveStep-by-step solution process for various loading conditions.
- Boundary conditions and their influence on deflections.

3. Combined Stresses

- **Axial and Flexural Loads**

- Analysis of members subjected to simultaneous bending and axial forces.
- Concept of eccentric loading and its effect on stress distribution.

- **Kern of a Section**

- Definition and significance of the core of a section.
- Stability of load application within the kern.

- **Loads Applied Off the Axes of Symmetry**

- Calculation of stress distribution due to oblique loading.
- Practical implications in real structural elements.

- **Stress at a Point & Mohr's Circle**

- Calculation of normal and shear stress at a given point.
- Graphical representation using Mohr's Circle.
- Principal stresses and maximum shear stress determination.

- **Transformation of Strain Components**

- Relationship between stress and strain transformation.
- Strain compatibility equations.

4. Columns

- **Critical Loads and Stability Analysis**

- Concept of buckling and slenderness ratio.

	• Effect of boundary conditions on buckling behavior. • **Euler's Formula for Long Columns** • Derivation and application • Limitations and assumptions of Euler's theory. • **Intermediate Columns** • Differences between short, intermediate, and long columns. • Behavior of columns with moderate slenderness ratios. • **Empirical Formulas for Column Design** • Rankine-Gordon formula and its modifications. • Consideration of material and geometric imperfections.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lectures using various modern presentation tools. • Interactive whiteboard lectures. • Discussion groups during lectures to stimulate thinking and analysis. • Asking students a set of reflective questions during lectures that include words like "What," "How," "When," and "Why." • Assigning homework that requires problem-solving and reasoning

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	66	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	59	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	8		5 and 10	LO #1 - #4
	Assignments	12		2 and 12	LO #3 - #4
				Continuous	
				13	
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1&2& 3&4	**Stresses in Beams:** **Derivation of flexure formulas, Economic sections, Unsymmetrical beams, Analysis of flexure action, Formula for horizontal shear stress.**
5&6& 7&8	**Beams Deflections:** **Theorem of area-moment method, Double integration method.**
9&10& 11&12	**Combined Stresses:** **Combined axial & flexural loads, Kern of a section, Loads applied off axes of symmetry, Stress at a point, Mohr's circle , Transformation of strain components.**
13&14,15	**Columns:** **Critical loads, Long columns by Euler's formula, Intermediate columns, Empirical formulas.**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	o A. Pytel and J. Kiusalaas, Strength of Materials. Cengage Learning, 3rd ed	No
Recommended Texts	o J. M. Gere and B. J. Goodno, Mechanics of Materials. Cengage Learning, 9th ed., 2018	Yes
Websites	o Websites related to Strength of Materials	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information
معلومات المادة الدراسية

Module Title	**BUILDING CONSTRUCTION**		**Module Delivery**	
Module Type	**Core**		☒ **Theory** ☒ **Lecture** ☐**Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BCE 203			
ECTS Credits	**4**			
SWL (hr/sem)	**100**			
Module Level	2	**Semester of Delivery**	1	
Administering Department	BCE	**College**	Type College Code	
Module Leader	Hiba Abdulhafith	**e-mail**	hibaabdulhafith@ntu.edu.iq	
Module Leader's Acad. Title	Assist Lecture	**Module Leader's Qualification**	M.Sc	
Module Tutor	Hiba Abdulhafith	**e-mail**	hibaabdulhafith@ntu.edu.iq	
Peer Reviewer Name	Hiba Abdulhafith	**e-mail**	hibaabdulhafith@ntu.edu.iq	
Scientific Committee Approval Date	14/10/2024	**Version Number**	2.0	

Relation with other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	• Know how to conduct field and laboratory soil tests • Knowing the types of foundations and how to create them • Learn about the methods of building walls and how to create them • Identify the types of thermal and sound insulators used in buildings • Identify the types of slip form and methods of creating them

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	To understand: • Equip learners with skills in site preparation and site testing. • Introduce learners to the types of foundations used in building construction and specify the application of each type. • Familiarize learners with the types and methods of building construction, as well as the types of structural systems used and their components. • Introduce learners to the formwork used in the execution and construction of buildings. • -Educate learners on thermal and acoustic insulation methods for buildings by identifying types of insulation and their applications
Indicative Contents المحتويات الإرشادية	**1. Introduction to Building Construction** • Definition of building construction concepts. • Importance of planning and design in construction. **2. Types of Foundations** • Shallow foundations: types and applications. • Deep foundations: types and applications. • Analysis of geological conditions and their impact on foundation selection. **3. Building Materials** • Types of materials used in construction: concrete, brick, steel, wood. • Properties of materials and testing methods.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• **Interactive Lectures**

	• Use multimedia presentations to illustrate key concepts and real-world applications. • Encourage questions and discussions to engage students actively. • **Hands-On Workshops** • Organize practical sessions where students can work with construction materials and tools. • Simulate construction tasks to enhance understanding of techniques and processes. • **Site Visits** • Arrange visits to construction sites to provide students with firsthand experience. • Facilitate discussions with industry professionals to gain insights into real-world practices. • **Group Projects** • Assign collaborative projects that require students to design and plan a building. • Encourage teamwork to develop communication and problem-solving skills. • **Case Studies** • Analyze real construction projects to understand challenges and solutions. • Discuss the application of theories and principles in practical scenarios. • **Guest Lectures** • Invite industry experts to share their experiences and knowledge. • Provide students with exposure to current trends and technologies in construction. • **Online Resources** • Utilize online platforms for research and collaboration. • Encourage students to access digital libraries, forums, and webinars relevant to building construction.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	54	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	5 and 10	LO #1 - #3
	Assignments	3	10% (10)	2 and 12	LO #1 - #3
	Projects / Lab.	1	10% (10)	Continuous	LO #4
	Report	1	10% (10)	13	LO #1 - #2
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #4
	Final Exam	3hr	50% (50)	16	ALL
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Required Tests on Site**
Week 2	**Soil Investigations and Tests, and the Engineer's Role in Them**
Week 3	Observation the Project During Site Planning
Week 4	Earthworks, Excavation, and Site Preparation
Week 5	Definition of the Concept of Foundations and Selection Criteria

Week 6	Shallow foundation
Week 7	Deep foundation
Week 8	Introduction to Types of Walls in Buildings and Their Benefits
Week 9	Brick Construction
Week 10	Stone and Block Construction
Week 11	Forms Used in Building Construction
Week 12	Slip forms
Week 13	Acoustical insulation
Week 14	Material
Week 15	Method of isolating

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Building construction handbook / Merritt	Yes
Recommended Texts	Building technology /Boyer	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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Module Information معلومات المادة الدراسية					
Module Title	**SURVEYING-II**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**BCE 204**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	1 2		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	
Module Leader	Saleh Jaafer suleiman		**e-mail**	salehjaafer@ntu.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Dr.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The objectives of **Surveying-II** generally focus on advancing students' understanding of geospatial measurements, methods, and tools. It builds upon basic surveying concepts and covers more advanced topics in surveying, including: • 1. Equip students with knowledge of the fundamental concepts and applications of total station equipment in surveying. • 2. Develop skills to accurately set up, configure, and operate total stations for various engineering tasks. • 3. Foster a solid understanding of horizontal and vertical curve computations and applications in civil engineering projects. • 4. Introduce and apply advanced techniques in GPS and GIS for real-world surveying projects. • 5. Ensure students can perform accurate field measurements and calculations using total stations in diverse engineering scenarios. • 6. Prepare students to handle tunnel surveying tasks with precision. • Promote the correct use and interpretation of surveying data for infrastructure development projects.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this course, students will be able to: • Demonstrate proficiency in the operation, configuration, and setup of total station equipment. • Correctly interpret and draw horizontal and vertical curves, along with their calculations for engineering projects. • Apply GPS and GIS technology in land surveying and infrastructure projects effectively. • Perform accurate field measurements using total stations and analyze the data for project-specific requirements. • Execute tunnel surveying techniques with a strong understanding of its practical applications. • Handle electronic distance measurement (EDM) settings and other system configurations within total station devices. • Understand and explain technical terms and abbreviations related to total station use and surveying.
Indicative Contents المحتويات الإرشادية	**Content Guidelines:** • **Introduction to Total Station:** • System description and components. • User interface and operating modes (theodolite, program, data management). • Station setup and application programs. • **Operation and Configuration:** • Total station setup and field operation. • Electronic Distance Measurement (EDM) settings.

	• Data collection and management techniques.
	• **Curve Computations:**
	  • Horizontal and vertical curve theory, types, and computations.
	  • Drawing and interpreting curves in project designs.
	• **Advanced Surveying Techniques:**
	  • Global Positioning System (GPS) implementation in surveying.
	  • Geographic Information System (GIS) in mapping and data analysis.
	• **Field Measurements:**
	• Practical field measurement techniques using total stations.
	• Project-based exercises on distance and angle measurements.
	• **Tunnel Surveying:**
	  • Techniques and tools for surveying tunnel alignments.
	• Practical applications and case studies.
	• **Instrument Calibration and Protection:**
	  • Instrument calibration (Check & Adjust).
	  • System info and protection mechanisms.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching and Learning Strategies: • Lectures: • Theoretical concepts related to total station operation, curve computations, GPS/GIS applications, and tunnel surveying. • Hands-on Training: • Practical exercises on total station configuration, operation, and data management. • Fieldwork to practice curve computations, tunnel surveying, and GIS-based mapping. • Group Projects: • Collaborative projects to apply surveying techniques on real or simulated infrastructure projects. • Demonstrations: • Step-by-step demonstrations on setting up total stations, performing measurements, and handling field data. • Case Studies: • Analysis of successful engineering projects involving total stations, GPS, GIS, and tunnel surveying. • Assessment:

	• Quizzes, fieldwork reports, and group project presentations to assess students' practical skills and theoretical knowledge.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	84	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	41	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #7
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #7
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered

Week 1,2	Identifying the integrated station device, describing the system and learning about the user interface, operation, configuring the device, weighing the device, learning to use programs, learning about applications.
Week 3,4	Learning about the settings of the electronic distance-measuring device (EDM), system information, checking, adjusting, and protecting devices, checking, adjusting, and initializing, learning about symbols, technical terms, and abbreviations, device components, and device settings, learning to measure distances, and learning to measure distances using a laser.
Week 5	Identify the different types of horizontal curves, perform calculations using the theodolite device and the integrated station device, and correct them in various applications of civil engineering works.
Week 6	Performing projection and lifting operations for different types of horizontal curves using the theodolite device and the integrated total station device in various applications of civil engineering works.
Week 7,8	Identify the different types of vertical curves, perform calculations using the theodolite device and the integrated station device, and correct them in various applications of civil engineering works.
Week 9,10	Become familiar with GPS and learn the correct implementation of the system.
Week 11.12	Get to know the Geographic Information System (GIS) and learn the correct implementation of the system.
Week 13,14	Learn to use the theodolite device and the integrated station device in carrying out building and construction works for small and large buildings related to civil engineering works.
Week 15	Identify tunnels and learn to use the integrated station device in the operations of digging and laying tunnels in various applications of civil engineering works.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to the integrated station device, describing the system and learning about the user interface, operation, configuring the device, weighing the device, learning to use programs, learning about applications.
Week 2	Lab 2: Learning about the settings of the electronic distance-measuring device (EDM), system information, checking

Week 3	Lab 3: Identify the different types of horizontal curves, perform calculations using the theodolite device and the integrated station device, and correct them in various applications of civil engineering works.
Week 4	Lab 4: Identify the different types of vertical curves, perform calculations using the theodolite device and the integrated station device, and correct them in various applications of civil engineering works.
Week 5	Lab 5: Become familiar with GPS and learn the correct implementation of the system.
Week 6	Lab 6: Learn to use the theodolite device and the integrated station device in carrying out building and construction works for small and large buildings related to civil engineering works.
Week 7	Lab 7: Identify tunnels and learn to use the integrated station device in the operations of digging and laying tunnels in various applications of civil engineering works.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Elementary surveying : an introduction to geometrics' / Charles D. Ghilani, Paul R.Wolf.13th ed.2013	Yes
Recommended Texts	ENGINEERING SURVING: /W. Schofield and M. Breach. Published by Elsevier Ltd. 2007.	No
Websites	**https://classroom.google.com/w/NjI1NDg4MzU0Mzkw/t/all**	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**Probability & Statistics**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BCE205**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	1 1		**Semester of Delivery**	2	
Administering Department	Type Dept. Code BCE		**College**	Type College Code TEMO	
Module Leader	Enas Hisham Mohammed		**e-mail**	E-mail	
Module Leader's Acad. Title	Assistant lecturer		**Module Leader's Qualification**	Msc.	
Module Tutor			**e-mail**	E-mail:enas.alhayali@ntu.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Understanding basic statistical principles: introducing students to basic statistical concepts such as mean, standard deviation, probability distributions, and hypothesis testing. • Collection and analysis of engineering data: teaching students how to collect engineering data from various sources and how to analyze it using appropriate statistical techniques. • Parameter estimation: teach students how to estimate the values of statistical parameters such as mean and variance using data samples. • Hypothesis testing: enabling students to test statistical hypotheses and evaluate their validity using appropriate statistical tests. • Model construction: teach students how to build statistical models to describe and predict geometric phenomena.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Basic statistical concepts: understand concepts such as Mean, median, mean, standard deviation, variance, probability distributions (such as normal distribution and discrete distributions), probability theory, and hypothesis testing. • Data collection methods: know the different data collection methods (such as questionnaires, observations, and experiments) and how to choose the appropriate sample size. • Data analysis techniques: understand the various statistical techniques of data analysis, such as descriptive analysis (table and frequency distributions), heuristic analysis (hypothesis tests, confidence intervals), and regression analysis. • Statistical software: the ability to use statistical computer programs (such as SPSS, Minitab, R) for data analysis
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • The basic principles of Statistics: Probabilities: the study of probabilities and their events, various probability distributions (e.g. normal distribution, discrete distributions). Random variables: types of random variables (connected, discrete), and their characteristics (e.g. mean, variance). Tabulation and iterative distributions: tabular and graphical data presentation methods. Measures of centrality and dispersion: calculation of Mean, median, modulus, variance, standard deviation. • 2. Probability distributions: The normal distribution: its importance in engineering statistics and its applications. Other distributions: binomial distributions, toxicological distributions, exponential distributions. The theory of the limits of centrality: its concept and significance in statistical inference.

	• Statistical inference: Estimation: estimation of population parameter values (e.g. mean and variance) based on a sample. Hypothesis testing: testing hypotheses about population parameters using appropriate tests (e.g. t-test, z-test). Confidence intervals: build confidence intervals to estimate the value of a population parameter with a certain accuracy. • Regression analysis: Simple linear regression: a relationship between two variables, estimation of coefficients, testing the significance of coefficients. Multiple linear regression: a relationship between a dependent variable and multiple independent variables. Analysis of deviation from the line: assessment of the suitability of the model for the data. • Contrast analysis (ANOVA): Comparison of averages of more than two groups: testing hypotheses about the equality of averages of several groups. Design of experiments: design of experiments to test certain hypotheses. • Data quality and quality control: Statistical control schemes: monitoring of industrial processes and detection of deviations. Capacity analysis: assessing the ability of a production process to achieve the required specifications. • Applications of Engineering Statistics: Engineering Data Analysis: Analysis of data generated by engineering experiments. Process optimization: using statistics to improve the efficiency of industrial processes. Service life estimation: estimate the expected service life of products. Risk analysis: assessing the risks associated with engineering projects.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem)	54	**Structured SWL (h/w)**	4

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	6	10% (10)	5 and 10	LO #1, #2 and #4
	Assignments	5	10% (10)	2 and 12	LO #3, #4
	Projects / Lab.	0	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #1, #3 and #5
Summative assessment	**Midterm Exam**	1hr	10% (10)	7	LO #1 - #2
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Definition of Engineering Statistics
Week 2	Types of Statistics, What is the data, Types of data and Importance of data
Week 3	Arithmetic mean, Types of arithmetic mean, Mode, and Median
Week 4	Measures of central tendency
Week 5	Bayes' theorem – Binomial, Poisson, and Normal distribution
Week 6	Central Limit Theorem
Week 7	Correctly execute Integer programming
Week 8	Gomory's cutting plane method

Week 9	Branch and bound method
Week 10	Correctly execute Integer programming
Week 11	ANOVA table
Week 12	Branch and bound method
Week 13	Law of large numbers and large and small samples
Week 14	Branch and bound method and Two phase method
Week 15	Variation and Standard deviation
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Statistics by J. Jothikumar	No
Recommended Texts	Introduction to Statistics by David M.ne La	No
Websites	https://imstat.org/2023/02/15/free-open-access-engineering-statistics-book	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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Module Information معلومات المادة الدراسية					
Module Title	**Calculus 2**			**Module Delivery**	
Module Type	Core			☒ **Seminar** ☒ **Tutorial** ☒ **Lab** ☐ **Lecture** ☐ **Practical** ☐ **Theory**	
Module Code	**BCE206**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	
Module Leader	Raghad		**e-mail**	Raghad.zidan@ntu.edu.iq	
Module Leader's Acad. Title	Assis. Lecturer		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	Understanding multiple integrals and their applications Studying curves using polar coordinates Calculating areas and volumes in cylindrical and spherical coordinates Vector calculations Unit vectors and orthogonal vectors

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. • A - Knowledge Objectives • A1 - Understand the fundamental concepts of multiple integrals • A2 - Comprehend polar, cylindrical, and spherical coordinates • A3 - Apply mathematical rules in integration problems • A4 - Analyze curves and areas in different coordinate systems • A5 - Apply dot product and cross product • B - Program-Specific Skill Objectives • B1 - Develop computational and mathematical analysis skills • B2 - Use various coordinate systems in engineering calculations • B3 - Solve engineering problems using multiple integrals

Indicative Contents
المحتويات الإرشادية
	Indicative content includes the following.
	
	• **Introduction to Multiple Integrals**
	  • Definition and significance of multiple integrals
	  • Overview of double and triple integrals
	  • Theoretical concepts and applications
	• **Review of Definite and Indefinite Integrals**
	  • Fundamental theorems of calculus
	  • Techniques for evaluating integrals
	  • Examples and practice problems
	• **Double Integration**
	  • Setting up double integrals in Cartesian coordinates
	  • Changing the order of integration
	  • Applications in calculating areas and volumes
	• **Triple Integration**
	  • Setting up triple integrals in Cartesian coordinates
	  • Applications of triple integrals in calculating volumes of solids
	  • Changing coordinates: cylindrical and spherical
	• **Applications of Integration**
	  • Calculating areas between curves
	  • Finding volumes of revolution
	  • Applications in physics and engineering problems
	• **Polar Coordinates**
	  • Introduction to polar coordinates and their conversion
	  • Graphing polar equations
	  • Integration in polar coordinates
	• **Curves Using Polar Coordinates**
	  • Analyzing curves represented in polar form
	  • Length of curves in polar coordinates
	  • Applications of polar curves in real-world scenarios
	• **Spherical and Cylindrical Coordinates**
	  • Understanding the concepts of cylindrical and spherical coordinates

- Converting between coordinate systems
- Applications of cylindrical and spherical coordinates in solving problems

- **Vector Calculations**
  - Introduction to vectors: definition and representation
  - Vector addition, subtraction, and scalar multiplication
  - Applications of vectors in engineering and physics
- **Unit Vectors and Orthogonal Vectors**

- Definition and properties of unit vectors
- Determining orthogonal vectors
- Applications in mechanics and spatial analysis

- **Dot Product and Cross Product of Vectors**

- Definition and calculation of dot product
- Properties and applications of dot product
- Definition and calculation of cross product
- Applications of cross product in physics and engineering

- **Review of Derivatives**

- Revisit key concepts of derivatives
- Relationship between integration and differentiation
- Application of derivatives in solving optimization problems

- **De Mover's Theorem**

- Statement and proof of De Mover's Theorem
- Applications of De Mover's Theorem in complex numbers
- Using De Mover's Theorem in solving polynomial equations

- **Preparation for Final Exam**

- Review of key concepts and problem-solving techniques
- Sample problems and practice exams
- Strategies for effective exam preparation

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lectures and presentations Group discussions and problem-solving sessions Hands-on projects and practical applications Use of software tools for modeling and solving differential equations

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	106	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	19	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	0	10% (10)	Continuous	All
	Report	0	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Review of the Basics of Definite and Indefinite Integrals
Week 2	Double and Triple Integration
Week 3	Applications of Integration
Week 4	Applications of Integration
Week 5	Applications of Multiple Integration
Week 6	Polar Coordinate
Week 7	Curves Using Polar Coordinates
Week 8	Spherical and Cylindrical Coordinates
Week 9	Vectors
Week 10	Vectors
Week 11	Vectors
Week 12	Dot Product and Cross Product of Vectors
Week 13	Review of Derivatives
Week 14	De Mover's Theorem
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	. Calculus II &Calculus III, Paul Dawkins, 2007	Yes
Recommended Texts	.	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	جرائم نظام البعث في العراق			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**NTU200**				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	2		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	
Module Leader	**Abdul Kareem Zuhair**		**e-mail**		
Module Leader's Acad. Title	**Assis. Lecturer**		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	هنالك عدد من الاهداف مثل :- • معرفة تاريخ تأسيس دولة العراق والتطورات السياسية المعاصرة. • فهم طبيعة النظام السياسي في عهدي الملكي والجمهوري في العراق. • إدراك طبيعة الجرائم السياسية والاقتصادية والاجتماعية والثقافية التي ارتكبها نظام حزب البعث البائد ضد أبناء الشعب بمختلف مكوناته خلال حقبة حكمه.

	دعم مهارات فهم قضايا السياسية, وتعزيز سبل التعليم التفاعلي لتعزيز سبل المشاركة في الشأن العام – المواطنة
التفاصيل الاساسية للمادة	.كتاب منهجي يدرس لطلبة المرحلة الثانية في الجامعات العراقية، ومن ابرز المواضيع التي يتناولها ويحاول تسليط الضوء عليها هي ... ماهية جرائم حزب البعث العربي الاشتراكي البائد ضد مبادئ حقوق الانسان في العراق منذ استيلاء وتفرد الحزب البائد بالسلطة السياسية في العراق سنة 1968 ولغاية سنة 2003 .
الكتب المنهجية	منهاج جرائم حزب البعث البائد في العراق / جمهورية العراق/ وزارة التعليم العالي والبحث العلمي, دائرة الدراسات والتخطيط والمتابعة، بغداد,2023.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
المصادر الخارجية	قيس ناصر وعبدالهادي معتوق, التأسيس المعرفي لدراسة جرائم حزب البعث في العراق (مقدمة عام), مركز العراقي لتوثيق جرائم التطرف، بغداد,2023.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	35	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	15	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	8		5 and 10	LO #1, #2 and #3, #4
	Assignments	8		2 and 12	LO #3, #4
	Projects / Lab.			Continuous	All
	Report	1		13	LO #1, #2 and #3
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #3
	Final Exam	3hr	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	المواد التي تم تغطيته
الاول	تعريف الجريمة واقسام الجرائم
الثاني	المحكمة الجنائية العليا ٢٠٠٥ م في العراق
الثالث	جرائم نظام حزب البعث في الدجيل والانفال وغيرها
الرابع	الجرائم النفسية والاجتماعية التي ارتكبها
الخامس	آليات الجرائم والطرق المنفذة
السادس	الآليات النفسية والاجتماعية التي استعملها النظام البعثي في العراق ضد أبناء الشعب
السابع	الدين والدولة في عهد نظام حزب البعث في العراق
الثامن	الثقافة والاعلام وعسكرة المجتمع في عهد نظام حزب البعث في العراق
التاسع	اثر القمع والحروب على البيئة والسكان في عهد نظام حزب البعث في العراق
العاشر	تجفيف الاهوار والهجرة القسرية في عهد نظام حزب البعث في العراق
الحادي عشر	تدمير البيئة الزراعية والحيوانية في عهد نظام حزب البعث في العراق
الثاني عشر	جريمة المقابر الجماعية في عهد نظام حزب البعث في العراق
الثالث عشر	جريمة الانفال في عهد نظام حزب البعث في العراق
الرابع عشر	جريمة قصف مدينة حلبجة في عهد نظام حزب البعث في العراق
الخامس عشر	التميز العنصري والطائفي بين أبناء الشعب في عهد نظام حزب البعث البائد في العراق

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts		

Websites	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

ملاحظة: سيتم تقريب العلامات التي تحتوي على فواصل عشرية أعلى أو أقل من 0.5 إلى العلامة الكاملة الأقرب (على سبيل المثال، ستقرب العلامة 54.5 إلى 55، بينما ستقرب العلامة 54.4 إلى 54). تلتزم الجامعة بسياسة عدم التساهل مع حالات "الرسوب القريب من النجاح"، وبالتالي فإن التعديل الوحيد على العلامات الممنوحة من قبل المقيمين الأصليين سيكون التقريب التلقائي كما هو موضح أعلاه.

Module Information معلومات المادة الدراسية					
Module Title	Concrete Technology II			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**BCE 209**				
ECTS Credits	5				
SWL (hr/sem)	122				
Module Level		2	**Semester of Delivery**		2
Administering Department		BCE	**College**	TEMO	
Module Leader	Eethar Thanon Dawood		**e-mail**	eethardawood@nth.edu.iq	
Module Leader's Acad. Title		Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		14/10/2024	**Version Number**		2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	By the end of this module, students should be able to: 1. Understand the fundamental properties of fresh and hardened concrete.

	2. Perform laboratory tests to evaluate workability, air content, unit weight, and other properties of fresh concrete. 3. Identify and explain the factors influencing concrete behavior in both fresh and hardened states. 4. Demonstrate knowledge and skill in the manufacture and handling of concrete (batching, mixing, placing, compacting, curing). 5. Understand and apply concrete mix design methods. 6. Evaluate the performance of hardened concrete and interpret test results accurately.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this module, students should be able to: 1. Describe the key physical properties of fresh concrete and the importance of workability and consistency. 2. Execute standard laboratory tests to assess fresh concrete properties such as slump, compaction factor, and flow. 3. Measure entrained air in concrete using volumetric, pressure, and gravimetric methods. 4. Demonstrate practical competence in the processes of concrete manufacturing, from raw material batching to curing. 5. Identify the main mechanical strengths of concrete, including compressive, tensile, and flexural strength, and explain the factors that affect them. 6. Evaluate and interpret the results of strength tests on hardened concrete, including discussion of test variability. 7. Apply concrete mix design procedures to develop mixes for different applications and performance requirements
Indicative Contents المحتويات الإرشادية	The module introduces the composition and behavior of concrete in both fresh and hardened states. It covers physical properties such as workability, consistency, bleeding, segregation, and unit weight. Students will study and perform tests related to fresh concrete, including slump and air content testing using multiple methods. The course also includes air-entrainment principles, unit weight and yield calculations, and the significance of proper batching, mixing, placing, and curing. Properties of hardened concrete and testing for various strengths are explored in detail. Additionally, students will learn different concrete mix design techniques, including methods established by the ACI and British standards.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	To ensure effective delivery of the module and to support the achievement of learning outcomes, the following strategies will be employed: • **Interactive Lectures**: Used to introduce theoretical concepts related to fresh and hardened concrete, including physical properties, strength, and mix design principles. These sessions will incorporate audiovisual aids and real-world examples to enhance comprehension. • **Laboratory Sessions**: Structured practical sessions that allow students to perform standardized concrete tests (e.g., slump, compaction, air content, strength tests), analyze results, and develop hands-on skills in concrete manufacturing. • **Demonstrations**: Instructor-led demonstrations of equipment and procedures used in the preparation, placement, and testing of concrete to model best practices and safety compliance. • **Problem-Based Learning (PBL)**: Real-life construction scenarios will be presented to students, who will be required to identify problems, propose testing and design solutions, and justify choices using theoretical knowledge. • **Group Work and Peer Collaboration**: Small group activities will promote teamwork, communication, and collaborative learning, especially during mix design and lab report writing. • **Case Studies and Industry Examples**: Relevant case studies will be integrated to demonstrate the application of concrete technology in various engineering contexts, enhancing students' analytical and reflective thinking. • **Formative Feedback and Tutorials**: Regular feedback sessions and academic support tutorials will be offered to help students clarify concepts, refine practical skills, and prepare for assessments. • **Independent Learning and Report Writing**: Students will be expected to engage in guided independent research, laboratory reporting, and reflective writing to consolidate their learning outside the classroom.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	83	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #6, #7
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #5
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #1 to #7
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Demonstrates knowledge about fresh concrete, Properties of fresh concrete: (Workability; Consistency; Segregation; Bleeding; Unit weight).
Week 2	Recognition of laboratory correctly execute Measurement of workability and Consistency, Factors affecting workability.
Week 3	Demonstrates knowledge about Air – Entrainment; Correctly execute Measurement of Entrained – Air: (Volumetric; Gravimetric and Pressure methods) Unit weight; yield; Cement factor.
Week 4	Demonstrates knowledge about Air – Entrainment; Correctly execute Measurement of Entrained – Air: (Volumetric; Gravimetric and Pressure methods) Unit weight; yield; Cement factor.

Week 5	Carries out manufacture of concrete: Batching; Mixing; Conveying; Placing; Compacting; and curing of concrete .
Week 6	Able to identify properties of hardened concrete
Week 7	Demonstrates Knowledge about kinds of strength. Able to identify factors affecting strength of hardened concrete. factors affecting test results of strength of hardened concrete.
Week 8	Demonstrates Knowledge about kinds of strength. Able to identify factors affecting strength of hardened concrete. factors affecting test results of strength of hardened concrete.
Week 9	Mid-term exam
Week 10	Able to identify concrete mix design methods
Week 11	Able to identify concrete mix design methods
Week 12	Able to identify concrete mix design methods
Week 13	Able to identify concrete mix design methods
Week 14	Able to identify concrete mix design methods
Week 15	Able to identify concrete mix design methods

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Batching and mixing of ingredients of concrete.
Week 2	Lab 2: Measuring of slump of fresh concrete
Week 3	Lab 3: Measuring of slump of compacting factor concrete
Week 4	Lab 4: Measuring of unit weight of fresh concrete.
Week 5	Lab 5: Measuring the air entrainment of fresh concrete.
Week 6	Lab 6: Measuring of compressive strength of hardened concrete using different water to cement ratio.
Week 7	Lab 7: Measuring of the splitting tensile strength of concrete and the relationship between it and compressive strength**.**
Week 8	Lab 8: Measuring of Flexural strength of concrete using different aggregate to cement ratio.
Week 9	**Mid-term exam**

Week 10	Lab 10: Effect of specimen size on compressive strength of concrete.
Week 11	Lab 11: Mix design of concrete mixes according to ACI
Week 12	Lab 12: Mix design of concrete mixes according to ACI
Week 13	Lab 13: Mix design of concrete mixes according to DOE method
Week 14	Lab14: Mix design of concrete mixes according to DOE method.
Week 15	Lab 15: Field adjustment for mix design of concrete mixes.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Engineering Concrete, Mix Design and Test Methods, Irving Kett, 2000. Concrete Technology, Theory and Practice, M.S. SHETTY , 2005 Properties of concrete, Nivelle, 2011.	No
Recommended Texts	ASTM, Standard, 2020	Yes
Websites	https://www.astm.org/products-services/bos.html	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	SOLID MECHANICS			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BCE 210**				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level			**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	Majid Ali Dhahir		**e-mail**	Majid.algburi@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Name		**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	• Deepen understanding of fundamental principles of material strength: The course aims to enable students to understand and analyze the behavior of materials under different forces. • Develop the ability to analyze engineering systems: The course aims to enhance students' ability to analyze and design structural systems that meet strength and stiffness requirements. • Stress and Strain Analysis: The course teaches students how to calculate the stresses and strains experienced by materials due to applied forces. • Enhance engineering thinking: Students are trained to think logically and systematically to solve engineering problems related to material strength. • Link theoretical concepts with practical applications: The course links theoretical material strength principles with practical solutions in engineering applications
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students will be able to: • **Understand the relationship between external loads and internal effects** such as strains, deformations, and stresses in structural elements. • **Define and classify different types of stresses in beams**, including normal and shear stresses. • **Derive and apply the flexure formula** to determine bending stresses in beams with various cross-sections. • **Analyze economic and unsymmetrical beam sections**, evaluating their stress distribution and efficiency. • **Explain and analyze the flexural behavior of beams**, including moment distribution and section properties. • **Apply the horizontal shear stress formula** to evaluate shear stress distribution in beams. • **Construct and interpret free-body diagrams and moment-curvature diagrams** for structural analysis. • **Describe the concept of beam deflections** and their significance in structural performance. • **Apply analytical methods** such as the area-moment theorem and double integration method to calculate beam deflections. • **Analyze combined stresses in columns**, including axial and flexural loads, and apply Euler's formula for critical load estimation. • These learning outcomes will equip students with the theoretical understanding and analytical skills necessary for structural analysis and design.

Indicative Contents
المحتويات الإرشادية
	Topic: Stresses and Deflections in Beams, Combined Stresses, and Columns
	
	1. **Introduction to Beam Stresses**
	  ○ Basic concepts of stresses in beams
	  ○ Definition of bending moment and its effects
	2. **Derivation of Flexure Formulas**
	  ○ Analysis of stress distribution in beams
	  ○ Derivation of bending stress equation
	3. **Economic Sections**

- Factors affecting the design of economic sections
- Selecting the optimal section for structural efficiency

4. **Analysis of Unsymmetrical Beams**
   - Difference between symmetrical and unsymmetrical beams
   - Stress distribution in unsymmetrical beams
5. **Analysis of Flexure Action**
   - Factors influencing beam bending
   - Different bending conditions and their effects
6. **Horizontal Shear Stress Formula**
   - Derivation of the shear stress equation
   - Practical applications of horizontal shear stress
7. **Introduction to Beam Deflections**
   - Definition of deflection and its significance in structural design
   - Factors affecting beam deflection
8. **Area-Moment Method**
   - Explanation of the theorem
   - Practical applications in beam deflection calculations
9. **Double Integration Method**
   - Steps to apply the method for deflection calculations
   - Example problems and solutions
10. **Combined Stresses**

- Definition and effects of axial and flexural loads
- Analysis of combined stresses in beams and columns

11. **Kern of a Section**

- Concept of the kern in structural design
- Calculating the kern location for different section shapes

12. **Loads Applied Off Axes of Symmetry**

- Effects of eccentric loads on stresses
- Stress analysis in non-symmetrical sections

13. **Stress at a Point & Transformation of Strain Components**

- Determining stress at a given point in a structure
- Transformation equations for strain components

14. **Columns: Critical Loads & Euler's Formula**

- Understanding column buckling and critical loads
- Application of Euler's formula for long columns

15. **Intermediate Columns & Empirical Formulas**

- Analysis of intermediate columns

	• Use of empirical formulas for practical design considerations

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lectures using various modern presentation tools. • Interactive whiteboard lectures. • Discussion groups during lectures to stimulate thinking and analysis. • Asking students a set of reflective questions during lectures that include words like "What," "How," "When," and "Why." • Assigning homework that requires problem-solving and reasoning

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	73	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	8		5 and 10	LO #1, #2 and #10, #11
	Assignments	12		2 and 12	LO #3, #4 and #6, #7
				Continuous	All
				13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1&2& 3&4	**Stresses in Beams:** **Derivation of flexure formulas, Economic sections, Unsymmetrical beams, Analysis of flexure action, Formula for horizontal shear stress.**
5&6& 7&8	**Beams Deflections:** **Theorem of area-moment method, Double integration method.**
9&10& 11&12	**Combined Stresses:** **Combined axial & flexural loads, Kern of a section, Loads applied off axes of symmetry, Stress at a point, Mohr's circle , Transformation of strain components.**
13&14,15	**Columns:** **Critical loads, Long columns by Euler's formula, Intermediate columns, Empirical formulas.**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	o A. Pytel and J. Kiusalaas, Strength of Materials. Cengage Learning, 3rd ed	No
Recommended Texts	o J. M. Gere and B. J. Goodno, Mechanics of Materials. Cengage Learning, 9th ed., 2018	Yes
Websites	o Websites related to Strength of Materials	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	CONSTRUCTION TECHNIQUES			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BCE 211				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	1 2		**Semester of Delivery**	2	
Administering Department	BCE		**College**	Type College Code	
Module Leader	Hiba Abdulhafith		**e-mail**	hibaabdulhafith@ntu.edu.iq	
Module Leader's Acad. Title	Assist Lecture		**Module Leader's Qualification**	M.Sc	
Module Tutor	Hiba Abdulhafith		**e-mail**	hibaabdulhafith@ntu.edu.iq	
Peer Reviewer Name	Hiba Abdulhafith		**e-mail**	hibaabdulhafith@ntu.edu.iq	
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Demonstrates knowledge about Scaffolding, types, components, uses. • Demonstrates knowledge about Floors and roofs, timber, jack arching • Demonstrates knowledge and recognition about Damp proofing materials. • Demonstrates knowledge about the implementation of finishing, interior and exterior • Demonstrates knowledge about Doors and windows and upstairs rails.

	• Recognition of laboratory Type of failure in building, causes and measures
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	To understand: Equip the learner with skills to identify the structural framework system, including columns and beams. • Introduce the learner to the types of flooring used. • Familiarize the learner with the types of finishing materials for both interior and exterior of buildings. • Introduce the learner to the complementary elements of a building, such as stairs, doors, and windows. • Educate the learner about the causes of failure in building elements and methods for remediation.
Indicative Contents المحتويات الإرشادية	• The learner identifies the types of columns and beams in the structural system. • The student differentiates between the types of flooring. • The student understands the finishing materials used inside and outside the building. • The student recognizes the types of stairs, doors, and windows. • The student understands the causes of failure in building elements and methods for their remediation..

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

- **Interactive Lectures**
  - Use multimedia presentations to illustrate key concepts and real-world applications.
  - Encourage questions and discussions to engage students actively.
- **Hands-On Workshops**
  - Organize practical sessions where students can work with construction materials and tools.
  - Simulate construction tasks to enhance understanding of techniques and processes.
- **Site Visits**
  - Arrange visits to construction sites to provide students with firsthand experience.
  - Facilitate discussions with industry professionals to gain insights into real-world practices.
- **Group Projects**
  - Assign collaborative projects that require students to design and plan a building.
  - Encourage teamwork to develop communication and problem-solving skills.
- **Case Studies**
  - Analyze real construction projects to understand challenges and solutions.
  - Discuss the application of theories and principles in practical scenarios.
- **Guest Lectures**
  - Invite industry experts to share their experiences and knowledge.
  - Provide students with exposure to current trends and technologies in construction.
- **Online Resources**
  - Utilize online platforms for research and collaboration.
  - Encourage students to access digital libraries, forums, and webinars relevant to building construction.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	45	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	55	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	5 and 10	LO #1, #2 and #٨, #11
	Assignments	3	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	types, components, uses.
Week 2	Columns classification, reinforcement
Week 3	Beams, types and reinforcement

Week 4	Types of Floors and roofs, timber, jack
Week 5	Concrete floors and roofs, one way, two way.
Week 6	Lift slab system and space frame roofing
Week 7	Damp proofing materials
Week 8	Floor finishing
Week 9	Inner wall finishing
Week 10	External wall finishing
Week 11	Modern finishing materials
Week 12	Upstairs, windows, Door
Week 13,14,15	Type of failure in building, causes and measures

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	*Building Construction Illustrated* by Francis D.K. Ching	Yes
Recommended Texts	*Fundamentals of Building Construction: Materials and Methods* by Edward Allen and Joseph Iana	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**FLUID MECHANICS**			**Module Delivery**	
Module Type	Support			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	BCE 212				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	1 2		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	Dr. Mohammed Tareq Khaleel		**e-mail**	Mohammed.alsafaawe@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Mohammed Tareq Khaleel		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• To understand the properties of fluids, dimensions and units. • To derive the equation of conservation of mass, momentum, energy and its application.

	• To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems. • To understand the various flow measuring devices. • To understand the classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students will be able to: • **Understand and convert between unit systems** (British and SI units) in fluid mechanics applications. • **Develop problem-solving skills** related to various fluid mechanics concepts and applications. • **Measure fluid flow rates** using different types of flow meters, such as Venturi meters, orifice meters, and rotameters. • **Analyze hydrostatic forces on submerged surfaces**, determining the horizontal and vertical components of force on gates and other structures. • **Determine pressure gauge readings** using different types of manometers, including simple and differential manometers. • **Draw and interpret hydraulic gradient lines (HGL) and energy gradient lines (EGL)** for different fluid flow conditions. • **Solve equations related to open channel flow**, including Manning's equation and Chezy's formula. • **Apply Bernoulli's equation** to solve problems involving fluid motion and energy conservation. • **Understand and analyze pipe flow** in pressurized systems, considering head loss and frictional effects. • **Examine the principles of buoyancy and stability**, including Archimedes' principle and the concept of metacentric height. • **Calculate Reynolds number** and classify different types of flow (laminar, transitional, and turbulent). • **Study the impact of viscosity on fluid motion**, including shear stress and velocity distribution in pipes. • **Apply the momentum equation** to analyze fluid forces in pipe bends, nozzles, and other flow systems. • **Evaluate flow characteristics through orifices and weirs**, determining discharge coefficients and flow rates. • These learning outcomes will equip students with both theoretical knowledge and practical skills essential for solving real-world fluid mechanics problems in engineering applications.
Indicative Contents المحتويات الإرشادية	**Part A - Fundamentals of Fluid Mechanics** • **SI Units, Dimensions, Symbols, and Abbreviations:** Understanding and application of SI units, dimensional analysis, symbols, and standard abbreviations used in fluid mechanics. [SSWL = 4 hrs]

- **Development of Fluid Mechanics and Properties of Fluids:**
  Historical perspective, physical properties of fluids such as density, specific weight, viscosity, compressibility, surface tension, and capillarity.
  [SSWL = 8 hrs]

Part B - Fluid Statics and Pressure Measurement

- **Characteristics of Flow:**
  Fundamental parameters including discharge, velocity, pressure, and shear stress. [SSWL = 5 hrs]
- **Pressure Measurement Techniques:**
  Understanding of absolute and gauge pressure, Bourdon gauge, piezometer columns, simple and differential manometers. [SSWL = 8 hrs]
- **Hydrostatic Forces on Surfaces:**
  Calculation of forces on plane and curved surfaces and determination of the center of pressure. [SSWL = 6 hrs]

Part C - Kinematics of Fluid Flow

- **Kinematics of Fluid Flow:**
  Describing fluid motion, streamlines, stream tubes, path lines, and flow nets.
  [SSWL = 6 hrs]
- **Classification of Flow:**
  Types of flow: laminar, turbulent, steady, unsteady, compressible, and incompressible flow. [SSWL = 5 hrs]
- **Continuity Equation:**
  Derivation and application in steady flow conditions. [SSWL = 5 hrs]

Part D - Fluid Dynamics

- **Energy Equation for Steady Flow:**
  Derivation and application of the Bernoulli equation; kinetic, potential, and flow energy; hydraulic grade line and energy line. [SSWL = 10 hrs]
- **Flow in Pressure Conduits:**
  Analysis of steady flow in pipelines, laminar vs turbulent flow, critical flow.
  [SSWL = 8 hrs]
- **Conduit Friction and Head Loss:**
  Friction factor, empirical equations for pipe flow, head losses due to friction, pipe roughness, minor head losses, and practical applications.[SSWL = 8 hrs]

	Part E - Practical Applications and Problem-Solving • **Pipeline Design and Pumping Systems (Part 1 & Part 2):** Analysis and solutions for practical pipeline problems, with and without pumps, including head losses at entrance, contraction, expansion, and bends. [SSWL = 10 hrs] • **Friction Factor Charts and Economic Pipe Diameter:** Derivation and use of friction factor charts, and determining economical diameter of pipes. [SSWL = 6 hrs] **Part F - Fluid Measurements** • **Measurement of Fluid Properties and Flow Quantities (Part 1 & Part 2):** Static pressure measurement, velocity measurement by Pitot tubes, nozzles, Venturi meters, and discharge coefficients. [SSWL = 10 hrs] • **Introduction to Open Channel Flow:** Types of channels, specific energy, specific energy curves, hydraulic jump, and design of open channels. [SSWL = 10 hrs] **Part G - Review and Exam Preparation** • **Revision and Problem Classes:** Solution of sample problems and practical exercises to reinforce understanding of fluid mechanics concepts. [SSWL = 7 hrs] • **Preparatory Week for Final Exam:** Comprehensive review and preparation for final assessments. [SSWL = 5 hrs] **Total Hours = 121 (Time table hrs x 15 weeks)**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Teaching students the basics of the curriculum (Whiteboard, discussion, videos) • Training students to use computers and online teaching aids. • To provide students with the skill of public speaking and discussing issues related to the curriculum.

	• Training students to participate and express their opinions on the scientific material

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	69	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	56	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	6	10% (10)	2 and 13	LO #1 - #2, LO #3 - #4, LO #5- #7, LO #8 - #9, LO #10 - #11, and LO #12 - #13,
	Assignments	6	10% (10)	2 and 13	LO #1 - #2, LO #3 - #4, LO #5- #7, LO #8 - #9,

					LO #10 - #11, and LO #12 - #13,
	Seminar	3	10% (10)	2 and 13	LO #2 - #3, LO #4 - #7, and LO #8 - #11
	Report	4	10% (10)	2 and 13	LO #1 - #3, LO #4 - #7, LO #8 - #11, LO #12 - #13,
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	• Demonstrates knowledge about SI Units, dimensions, symbols, abbreviations. • Demonstrates knowledge about the Development of fluid mechanics, properties of fluids; density, specific weight, viscosity, compressibility, surface tension, capillarity etc.
Week 2	• Demonstrates knowledge about the Characteristics of flow; discharge, velocity, pressure, shear etc. • Conducts the Standard tests concerning: Fluid static's; absolute and gauge pressure, pressure measurement; Bourdon gauge, piezometer column, simple manometer, differential manometer.
Week 3	Monitors and conducts hydrostatic forces on plane and curved surfaces, center of pressure.
Week 4	• Demonstrates knowledge about Kinematics of fluid flow. • Able to identify Classification of types of flow; streamlines, stream tube, path lines, flow net. • Correctly implement Continuity equation.
Week 5	• Correctly Derivatives and execute Energy equation for steady flow; potential, kinetic and flow energy; hydraulic grade line and energy line.
Week 6	• Correctly draw solution of flow problems.

Week 7	• Recognition of laboratory Steady flow in pressure conduits; laminar and turbulent flow; critical flow. • Correctly execute general equation for conduit friction; friction for laminar flow; friction for turbulent flow; pipe roughness.
Week 8	• Correctly draw and compute friction factor charts; empirical equations for pipe flow; economical diameter of pipes.
Week 9	• Demonstrates knowledge about Minor head losses; loss at entrance, losses due to contraction; losses due to expansion; loss in pipe fittings; loss in bend and elbows, etc.
Week 10	• Part 1_ Monitors and conducts Solution of practical pipeline problems; pipeline with pumps.
Week 11	• Part 2_ Monitors and conducts Solution of practical pipeline problems; pipeline with pumps.
Week 12	• Part 1_ Demonstrates knowledge about Fluid measurements; measurement of fluid properties ; measurement of static pressure; velocity measurement by different methods; measurements of discharge; nozzles; coefficients of contraction; coefficients of velocity; coefficients of discharge; Venture tube; nozzle meter; Pitot Tube.
Week 13	• Part 2_ Demonstrates knowledge about Fluid measurements; measurement of fluid properties ; measurement of static pressure; velocity measurement by different methods; measurements of discharge; nozzles; coefficients of contraction; coefficients of velocity; coefficients of discharge; Venture tube; nozzle meter; Pitot Tube.
Week 14	• Introduction to open channels, types of channels, best hydraulic section, specific energy and specific energy curve,
Week 15	• hydraulic jump, design of open channels,
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fluid Mechanics Fundamentals and applications by Yunus A. Cengel, John M. Cimbala.	No
Recommended Texts	A textbook of fluid mechanics and hydraulic machines by Rajput	No

Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics**			**Module Delivery**	
Module Type	Core			☒ **Seminar** ☒ **Tutorial** ☒ **Lab** ☐ **Lecture** ☐ **Practical** ☐ **Theory**	
Module Code	**BCE213**				
ECTS Credits	**5**				
SWL (hr/sem)	125				
Module Level	1 2		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	Raghad		**e-mail**	Raghad.zidan@ntu.edu.iq	
Module Leader's Acad. Title	Assis. Lecturer		**Module Leader's Qualification**	Master	
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name	Name		**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives	

أهداف المادة الدراسية	• Understand first-order linear differential equations • Develop skills to solve separable and homogeneous equations • Understand exact and inexact linear differential equations • Apply various methods to solve equations • Find general and particular solutions • Solve differential equations with constant coefficients • Use differential equations in engineering applications
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. • A - Knowledge Goals: • A1. Understand the fundamental concepts of differential equations • A2. Analyze differential equations • A3. Know solution methods • A4. Apply the theory of equations • A5. Distinguish between exact and inexact equations • A6. Understand equations with constant coefficients • A7. Apply differential equations in various fields • • B - Program-Specific Skill Goals: • B1. Apply mathematical analysis • B2. Critical and analytical thinking • B3. Effective communication
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Introduction to Differential Equations** • Definition and classification of differential equations • Importance and applications in engineering and science **First-Order Differential Equations** • Separable equations • Homogeneous equations • Linear first-order equations • Exact equations and the method of integrating factors **Solutions of First-Order Equations** • General and particular solutions • Applications to real-world problems (e.g., population growth, cooling laws) **Higher-Order Differential Equations** • Definition and classification of higher-order equations • Homogeneous linear equations with constant coefficients • Non-homogeneous linear equations: methods of undetermined coefficients and variation of parameters

	Applications of Differential Equations • Mechanical systems (e.g., mass-spring systems) • Electrical circuits (e.g., RC and RL circuits) • Fluid dynamics and heat transfer **Laplace Transforms** • Definition and properties of Laplace transforms • Inverse Laplace transforms • Application of Laplace transforms to solve differential equations **Systems of Differential Equations** • Introduction to systems of first-order differential equations • Matrix methods and eigenvalues/eigenvectors • Stability analysis of equilibrium points **Numerical Methods for Differential Equations** • Euler's method and its applications • Runge-Kutta methods • Error analysis and stability considerations **Series Solutions of Differential Equations** • Power series solutions near ordinary points • Frobenius method for singular points **Partial Differential Equations (Introduction)** • Basic concepts and classifications • Examples and applications in engineering and physics (e.g., heat equation, wave equation) **Conclusion and Review** • Summary of key concepts covered in the course • Discussion on further applications of differential equations in various fields **Projects and Case Studies** • Research projects related to real-world applications of differential equations • Case studies analyzing specific engineering problems using differential equation

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lectures and presentations • Group discussions and problem-solving sessions • Hands-on projects and practical applications • Use of software tools for modeling and solving differential equations

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	85	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	40	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	0	10% (10)	Continuous	All
	Report	0	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	First-order linear differential equations, separable and homogeneous equations
Week 2	First-order linear differential equations,
Week 3	General and particular solutions
Week 4	Higher-order equations
Week 5	Differential equations
Week 6	Derivatives
Week 7	Derivatives of functions
Week 8	Integration
Week 9	Integration
Week 10	Integration techniques
Week 11	Integration techniques
Week 12	Integration Applications
Week 13	Vectors
Week 14	Vectors
Week 15	Complex numbers
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	. Calculus II &Calculus III, Paul Dawkins, 2007	Yes
Recommended Texts	.	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**Arabic Language**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**NTU201**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	1 2		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	Inas Sameer Mahmood		**e-mail**	inasaldabag@ntu.edu.iq	
Module Leader's Acad. Title	lecturer		**Module Leader's Qualification**	MSc	
Module Tutor	-		**e-mail**	-	
Peer Reviewer Name	-		**e-mail**	-	
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	•
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	•
Indicative Contents المحتويات الإرشادية	•

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	35	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	15	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	-	-	-	All
	Report	1	20% (20)	14	LO #5, #8 and #10

Summative assessment	**Midterm Exam**	2hr	10% (10)	8	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		No
Recommended Texts	-	-
Websites	-	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**Computer**			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	NTU202				
ECTS Credits	**3**				
SWL (hr/sem)	**50**				
Module Level	2		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	Ekhlas N. Alansari		**e-mail**	ekhlasmohammed@ntu.edu.iq	
Module Leader's Acad. Title	Lecture		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Ekhlas N. Alansari		**e-mail**	ekhlasmohammed@ntu.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• Networking Fundamentals: Students will gain a solid understanding of networks, including their types, components, and basic security concepts. They will also learn how to troubleshoot common network issues.

	• E-commerce and Digital Banking: The module will explore the concepts of electronic banking and its various services, such as online banking, mobile banking, and ATM transactions. • Computer Troubleshooting: Students will develop skills in identifying and resolving common hardware and software problems. • Introduction to Artificial Intelligence: This section will provide a foundational understanding of AI, its history, techniques, and ethical implications. • AI Applications and Impact: Students will explore the practical applications of AI in various industries, as well as its societal implications, including ethical considerations. • Future of AI: The module will delve into emerging trends in AI and discuss the potential future directions of this technology.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Networking Proficiency: Students will be able to design, implement, and troubleshoot basic computer networks. They will understand network topologies, protocols, and security measures. • E-commerce Expertise: Students will gain a comprehensive understanding of electronic commerce, including online banking, payment systems, and digital marketing. They will be able to identify the key components of a successful e-commerce business. • Troubleshooting Skills: Students will be equipped with the ability to diagnose and resolve common hardware and software issues, improving their problem-solving skills. • AI Fundamentals: Students will develop a solid foundation in artificial intelligence, including its history, applications, and ethical implications. They will be able to explain key concepts such as machine learning and deep learning. • Technological Awareness: Students will stay up-to-date with the latest advancements in technology, particularly in the areas of networking, e-commerce, and AI. • Critical Thinking and Problem-Solving: Students will be able to apply critical thinking skills to analyze complex technological problems and develop effective solutions
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A Security and Networking: What is a network? Types of networks. Basic network components. Network Security Basics. Understanding network threats. Network Troubleshooting Part B E-Commerce:

	Concepts of Electronic banking services this include online banking: ATM and debit card services, Phone banking, SMS banking, electronic alert, Mobile banking. Part C Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues Part D Introduction to Al: Definition of Al, History of Al, AI Techniques and Approaches, Challenges and Ethical Considerations. Part E Al in Our Daily Lives: Al in smartphones and virtual assistants like Siri or Google Assistant Part F Applications of Al: Education, Healthcare, Finance, Transportation, Marketing and Advertising. Part G Al and Society: (How Al affects social, Al and international relations, Al and the future of humanity) Part H Ethical Challenges in Al : (Al ethics, privacy and surveillance, the impact of Al on the job market). Part I The Future of Al (Future trends in Al, recent research and emerging technologies)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture: Introduce new concepts and demonstrate techniques. • Board (Normal or Smart) • Computers • Presentation software such as PowerPoint • Group Work: Encourage collaboration and problem-solving through group activities. • Q&A: Facilitate discussion and address student questions

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	35	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem)	15	**Unstructured SWL (h/w)**	1

الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Class work	8	10% (10)	Continuous	All
	seminar	2	10% (10)	6 and 11	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري والعملي

	Material Covered
Week 1	Security and Networking: What is a network? Types of networks. Basic network components. Network Security Basics. Understanding network threats. Network Troubleshooting
Week 2	E-Commerce: Concepts of Electronic banking services this include online banking: ATM and debit card services, Phone banking, SMS banking, electronic alert, Mobile banking
Week 3-4	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues

Week 5-6	Introduction to Al: Definition of Al, History of Al, AI Techniques and Approaches, Challenges and Ethical Considerations.
Week 7	Midterm Exam
Week 8-9	Al in Our Daily Lives: Al in smartphones and virtual assistants like Siri or Google Assistant
Week 10-11-12	Applications of Al: Education, Healthcare, Finance, Transportation, Marketing and Advertising.
Week 13	Al and Society: (How Al affects social, Al and international relations, Al and the future of humanity)
Week 14	Ethical Challenges in Al :(Al ethics, privacy and surveillance, the impact of Al on the job market).
Week 15	The Future of Al (Future trends in Al, recent research and emerging technologies)
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Security and Networking: What is a network? Types of networks. Basic network components. Network Security Basics. Understanding network threats. Network Troubleshooting
Week 2	E-Commerce: Concepts of Electronic banking services this include online banking: ATM and debit card services, Phone banking, SMS banking, electronic alert, Mobile banking
Week 3-4	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues
Week 5-6	Introduction to Al: Definition of Al, History of Al, AI Techniques and Approaches, Challenges and Ethical Considerations.
Week 7	Midterm Exam
Week 8-9	Al in Our Daily Lives: Al in smartphones and virtual assistants like Siri or Google Assistant
Week 10-11-12	Applications of Al: Education, Healthcare, Finance, Transportation, Marketing and Advertising.
Week 13	Al and Society: (How Al affects social, Al and international relations, Al and the future of humanity)
Week 14	Ethical Challenges in Al :(Al ethics, privacy and surveillance, the impact of Al on the job market).

Week 15	The Future of Al (Future trends in Al, recent research and emerging technologies)
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts	1. Graham Brown, David Watson, "Cambridge IGCSE Information and Communication Technology", 3rd Edition (2020) 2. 2Alan Evans, Kendall Martin, Mary Anne Poatsy, "Technology In Action Complete", 16th Edition (2020). 3. Ahmed Banafa, "Introduction to Artificial Intelligence (AI)", 1st Edition (2024). 4. الخضر علي الخضر بحاث " أساسيات الحاسوب" 2016 4. 5. الدكتور عادل عبدالنور, "مدخل إلى عالم الذكاء الاصطناعي " 2005 5.	
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	CONCRETE TECHNOLOGY III			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**BCE 301**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		3	**Semester of Delivery**		1
Administering Department		BCE	**College**		TEMO
Module Leader	Eethar Thanon Dawood		**e-mail**		eethardawood@nth.edu.iq
Module Leader's Acad. Title		Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		E-mail
Peer Reviewer Name		Name	**e-mail**		E-mail
Scientific Committee Approval Date		14/10/2024	**Version Number**		2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This module aims to provide students with advanced knowledge and understanding of concrete as a construction material. It covers the properties, behaviours, and performance of fresh and hardened concrete, including its durability, sustainability, and special types. It also equips students with skills in non-destructive testing, quality assessment, and sustainable material selection in accordance with modern engineering practices.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students will be able to: 1. Explain the behaviour and properties of fresh and hardened concrete, including elasticity, shrinkage, creep, and durability. 2. Describe the importance and methods of concrete curing. 3. Evaluate the bond strength between steel and concrete using testing methods such as the pull-out test. 4. Apply non-destructive testing (NDT) methods to assess concrete quality. 5. Identify and analyse special types of concrete and their mix design principles (e.g., high strength, lightweight, foamed, and aerated concretes). 6. Assess the sustainability aspects of concrete, including life cycle assessment (LCA), green building materials, and carbon footprint. 7. Integrate sustainability principles into material selection and concrete design.
Indicative Contents المحتويات الإرشادية	1. Introduction to concrete technology; properties of fresh and hardened concrete 2. Field adjustments and workability of concrete 3. Elasticity of concrete 4. Shrinkage and creep in concrete 5. Durability of concrete 6. Importance and methods of concrete curing 7. Bond strength between steel and concrete – pull-out test 8. Non-destructive testing (NDT) of concrete 9. Mid-term exam 10. High strength concrete – mix design 11. Lightweight aggregate concrete – mix design 12. Foamed and aerated concrete – mix design 13. Sustainability in concrete production 14. Green building materials, life cycle assessment (LCA), and carbon footprint 15. Integration of sustainability principles into concrete design

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	To ensure effective learning, a combination of theoretical instruction, practical applications, and interactive activities will be employed. The following strategies will be used: **1. Lectures and Interactive Discussions** • **Objective:** Provide foundational knowledge on concrete materials, properties, and design principles. • **Approach:** Use PowerPoint presentations, real-world examples, and case studies to explain key concepts. • **Engagement:** Encourage students to ask questions, participate in discussions, and share experiences related to concrete applications. **2. Laboratory Experiments and Practical Demonstrations** • **Objective:** Reinforce theoretical knowledge through hands-on experience with concrete materials and testing methods. • **Approach:** Conduct lab sessions on fresh and hardened concrete properties, mix design, and in-situ testing. • **Engagement:** Assign students to small groups for conducting experiments and interpreting results. **3. Field Visits and On-Site Observations** • **Objective:** Provide real-world exposure to concrete construction, testing, and quality control. • **Approach:** Arrange visits to construction sites, batching plants, and material testing labs. • **Engagement:** Require students to prepare field reports and presentations based on their observations. **4. Problem-Based Learning (PBL) and Case Studies** • **Objective:** Develop critical thinking and problem-solving skills in concrete engineering. • **Approach:** Present real-world challenges such as concrete mix failures, structural cracks, or durability issues. • **Engagement:** Assign students to analyze cases, propose solutions, and justify their recommendations. **5. Group Projects and Mini-Research Assignments** • **Objective:** Encourage teamwork, research skills, and innovation in concrete applications. • **Approach:** Assign projects such as optimizing concrete mix designs, evaluating sustainability aspects, or developing special types of concrete. • **Engagement:** Require students to present findings in reports and presentations. **6. Continuous Assessment and Feedback** • **Objective:** Monitor student progress and provide timely guidance.

	• **Approach:** Use quizzes, online assessments, and peer reviews to reinforce learning. • **Engagement:** Provide detailed feedback and hold one-on-one discussions for improvement.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	59	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	56	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #3 and #5, #7
	Assignments	2	10% (10)	2 and 12	LO #2 and #4, #6
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #1 - #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to concrete technology, fresh concrete, hardened concrete, and field adjustment
Week 2	Demonstrates knowledge about Elasticity of concrete
Week 3	Demonstrates knowledge about Shrinkage and Creep of concrete
Week 4	Demonstrates knowledge about Durability of concrete
Week 5	Demonstrates knowledge about Importance of curing, and Methods of curing concrete
Week 6	Demonstrates knowledge about measuring the bond strength of steel with concrete using a pull-out test
Week 7	Non-destructive test of concrete
Week 8	Non-destructive test of concrete
Week 9	Mid-term exam
Week 10	Special types of concrete: High strength concrete, Mix design
Week 11	Special types of concrete: Lightweight aggregate concrete , Mix design
Week 12	Special types of concrete: Foamed and aerated concrete , Mix design
Week 13	Sustainability of concrete, Green building materials, life cycle assessment and carbon footprint.
Week 14	Sustainability of concrete, Green building materials, life cycle assessment and carbon footprint.
Week 15	Sustainability of concrete, Green building materials, life cycle assessment and carbon footprint.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Preparation of concrete specimens.
Week 2	Lab 2: Static Modulus of Elasticity test of concrete.
Week 3	Lab 3: Shrinkage test of mortar and concrete.
Week 4	Lab 4: Density, Adsorption and Voids ratio test of concrete.

Week 5	Lab 5: Density, Adsorption and Voids ratio test of concrete.
Week 6	Lab 6: Pull out test .
Week 7	Lab 7:Ultrasonic pulse velocity test of concrete.
Week 8	Lab 8: Hummer test of Concrete.
Week 9	**Mid term exam**
Week 10	Lab 10: Mix design of High strength concrete and conducting the learned tests in this course.
Week 11	Lab 11: Mix design of High strength concrete and conducting the learned tests in this course
Week 12	Lab 12: Mix design of Lightweight aggregate concrete and conducting the learned tests in this course
Week 13	Lab 13: Mix design of Lightweight aggregate concrete and conducting the learned tests in this course
Week 14	Lab14: Mix design of foamed concrete and conducting the learned tests in this course.
Week 15	Lab 15: Mix design of foamed concrete and conducting the learned tests in this course.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Engineering Concrete, Mix Design and Test Methods, Irving Kett, 2000. Advanced Concrete Technology, John Newman Ban Seng Choo, 2003 High Performance Concrete, P.-C.Aitcin, 2004. Concrete Technology, Theory and Practice, M.S. SHETTY , 2005 Properties of concrete, Nivelle, 2011	No
Recommended Texts	ASTM, Standard, 2020	Yes
Websites	https://www.astm.org/products-services/bos.html	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية			
Module Title	FUNDAMENTALS OF REINFORCED CONCRETE	**Module Delivery**	
Module Type	**Core**	☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BCE 302**		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	**Semester of Delivery**	1
Administering Department	BCE	**College**	TEC
Module	**Dr. Ammar Abduljabar**	**e-mail**	ammarabduljabar@ntu.edu.iq

Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	13/10/2023	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	To develop an understanding of performance and design methodology for basic reinforced concrete structural elements.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Determine the static and kinematic indeterminacy of beam, truss and frame. • Analyze propped cantilevers, fixed and continuous beams • Analyze indeterminate beams, pin and rigid jointed structures with and without temperature effect. • Understand the concepts of slope deflection method for beams and portal frame. • Analyze continuous beams and portal frame using moment distribution method • Draw influence line diagrams for determinate and indeterminate beams.
Indicative Contents المحتويات الإرشادية	1. **Materials Used and Their Characteristics** o Types of concrete and reinforcement materials. o Properties of concrete and steel reinforcement. o Interaction between concrete and steel in structural elements. 2. **Methods of Analysis and Design** o Fundamental principles of structural analysis. o Limit state design vs. working stress method. o Load and resistance factors in reinforced concrete design. 3. **Analysis and Design Using Moment Coefficients** o Application of moment coefficients in beam design. o Simplified analysis for continuous beams and slabs. o Practical examples of moment coefficient-based design. 4. **Design of Shear** o Shear forces in reinforced concrete structures.

	○ Shear reinforcement (stirrups and inclined bars). ○ Shear failure mechanisms and design calculations. 5. **Design of Torsion** ○ Behavior of reinforced concrete members under torsion. ○ Design of torsional reinforcement. ○ Combined effects of bending, shear, and torsion. 6. **Serviceability of One-Way Slabs and Beams** ○ Deflection control and permissible limits. ○ Crack width limitations and durability considerations. ○ Reinforcement detailing for serviceability. 7. **Cohesion Stresses and Development Length** ○ Bond between concrete and reinforcement. ○ Development length and anchorage requirements. ○ Splicing and lap length considerations. 8. **Design of Short Columns** ○ Behavior of short columns under axial and eccentric loads. ○ Design principles for reinforced concrete columns. ○ Column interaction diagrams and failure modes.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities Preliminary & Further Assignment (Homework),) Seminar, Implementation/Application/Practice Final Exam Preparation for the Final Exam Mid-Term Exam Preparation for the Mid-Term Exam Short Exam and Preparation for the Short Exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	73	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية

		Time/Numbe	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative	**Quizzes**	8		5 and 10	LO #1 - #6
	Assignments	10		2 and 12	LO #1 - #6
Summative	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
1,2	• **Demonstrates knowledge about Analysis of the structures:** • Loads, Load combinations, Safety provisions of the ACI code, Analysis of beams and frames, ACI moment coefficients, Arrangement of live load.
3	• **Demonstrates knowledge about Materials**: • Properties of concrete in compression, Modulus of elasticity, Stiffness, Properties of concrete in tension, Shrinkage and Temperature effects, Reinforcing steels for concrete.
4, 5,6, 7	• **Demonstrates knowledge about Flexural analysis and design of beams:**

	• Behavior of reinforced concrete beam, tension-reinforced beams analysis, Design of rectangular beams, Design aids, and Practical considerations in beams design, rectangular beam with tension and compression reinforcement, T-beams.
8,9	• **Demonstrates knowledge about Shear and diagonal tension in beams:** • Inhomogeneous elastic beams with diagonal tension, ACI code requirements for shear design, reinforced concrete beams without shear reinforcement, reinforced concrete beams with web reinforcement deep beams and the effect of axial forces
10,11	• **Demonstrates knowledge about Bond, Anchorage and development length:** • Flexural bond fundamentals, Bond strength and development length, ACI-code specifications for tension reinforcement development, tension bars anchorage by hooks, Compression development of bars, Bar cutoff and bend points in beams, as well as bar splices.
12,13	• **Demonstrates knowledge about Short columns:** • Compression along an axis, spirals and lateral ties rectangular column compression and bending Analysis of strain compatibility and interaction diagrams Columns that are round, ACI-code requirements for column design, design tools, bending in both directions, the load contour method
14,15	• **Demonstrates knowledge about Serviceability:** • Flexural member cracking, ACI-code provisions for crack control, deflection control, immediate deflections, and long-term load deflections ACI-code provisions for deflection control, including deflections caused by shrinkage and temperature variations.

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts		
Recommended		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks**	**Definition**
Success	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
(50 - 100)	**E** - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**F** – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	STRUCTURAL ANALYSIS			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BCE 303**				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	3		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	

Module	**Muthana Adel Najim**	**e-mail**	abbu@ntu.edu.iq
Module Leader's Acad. Title	Assis. Prof	**Module Leader's Qualification**	PhD
Module Tutor		**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	14/10/2024	**Version Number**	2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The course will help the students understand the concepts of indeterminacy of structural elements, analysis of the structures, drawing shear force and bending moment diagrams.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Determine the static and kinematic indeterminacy of beam, truss and frame. • Analyze propped cantilevers, fixed and continuous beams • Analyze indeterminate beams, pin and rigid jointed structures with and without temperature effect. • Understand the concepts of slope deflection method for beams and portal frame. • Analyze continuous beams and portal frame using moment distribution method • Draw influence line diagrams for determinate and indeterminate beams.
Indicative Contents المحتويات الإرشادية	**1. Stability and Determinacy of Structures** • Definition of stability and determinacy • Conditions for static and kinematic stability • External and internal determinacy • Equilibrium equations and degree of static indeterminacy

	• Examples of stable, unstable, determinate, and indeterminate structures **2. Statically Determinate Rigid Frames** • Characteristics of statically determinate frames • Analysis using equilibrium equations • Reactions and internal force calculations • Support conditions and their impact on determinacy • Real-world applications of rigid frames **3. Statically Determinate Trusses** • Definition and classification of trusses • Assumptions in truss analysis • Methods of analysis: Method of joints and method of sections • Zero-force members and their identification • Practical applications in bridges and roof structures **4. Virtual Work and Unit Load Method for Elastic Deformation: Beams and Frames** • Concept of virtual work and principle of virtual forces • Application of unit load method to determine deflections • Energy methods in structural analysis • Calculation of deflections and rotations in beams and frames • Work-energy relations in structures **5. Method of Virtual Work: Trusses** • Application of virtual work principles in truss analysis • Calculation of nodal displacements and member deformations • Compatibility conditions in trusses • Examples and step-by-step solution approach **6. Approximate Analysis of Statically Indeterminate Structures: Frames** • Need for approximate methods in structural analysis • Assumptions in approximate analysis • Portal method and cantilever method • Comparison with exact methods • Practical applications in multi-story buildings **7. Analysis of Statically Indeterminate Structures by the Method of Consistent Deformations** • Principle of consistent deformations • Compatibility equations and redundant forces • Application to beams, trusses, and frames • Stepwise solution approach • Examples and practical considerations **8. Analysis of Statically Indeterminate Structures by the Method of Slope Deflection** • Introduction to slope-deflection equations • Assumptions and limitations • Application to beams and frames • Calculation of moments, rotations, and deflections • Example problems and real-world applications **9. Displacement Method of Analysis: Moment Distribution** • Introduction to the moment distribution method • Fixed-end moments and distribution factors

	• Successive approximations and convergence • Application to continuous beams and frames • Practical significance and limitations

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture & In-Class Activities • Preliminary & Further • Assignment (Homework),) Seminar, Implementation/Application/Practice • Final Exam • Preparation for the Final Exam • Mid-Term Exam • Preparation for the Mid-Term Exam • Short Exam and • Preparation for the Short Exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	73	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Numbe	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative	**Quizzes**	8			LO #1, #2 and #6
	Assignments	6			LO #3, #4 and #6
	Seminar	1			All
	Midterm Exam	2hr	10% (10)	7	LO #1 - #4

Summative	**Final Exam**	3hr	50% (50)	16	ALL
Total assessment			100% (100		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
1	**Demonstrates knowledge about Introduction:** Definition of engineering structures, Classification of engineering structures • Forces applied on engineering structures, Types of loads and supports.
2	**Demonstrates knowledge about Stability and determinacy of structures:** • Method used for stability of engineering structure, Stability and determinacy of beams. Stability and determinacy of trusses, Stability and determinacy of rigid frames.
3&4	**Demonstrates knowledge about Statically determinate beams** • Application of the Equations of Equilibrium, Statically determinate rigid frames. Application of the Equations of Equilibrium, statistically determined Trusses, Common forms of trusses, The joint method, Members of the Zero-Force, The sectional method, Complex trusses and Compound trusses.
5&6	**Demonstrates knowledge about Influence line for statically determinate structures:** • Influence line for beams, Qualitative influence lines. Influence line for beams, Influence line for floor girders, Influence line for trusses.
7	**Demonstrates knowledge about:** • Moving concentrated loads, Maxima criterion Maximum bending moment absolute0
8	**Demonstrates knowledge about approximate analysis for statically indeterminate structures:** • Vertical loads on building frames and **Lateral loads** on building frames: (Portal method).

9&10	**Demonstrates knowledge of deflection using energy methods of structures:** (Beams, Truss, Rigid frames), External work and strain energy, Work and energy principal, Virtual work principal (Virtual work method): Trusses, Virtual Work Method: Beams and Frames.
11&12	• Slope-deflection method for statically indeterminate beams and rigid frames without joint translation.
13&14&15	**Demonstrate knowledge about the moment distribution method:** • Fixed-end situations (FEMs), Distribution factor, Member stiffness factor, Joint stiffness factor (DF), relative stiffness factor of members, Factor of carry-over, Modified stiffness factor, Modification of the stiffness factor, moment distribution for beams, Moment distribution for frames without joint translation.

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks**	**Definition**
Success	**A** – Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
(50 - 100)	**E** – Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**F** – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**SOIL MECHANICS**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**BCE 304**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	3		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	
Module Leader	**Dr. Harith Ibrahem**		**e-mail**	harithali@ntu.edu.iq	
Module Leader's Acad. Title	Assis. Prof		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The student should understand the nature of soil, its formation, classification and engineering properties. The student should also know the behavior of soil under stresses, the effect of water flowing inside the soil, the using of soil as a construction material. The different methods used for testing the soil in laboratory and field should also be given to the student.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students will be able to: **1. Soil Formation, Classification, and Geotechnical Properties** • Demonstrate a fundamental understanding of soil formation processes, including rock erosion and weathering. • Differentiate between residual and transported soils and describe their engineering significance. • Identify the types of soil based on their geological origin and physical characteristics. • Classify soils using standard classification systems such as USCS and AASHTO. **2. Rock Types and Their Influence on Soil Formation** • Recognize the three main rock types (sedimentary, igneous, metamorphic) and their contribution to soil formation. • Explain the engineering properties of different rock types and their influence on soil behavior. **3. Geotechnical Index and Strength Properties** • Analyze grain size distribution and its effect on soil grading and compaction. • Identify clay minerals and their role in soil plasticity, shrink-swell behavior, and shear strength. • Understand the weight-volume relationship in soil and apply fundamental equations to determine soil properties. • Perform laboratory and field tests to evaluate soil compaction characteristics. **4. Hydraulic Properties of Soils** • Define permeability and its role in soil behavior under seepage conditions. • Conduct permeability tests in both laboratory and field settings to determine hydraulic conductivity. • Apply Darcy's Law to calculate seepage velocity and flow rates through soils. **5. Seepage and Flow through Soils** • Analyze one-dimensional and two-dimensional flow in soil structures using flow net analysis. • Evaluate the risks of piping, boiling, and seepage failure in earth structures. • Develop solutions to mitigate seepage-related failures in embankments, dams, and foundations. **6. Stress Distribution in Soils** • Explain the principles of total stress, effective stress, and pore water pressure. • Calculate effective stress under different loading conditions and its impact on soil strength and stability. • Apply effective stress principles in geotechnical engineering applications such as consolidation and slope stability.
Indicative Contents المحتويات الإرشادية	**1. Knowledge of Soil Formation, Deposits, and Types of Soil** • Definition of soil and its engineering significance

	• Soil formation processes: Weathering and rock erosion • Types of soil deposits: Residual vs. transported soils • Organic soils and their characteristics • Classification of soils based on origin, grain size, and composition **2. Soil Formation by Rock Erosion** • Physical and chemical weathering processes • Factors affecting rock erosion and soil formation • Role of climate, topography, and time in soil development **3. Residual and Transported Soils, Organic Soils** • **Residual soils**: Formation, characteristics, and engineering properties • **Transported soils**: Types based on mode of transport (colluvial, alluvial, aeolian, glacial) • **Organic soils**: Peat and other organic deposits, their behavior and challenges in construction **4. Types of Rocks: Sedimentary, Igneous, and Metamorphic** • Formation and classification of rocks • Engineering properties and relevance to geotechnical engineering • Examples of each rock type and their influence on soil formation **5. Identification of Geotechnical Properties** • Index properties: Grain size distribution, Atterberg limits, specific gravity • Strength properties: Shear strength, compressibility, and consolidation • Factors affecting geotechnical properties **6. Formation of Natural Sedimentation and Grain Size Distribution** • Sedimentation processes and their impact on soil structure • Grain size distribution curve and its significance • Soil gradation: Well-graded vs. poorly graded soils **7. Clay Minerals and Soil Classification** • Types of clay minerals: Kaolinite, montmorillonite, illite • Effect of clay minerals on soil behavior • Unified Soil Classification System (USCS) and AASHTO classification **8. Weight–Volume Relationship and Soil Compaction** • Definitions: Water content, void ratio, degree of saturation, porosity • Phase relationships in soil mechanics • Principles and methods of soil compaction • Standard and modified Proctor tests **9. Identification of Hydraulic Properties: Permeability (Field & Lab)** • Definition and importance of permeability in soil engineering • Darcy's Law and coefficient of permeability • Laboratory permeability tests (constant head, falling head) • Field tests for permeability (pumping test, borehole permeability test) **10. Continuous Flow and One- & Two-Dimensional Flow** • Fundamentals of seepage and groundwater movement • **One-dimensional flow**: Permeability in stratified soils • **Two-dimensional flow**: Seepage through embankments and dams • Flow net analysis: Importance and construction • Piping and boiling phenomena in soil **11. Principles of Effective Stress**

	• Concept and significance of effective stress in soil mechanics • Relationship between total stress, pore water pressure, and effective stress • Effect of effective stress on soil strength and consolidation **12. Total Stress, Effective Stress, and Pore Water Pressure** • Definition of total stress and its components • Role of pore water pressure in soil behavior • Effective stress equation and its engineering applications • Variation of pore water pressure under different loading conditions

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture & In-Class Activities • Laboratory • Assignment (Homework) • Seminar • Report Writing • Final Exam • Preparation for the Final Exam • Mid-Term Exam • Preparation for the Mid-Term Exam • Short Exam and • Preparation for the Short Exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	66	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	34	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
As		**Time/Numbe**	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative	**Quizzes**	4			LO #1 - #3, LO #4 - #6
	Assignments	4			LO #1 - #2,

					LO #3 - #4,
	Seminar	2			LO #2 - #3, LO #4 -
	Report	7			LO #1 - #6
Summative	**Midterm Exam**	2hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
1	Demonstrates knowledge about soil formation, Their deposits, Types of soil.
2	Demonstrates knowledge about: • formation by rock erosion, • Residual & transported soils, Organic soils, Types of rocks sedimentary igneous & metamorphic rocks.
3,4	Able to identify geotechnical properties.
4,5,6,7	Demonstrates knowledge about**:** • Formation of natural sedimentation, Grain size distribution, • Clay minerals, Soil classification, Weight– volume relationship, Soil compaction
8,9	Able to identify hydraulic properties, Permeability field & LAB
10,11	Able to identify continuous flow, One & two dimensional (Flow, Flow net, Piping or boiling).

12,13,14,1	Demonstrates knowledge about: • Principles of effective stress. • Total stress. • Effective stress. Pure water pressure

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks**	**Definition**
Success	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
(50 - 100)	**E -** Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**F** – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية				
Module Title	PAVEMENT ENGINEERING		**Module Delivery**	
Module Type	**Core**		☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**BCE 305**			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	3	**Semester of Delivery**	1	
Administering Department	BCE	**College**	TEMO	

Module Leader	Dr. Zaid Hazim Al-Saffar	**e-mail**	Zaid.alsaffar@ntu.edu.iq
Module Leader's Acad. Title		**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	14/10/2024	**Version Number**	2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The student must learn the geometrical engineering design of highways, The structural design of flexible & rigid pavements. The student must learn also, All the site works that may be needed for road construction & maintenance of pavements. The student can be able to accomplish the important tests of soil layers, asphalt and concrete pavements as well as he will have an important information about airport & railway engineering.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**Module Learning Outcomes** 1. **Understand Pavement Fundamentals**: Demonstrate knowledge of the introduction and description of pavements, their functional requirements, and the various types and uses. 2. **Soil Analysis**: Apply AASHTO classification for soil, conduct soil surveys for highway construction, and utilize geophysical methods of soil exploration, including Ground Penetrating Radar (GPR). 3. **Soil Compaction Techniques**: Evaluate soil compaction methods, determine optimum moisture content, and apply field compaction procedures. 4. **Soil Stabilization**: Demonstrate knowledge of soil stabilization techniques using cement, asphalt, lime, and polymer-based solutions, and understand geogrid selection and installation.

	5. **Asphalt Materials Knowledge**: Identify types, characteristics, and uses of asphaltic materials, including classification, refining processes, and composition. 6. **Mix Design and Implementation**: Effectively implement various asphalt mixtures (hot, warm, cold) and conduct asphalt content determination using Marshal and Superpave methods.
Indicative Contents المحتويات الإرشادية	• **Introduction to Pavements**: Description, functional requirements, types, and applications. • **Earthworks**: Sub-grade, subbase, and base works. • **Soil Classification**: AASHTO classification system and its application in highway construction. • **Soil Exploration Methods**: Geophysical methods, Ground Penetrating Radar (GPR) principles, and advantages. • **Soil Compaction**: Concepts of optimum moisture content, compacting effort, field procedures, and California Bearing Ratio (CBR) testing. • **Soil Stabilization**: Techniques using cement, asphalt, lime, polymer solutions, and geogrid applications. • **Asphaltic Materials**: Types, characteristics, classification, refining processes, and properties. • **Cutback and Emulsion**: Types, characteristics, applications, and specifications for prime and tack coats. • **Asphalt Mixtures**: Knowledge of hot, warm, and cold mix designs, job mix preparations in labs and plants, and field applications.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture & In-Class Activities • Preliminary & Further Study • Laboratory • Assignment (Homework) • Seminar • Report Writing • Final Exam • Preparation for the Final Exam • Mid-Term Exam • Preparation for the Mid-Term Exam • Short Exam and • Preparation for the Short Exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	66	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	34	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5		5 and 10	LO #1, #3 and #6
	Assignments	4		2 and 12	LO #2, #4 and #5
	seminar	3		Continuous	All
	Report	4		13	LO #3, #4 and #6
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1	Introduction and Description of Pavements, Functional Requirements, Types and Uses of Pavements, earthworks (Sub-grade and Subbase works, base works)

2,3	AASHTO classification for soil, Soil surveys for highway construction, Geophysical Methods of Soil Exploration, Ground Penetrating Radar (GPR): Principles and advantages
4	Soil Compaction, Optimum Moisture Content, Compacting Effort, Field Compaction Procedures, California Bearing Ratio (CBR)
5,6	Soil stabilization (stabilized by cement, asphalt, lime, Polymer-based water solutions), Geogrid (Types of Geogrids: Key Considerations for Geogrid Selection and Installation), Frost Action in Soils
7,8	Asphaltic materials, descriptions, types, characteristics, uses. Classification or Source of Asphalt, Refining Processes, Asphalt Composition, Properties of Asphalt Materials
9,10	Cutback and emulsion, types, characteristics and uses, Prime and tack coats (specifications, applications), Rate of Curing
11,12	Demonstrates knowledge and correctly implement asphalt mixtures (Hot, warm and Cold) mix
13, 14,15	Monitors and conducts asphalt content determination (Marshal and Superpave), Job mix, preparations in laboratory and plants, applications in the fields.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
1,2	Embankments and filling, natural and fill subgrade, subbase, soil stabilization (sampling according to SORB)
3	Penetration test of bitumen
4	Softening point test of bitumen
5	Ductility test of bitumen
6	Specific gravity test of bitumen
7	Solubility test of bitumen
8	Site visit to asphalt plant
9	Prime coat and tack coat (test and sampling)
10,11,12	Marshall mix design
13	Indirect tensile strength and moisture damage tests
14,15	Site visit to pavement works location

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Traffic and Highway Engineering, Fourth Edition** Nicholas J. Garber and Lester A. Hoel	No
Recommended Texts	**Hot Mix Asphalt Materials, Mixture Design and Construction"** by Roberts et al. **Pavement Analysis and Design"** by Yang H. Huang **Asphalt Pavements: A Practical Guide to Design, Production and Maintenance"** by Patrick Lavin	No
Journals	**Transportation Research Record (TRR)** **International Journal of Pavement Engineering** **Journal of Materials in Civil Engineering (ASCE)** **Construction and Building Materials (Elsevier)**	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	ENGINEERING ANALYSIS			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BCE 306**				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level		3	**Semester of Delivery**		1
Administering Department		BCE	**College**	TEMO	
Module Leader	**Huda Saad**		**e-mail**	Huda_saad@ntu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Master
Module Tutor			**e-mail**		
Peer Reviewer Name		Name	**e-mail**		

Scientific Committee Approval Date	14/10/2024	**Version Number**	2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course aims to equip students with the fundamental knowledge and practical skills required to analyze and solve ordinary and partial differential equations, with a particular focus on applications in structural and construction engineering. The primary objectives include: 1. **Understanding the theoretical foundations** of ordinary and partial differential equations. 2. **Analyzing and solving linear differential equations** of second and higher orders using methods such as the undetermined coefficient method and integration techniques. 3. **Applying ordinary differential equations (ODEs)** to engineering problems, including beam and column analysis, beam-columns, beams on elastic foundations, and forced oscillations in dynamic analysis. 4. **Identifying and implementing singular functions**, such as the unit step function, unit impulse function, and unit moment function, in mathematical modeling. 5. **Correctly executing integration methods** to solve ODE applications related to beam analysis. 6. **Understanding Fourier series** and Euler formulas, and applying Fourier expansions (full-range and half-range) to solve construction engineering problems. 7. **Demonstrating knowledge of partial differential equations (PDEs)** and correctly applying them to solve one-dimensional wave equations, free longitudinal and transverse beam vibrations, one-dimensional heat

	equations, consolidation equations, and two-dimensional Laplace equations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this course, students will be able to: 1. **Demonstrate knowledge** of fundamental concepts in ordinary differential equations, including linear differential equations, homogeneous equations, and general solutions. 2. **Solve initial value problems** for homogeneous linear differential equations of any order using various techniques. 3. **Apply the undetermined coefficient method** to solve non-homogeneous differential equations in engineering applications such as structural dynamics and beam analysis. 4. **Model engineering problems** involving beams, columns, beam-columns, and elastic foundations using differential equations. 5. **Use singular functions effectively**, including unit step functions, unit impulse functions, and unit moment functions, in engineering applications. 6. **Analyze and solve** problems involving Fourier series, including Euler formulas, expansions for arbitrary periods (2L), and odd/even function representations. 7. **Implement Fourier series applications** in structural engineering, including vibration analysis and response predictions. 8. **Demonstrate proficiency in solving PDEs**, including wave equations, beam vibration equations, heat transfer equations, consolidation equations, and Laplace's equation in two dimensions.

Indicative Contents
المحتويات الإرشادية
	I. Ordinary Differential Equations (ODEs)
	
	• Introduction to ordinary differential equations (ODEs)
	• Linear differential equations: second-order and higher
	• Homogeneous linear equations and their general solutions
	• Initial value problems and solutions for higher-order ODEs
	• ODEs with constant coefficients
	• Non-homogeneous equations and the method of undetermined coefficients
	
	II. Applications of ODEs in Engineering
	
	• Structural applications of ODEs:
	  ○ Beams and columns
	  ○ Beam-columns
	  ○ Beams on elastic foundations
	• Dynamic analysis and forced oscillations

	III. Singular Functions and Their Applications • Unit step function • Unit impulse function • Unit moment function **IV. Fourier Series and Its Applications** • Introduction to Fourier series • Euler formulas and Fourier series for different periods • Expansions for odd and even functions • Half-range expansions • Applications of Fourier series in construction engineering **V. Partial Differential Equations (PDEs)** • One-dimensional wave equations • Free longitudinal vibration of beams • Free transverse vibration of beams • One-dimensional heat equation • Consolidation equation • Two-dimensional Laplace equation

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture & In-Class Activities • Assignment (Homework) • Seminar • Final Exam • Preparation for the Final Exam • Mid-Term Exam • Preparation for the Mid-Term Exam • Short Exam and • Preparation for the Short Exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	54	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	6		5 and 10	LO #2, #4 and #6
	Assignments	10		2 and 12	LO #3, #4 and #6, #7
	Seminar	3		Continuous	All
	Report	4		13	LO #3, #5 and #5
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1	Introduction and Description of Pavements, Functional Requirements, Types and Uses of Pavements, earthworks (Sub-grade and Subbase works, base works)
1&2	Demonstrates knowledge about ordinary differential equations, liner differential equations, homogeneous linear equations of the second order, general solution. Basis initial value problem, homogeneous linear differential equations of arbitrary order n, equations of order with constant coefficients, non-homogeneous equations solving by the method of undetermined coefficient.
3&4&5	Uses correctly the applications of O.D.E of undetermined coefficient method in: beam & column, beam-column, beam on elastic foundation, modeling: forced oscillation (dynamics analysis).

6	Able to identify and implement singular function: unit step function, unit impulse function, unit moment function.
7&8	Correctly execute the applications of O.D.E of integration method in beams.
9&10&11	Correctly execute Fourier series, Euler formulas, Fourier series for any period (2L), odd and even functions, Half – rang expansion, applications of Fourier series in construction engineering.
12&13&14,15	Demonstrates knowledge and correctly execute Partial differential equations, one dimensional wave equation, free longitudinal vibration of beam, free transverse vibration of beam, one dimensional heat equation, consolidation equation, two dimensional Laplace equation.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Advanced engineering mathematics / Erwin kreyszig	
Recommended Texts	Applied mathematics for engineering & physicists / pipes & harvill	
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	MASONRY BUILDINGS			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**BCE 307**				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	3		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	**Jasim M. Abed**		**e-mail**	jasimabd@ntu.edu.iq	
Module Leader's Acad. Title	**Assist. Prof**		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The course aims to: • Introduce different types of masonry materials and their mechanical properties, including strength, durability, and aesthetic considerations. • Develop an understanding of load-bearing capacity and deformation analysis in masonry structures. • Provide fundamental principles for designing reinforced masonry walls, columns, and beams to enhance structural performance.

	• Equip students with the skills to estimate the quantity of masonry units and mortar required for construction projects. • Train students in assessing the condition of existing masonry structures and identifying potential structural deficiencies. • Explore specialized topics such as confined masonry, infill masonry in reinforced concrete frames, and advanced assessment techniques for aging masonry buildings.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the course, students will be able to: **Types of Masonry Materials and Their Properties** • Identify different masonry materials, including bricks, stones, and blocks. • Evaluate masonry materials based on strength, durability, and visual appeal. **Mechanical Properties of Masonry: Calculating Strength and Stiffness** • Analyze the mechanical behavior of masonry under various loading conditions. • Calculate the strength, stiffness, and deformation characteristics of masonry elements. **Design of Reinforced Masonry Walls, Columns, and Beams** • Apply design principles to reinforced masonry structural components. • Ensure compliance with safety standards and durability requirements. **Quantity Estimation of Masonry Units and Mortar for Construction Projects** • Calculate the quantity of bricks, blocks, and mortar required for masonry construction. • Develop cost-effective material estimation techniques for project planning. **Condition Assessment of Existing Masonry Structures** • Conduct structural evaluations of masonry buildings to identify deficiencies. • Recommend appropriate maintenance and rehabilitation measures. **Special Topics - Confined Masonry and Infill Masonry** • Understand the role of confined masonry in seismic-resistant construction. • Analyze the behavior of masonry infill in reinforced concrete frames. **Special Topics - Assessment of Existing Masonry Structures (Parts I, II, III)** • Apply assessment techniques to evaluate the stability and integrity of aging masonry structures. • Develop strategies for rehabilitation, strengthening, and retrofitting based on assessment results.
Indicative Contents المحتويات الإرشادية	**Types of Masonry Materials and Their Properties** • Classification of masonry materials (bricks, stones, blocks). • Strength and durability characteristics of different masonry types. • Aesthetic and functional considerations in material selection. • **Mechanical Properties of Masonry: Calculating Strength and Stiffness**

	• Stress-strain behavior of masonry materials. • Load-bearing capacity and failure modes. • Methods for analyzing stiffness and deformation. **Design of Reinforced Masonry Walls, Columns, and Beams** • Design principles for reinforced masonry structural elements. • Load distribution and reinforcement techniques. • Case studies on masonry design applications. **Quantity Estimation of Masonry Units and Mortar for Construction Projects** • Material estimation methods for masonry structures. • Calculation techniques for bricks, blocks, and mortar. • Optimizing material usage for cost efficiency. **Condition Assessment of Existing Masonry Structures** • Structural evaluation methodologies. • Identifying cracks, material degradation, and structural distress. • Rehabilitation techniques for masonry buildings. **Special Topics - Confined Masonry and Infill Masonry** • Principles and applications of confined masonry. • Performance of masonry infill walls in RC frames. • Seismic considerations in confined masonry structures. **Special Topics - Assessment of Existing Masonry Structures (Parts I, II, III)** • Advanced assessment techniques for old masonry structures. • Use of non-destructive testing methods. • Strategies for retrofitting and strengthening aging masonry buildings. • This course will provide students with both theoretical knowledge and practical skills in masonry construction, design, assessment, and rehabilitation.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture & In-Class Activities • Assignment (Homework) • Seminar • Final Exam • Preparation for the Final Exam • Mid-Term Exam • Preparation for the Mid-Term Exam • Short Exam and • Preparation for the Short Exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	68	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	82	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	8		5 and 10	LO #1 - #3, LO #4 - #6
	Assignments	8		2 and 12	LO #1 - #2, LO #3 - #4,
	Projects / Lab.			Continuous	LO #2 - #3, LO #4 -
	Report	1		13	LO #1 - #6
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Types of Masonry Materials and Their Properties
Week 2	Identification and evaluation of masonry materials such as bricks, stones, and blocks, focusing on strength, durability, and appearance.
Week 3	Mechanical Properties of Masonry: Calculating Strength and Stiffness
Week 4 Week 5	Methods to analyze and calculate the load-bearing capacity and deformation of masonry elements.
Week 6 Week 7	Design of Reinforced Masonry Walls, Columns, and Beams
Week 8	Principles of designing structural masonry elements for enhanced strength and durability.
Week 9	Quantity Estimation of Masonry Units and Mortar for Construction Projects
Week 10 Week 11	Techniques for calculating the required materials for efficient project planning.
Week 12	Condition Assessment of Existing Masonry Structures
Week 13,14,15	Confined Masonry, Infill Masonry, Special Topics - Masonry Infill in RC Frames • Special Topics - Assessment of Existing Masonry Structures • Special Topics - Assessment of Existing Masonry Structures Part - II Special Topics - Assessment of Existing Masonry Structures Part - III

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**CONSTRUCTION MANAGEMENT**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**BCE 308**				
ECTS Credits	**5**				
SWL (hr/sem)	125				
Module Level		3	**Semester of Delivery**		2
Administering Department		BCE	**College**	TEMO	
Module Leader	**Mohammed Adnan**		**e-mail**	mbasher@ntu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		14/10/2024	**Version Number**		2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• To establish an understanding of how construction industry operates including the project life cycle and participants involved. To introduce the principles of project management and its functions. • To provide the students with essentials of construction management including procurement, planning, estimating, and scheduling.

	• To familiarize students with measuring and managing performance in construction. • To present and discuss some tools to improve performance at project and organizational level. • To increase the awareness of students on the emerging issues and advanced processes in construction.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• An ability to function on multi-disciplinary teams. • An ability to identify, formulate and solve engineering problems. • An ability to communicate effectively. • The broad education necessary to understand the impact of engineering solutions in a global and societal context. • A recognition of the need for as well as ability to engage in life-long learning. • A knowledge of contemporary issues. An ability to use the techniques, skills and modern engineering tools necessary for engineering.
Indicative Contents المحتويات الإرشادية	**1. Introduction to the Course** • Overview of construction management as a discipline. • The role of construction management in the industry. • The characteristics of the construction sector at domestic and global levels. • The structure of the course and key learning objectives. **2. Construction Project Management** • Definition and nature of construction projects. • The project life-cycle and its phases. • Principles and functions of project management. • Key stakeholders in construction project management. **3. Construction Cost Estimation and Bidding** • Importance of planning and design in project cost estimation. • Project scope management and cost estimation techniques. • Elements of cost estimation and budgeting. • Bidding process and contractor selection strategies. **4. Construction Project Planning and Scheduling** • Introduction to scheduling and its significance in project management. • Work breakdown structure (WBS) and its role in project planning. • Scheduling techniques: Gantt charts, network diagrams, and PERT. • The Critical Path Method (CPM) for project scheduling. • Resource allocation and management. • Project crashing and time-cost trade-offs. **5. Construction Procurement** • Fundamentals of investment in construction projects. • Financing strategies for construction projects. • Procurement methods and strategies. • Comparison of project delivery methods. • Contract types and risk-sharing mechanisms. • National and international construction contracts. • Contract administration and claims management.

	6. Performance Measurement in Construction • Definition and importance of performance measurement. • Common performance issues in construction projects. • Factors affecting project success. • Industry reports and construction performance benchmarks. • Key performance indicators (KPIs) and their applications. **7. Improving Project and Organizational Performance in Construction** • Benchmarking best practices for construction management. • Risk management strategies for minimizing project uncertainties. • Financial management techniques in construction projects. • Dispute resolution and claims management approaches. • Effective human resources management in construction teams. • Knowledge management and innovation in construction. • Total quality management (TQM) for improving project efficiency. • Strategic use of IT and digital technologies in construction. • Collaborative strategies for enhancing construction productivity. • Health and safety considerations in construction projects. **8. Project Management Strategies** • Overview of project management strategies for improved construction performance. • Application of strategic management in construction projects. • Case studies on successful project management implementations. • Final assignment and course wrap-up. This structured guideline provides a comprehensive framework for understanding key aspects of construction management, ensuring students gain both theoretical and practical insights into the field.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	68	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية				
	Time/Numbe	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**

Formative	**Quizzes**	5		5 and 10	LO #1 - #3, LO #4 - #6
	Assignments	8		2 and 12	LO #1 - #2, LO #3 - #4,
	Projects / Lab.			Continuou	LO #2 - #3, LO #4 -
	Seminar	3		13	LO #1 - #6
Summative	**Midterm Exam**	2hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
1	**Introduction to the course** **Demonstrates knowledge** • Construction management as a discipline. • Context of construction management. Characteristics of the construction industry, domestic and global construction market, overview of the course.
2,3	**Construction project management** Uses correctly the definition of a project, nature of construction projects, project life-cycle, principles of project management, project management functions.
4	**Construction cost estimation and bidding**

	Correctly implement planning and design, project scope management, elements of cost estimation, estimating methods, project budgeting, bidding.
5,6	**Construction project planning and scheduling** Correctly implement scheduling process, work breakdown structures, scheduling techniques, critical path method, resource management, crashing.
7,8	**Construction procurement** Correctly implement investing in construction projects, project finance, procurement strategies, project delivery methods, contract types, national and international contracts, and contract and claim management.
9	**Performance measurement** Correctly execute definition of performance, performance issues in construction, factors affecting project success, industry reports, performance measurement tools, key performance indicators.
10,11,12	**Improving project and organizational performance in construction** Demonstrates knowledge about benchmarking, risk management, financial management, claims and dispute resolution, human resources management, knowledge management, total quality management, strategic use of IT, strategic collaborations, health and safety.
13,14,15	**Project management strategies** Demonstrates knowledge about course overview, project management strategies to enhance performance in construction, final assignment.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Kerzner, H. (2022). *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*. Wiley. lough, R. H., Sears, G. A., & Sears, S. K. (2015). *Construction Project Management*. Wiley. Callahan, M. T., Quackenbush, D. G., & Rowings, J. E. *Construction Project Scheduling*. McGraw-Hil	
Recommended	Halpin, D. W., & Senior, B. A. *Construction Management*. Wiley. Hendrickson, C. *Project Management for Construction: Fundamental Concepts for Owners, Engineers, Architects, and Builders*. Prentice Hall. Gould, F. E., & Joyce, N. E. (2008). *Construction Project Management*. Pearson.	

Websites	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks**	**Definition**
Success	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
(50 - 100)	**E -** Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**F –** Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**ADVANCED SOIL MECHANICS**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**BCE 304**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		3	**Semester of Delivery**		2
Administering Department		BCE	**College**	TEMO	
Module	Dr. Harith Ibrahem		**e-mail**	harithali@ntu.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		14/10/2024	**Version Number**		2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Provide students with fundamental knowledge about **soil formation, types of soil, and their deposits**. 2. Enable students to understand the **distribution of external stresses in soil** and their effects on structures. 3. Enhance students' understanding of **consolidation theories and settlement analysis**, including **Terzaghi's theory and its assumptions**.

	4. Develop students' ability to analyze **shear strength** of soil using **Mohr-Coulomb theory**. 5. Train students in conducting **laboratory soil tests**, such as **direct shear test, triaxial test, and coefficient of pure water pressure measurement**. 6. Introduce students to the characteristics and engineering behavior of **collapsible and swelling soils**.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this course, students will be able to: 1. **Understand soil formation and deposition**, identify different soil types, and describe their engineering properties. 2. **Analyze the distribution of external stresses in soil** and assess their impact on structural stability. 3. **Apply consolidation theory in soil settlement analysis**, including performing calculations related to compression and settlement. 4. **Interpret Mohr-Coulomb shear strength theory** and apply it in analyzing soil stability under different loading conditions. 5. **Conduct laboratory soil tests**, including **direct shear test, triaxial test, and pure water pressure coefficient measurement**, and accurately interpret test results. 6. **Evaluate problems associated with collapsible and swelling soils** and propose suitable engineering solutions.
Indicative Contents المحتويات الإرشادية	**Instructional Content Guidelines** **Module 1: Introduction to Soil Mechanics** • Importance of soil mechanics in civil engineering. • Soil as a three-phase system (solid, liquid, and gas). • Soil formation, weathering processes, and soil deposits. **Module 2: Soil Classification & Index Properties** • Soil particle size and classification systems (USCS, AASHTO). • Atterberg limits (liquid limit, plastic limit, shrinkage limit). • Specific gravity and unit weight of soils. **Module 3: Soil Compaction & Field Control** • Principles of soil compaction and its effect on strength and permeability. • Standard and modified Proctor compaction tests. • Field compaction control methods (nuclear density gauge, sand cone test). **Module 4: Permeability & Seepage** • Darcy's Law and soil permeability. • Laboratory and field permeability tests (constant and falling head tests). • Flow nets and seepage analysis through earth dams and retaining structures. **Module 5: Stress Distribution in Soil** • Stress due to self-weight of soil. • Vertical stress due to point loads, line loads, and uniformly distributed loads (Boussinesq's and Westergaard's equations). • Influence diagrams and pressure bulb concept.

	Module 6: Consolidation & Settlement Analysis • Concept of soil consolidation and settlement. • Terzaghi's one-dimensional consolidation theory and assumptions. • Coefficient of consolidation (Cv) and time rate of settlement. • Primary and secondary consolidation. **Module 7: Shear Strength of Soil** • Concept of shear strength and failure criteria. • Mohr's Circle and Mohr-Coulomb failure theory. • Laboratory shear strength tests: direct shear test, triaxial test, unconfined compression test. • Stress path analysis for drained and undrained conditions. **Module 8: Expansive & Collapsible Soils** • Definition and characteristics of swelling soils (clay minerals, moisture variation effects). • Swell potential tests and mitigation techniques. • Collapsible soils and their engineering implications. • Methods for treating problematic soils. **Module 9: Lateral Earth Pressure & Retaining Structures** • Rankine's and Coulomb's theories of lateral earth pressure. • Active, passive, and at-rest earth pressure conditions. • Design considerations for retaining walls and sheet piles. **Module 10: Bearing Capacity & Foundation Design** • Terzaghi's bearing capacity equations for shallow foundations. • Effect of water table on bearing capacity. • Load tests and field evaluation of soil bearing capacity. • Types of foundations: shallow and deep foundations. **Module 11: Slope Stability Analysis** • Types of slopes and failure mechanisms. • Methods of slope stability analysis (infinite slope, limit equilibrium methods). • Factor of safety and reinforcement techniques for slope stabilization. **Module 12: Laboratory Tests & Field Applications** • Overview of essential soil mechanics laboratory tests. • In-situ soil testing methods (SPT, CPT, plate load test). • Interpretation of soil test data for engineering applications.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture & In-Class Activities • Laboratory • Assignment (Homework) • Seminar • Report Writing • Final Exam • Preparation for the Final Exam

	• Mid-Term Exam • Preparation for the Mid-Term Exam • Short Exam and • Preparation for the Short Exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	66	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	34	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation
تقييم المادة الدراسية

As		**Time/Numbe**	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative	**Quizzes**	5		5 and 10	LO #1 - #2, LO #3 - #5
	Assignments	4		2 and 12	LO #1 - #3, LO #4 - #6,
	Seminar	2		Continuou	LO #2 - #3, LO #4 -
	Report	7		13	LO #1 - #4
Summative	**Midterm Exam**	2hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
1	Demonstrates knowledge about soil formation, Their deposits, Types of soil.
1,2,3,4	Demonstrates knowledge about distribution of external stresses
5,6,7,8	Demonstrates knowledge about: • **Consolidation theory & settlement.** • **Terzaghi's theory & assumptions.** • **Consolidation test.** **Consolidation analysis**
9,10,11,12	Demonstrates knowledge about shear strength of soil and Mohr-Coulomb theory. Carries out laboratory tests, direct shear test, Tri-axial test and coefficient of pure water pressure.
13,14,15	Demonstrates knowledge about collapsible soil & swelling soil

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
	Lab Session 1: Soil Classification & Identification • Determination of **grain size distribution** (sieve analysis & hydrometer test). • **Atterberg limits** (liquid limit, plastic limit, and shrinkage limit). • Visual classification and field identification of soils. **Lab Session 2: Soil Compaction** • Standard and Modified **Proctor Compaction Tests**. • Determination of **optimum moisture content (OMC) and maximum dry density (MDD)**. • Effect of compaction on soil properties. **Lab Session 3: Moisture Content & Specific Gravity** • Oven-drying method for **moisture content determination**. • **Specific gravity** of soil solids using pycnometer. **Lab Session 4: Permeability of Soil** • **Constant-head permeability test** (coarse-grained soils). • **Falling-head permeability test** (fine-grained soils). • Calculation of **coefficient of permeability**. **Lab Session 5: Consolidation Test** • One-dimensional **oedometer test** for settlement analysis. • Determination of **coefficient of consolidation (Cv)**.

	• Primary and secondary consolidation interpretation. **Lab Session 6: Direct Shear Test** • Testing **cohesionless and cohesive soils** under different normal stresses. • Determination of **shear strength parameters (cohesion & internal friction angle)**. • Analysis of **failure envelopes**. **Lab Session 7: Triaxial Compression Test** • **Unconsolidated undrained (UU), consolidated undrained (CU), and consolidated drained (CD) tests**. • Determination of **effective stress parameters**. • Stress-strain behavior interpretation. **Lab Session 8: Swelling and Collapsibility Tests** • Swell test for expansive soils (free swell index, swell pressure). • Collapse potential test for collapsible soils. • Engineering solutions for expansive and collapsible soils. **Lab Session 9: Coefficient of Pure Water Pressure** • Measurement of **pore water pressure** in soil samples. • Effect of **drainage conditions** on soil strength. **Lab Session 10: Final Practical Exam & Case Study Analysis** • Performing one of the major soil tests independently. • Interpretation and discussion of real-world soil mechanics problems.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Das, B. M. *Principles of Geotechnical Engineering* (9th Edition). Cengage Learning. Holtz, R. D., Kovacs, W. D., & Sheahan, T. C. *An Introduction to Geotechnical Engineering* (2nd Edition). Pearson. Terzaghi, K., Peck, R. B., & Mesri, G. *Soil Mechanics in Engineering Practice* (3rd Edition). Wiley.	
Recommended		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks**	**Definition**
Success	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
(50 - 100)	**E** - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**F** – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	ENVIRONMENTAL ENGINEERING			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**BCE 310**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	3		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	Dr. Nabil I. Khalil		**e-mail**	nabeelasmeel@ntu.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. **Water Demand & Consumption:** ○ Demonstrate knowledge of the demand for water for various purposes, including fire demand and per capita demand. ○ Understand factors affecting water consumption and fluctuation in demand. ○ Analyze the design period, forecasting population growth, and determine design periods for water supply components.

	2. **Water Sources:** o Demonstrate understanding of various water sources: surface sources, groundwater sources, and infiltration galleries. o Assess and select the most suitable water sources based on relative merits. 3. **Intake Works:** o Demonstrate knowledge of intake works, including their types, locations, requirements, and features. 4. **Water Quality:** o Understand impurities in water, their effects, and their significance, including waterborne diseases. o Learn the process of collecting water samples for analysis. o Understand water analysis methods, including physical, chemical, and bacteriological aspects. o Know the water quality standards (I.S. & WHO). 5. **Water Treatment Process:** o Demonstrate understanding of flow diagrams and layouts of different water treatment works. o Learn about aeration, filtration, and sedimentation, including their purpose, types, and design criteria. o Gain knowledge of disinfection methods, including chlorination, breakpoint chlorination, superchlorination, and tertiary treatments. 6. **Distribution Systems:** o Demonstrate understanding of different types of water supply systems (continuous and intermittent), and various layout systems (gravity, pumping, and combined systems). o Learn about the maintenance of distribution systems and equalizing storage. o Understand the types of storage reservoirs and their capacity requirements. 7. **Air Pollution Control:** o Introduce the concept of air pollution, various pollutants, their sources, and effects on human health and materials. o Understand methods for preventing air pollution at the source and the introduction of control devices.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this course, students will be able to: 1. **Estimate Water Demand:** o Accurately estimate water demand for various uses and apply the knowledge to design water supply systems. o Analyze the fluctuation of water demand and adjust designs for future needs. 2. **Select Water Sources:** o Evaluate surface and groundwater sources for water supply systems, selecting the most suitable sources based on specific criteria.

	3. **Design Intake Works:** o Design intake systems, determining appropriate location, type, and requirements for efficient water intake. 4. **Assess Water Quality:** o Conduct water quality tests, analyze results, and compare them with I.S. & WHO standards. o Understand the significance of impurities in water and their effects on human health. 5. **Apply Water Treatment Methods:** o Design and evaluate water treatment processes, including aeration, sedimentation, flocculation, filtration, and disinfection. o Solve design problems related to rapid sand filters and sedimentation tanks. 6. **Design Water Distribution Systems:** o Design water distribution systems using appropriate layouts and systems (gravity, pumping, or combined). o Address the maintenance needs and capacity requirements for storage reservoirs. 7. **Control Air Pollution:** o Identify sources of air pollution and assess the impact on health and the environment. o Apply methods for controlling air pollution, including prevention at the source and installation of control devices.
Indicative Contents المحتويات الإرشادية	**Module 1: Water Demand and Consumption** • Water demand for domestic, industrial, agricultural, and fire purposes. • Factors affecting water consumption: climate, population growth, seasonal variations. • Fluctuation in demand and its impact on system design. • Design period and forecasting population growth for water supply components. **Module 2: Water Sources** • Surface water sources: rivers, lakes, and reservoirs. • Groundwater sources: wells, boreholes, and infiltration galleries. • Assessment of water sources: availability, quality, and sustainability. • Selection of water sources based on economic, environmental, and technical criteria. **Module 3: Intake Works** • Types of intake systems: gravity intake, pumping intake, and infiltration galleries.

- Design considerations for intake location, size, and operational features.
- Assessment of water quality at intake points.

Module 4: Water Quality and Analysis

- Impurities in water: organic, inorganic, biological, and particulate impurities.
- Effects of waterborne diseases and their prevention.
- Collection of water samples and techniques for laboratory analysis.
- Physical, chemical, and bacteriological analysis methods.
- Water quality standards (I.S. & WHO).

Module 5: Water Treatment Process

- **Aeration:** Purpose, types of aerators (gravity and spray).
- **Sedimentation:** Process and design criteria for sedimentation tanks, types of coagulants, jar tests, and coagulation dosing.
- **Flocculation:** Mechanism of flocculation and the use of clariflocculators.
- **Filtration:** Design and operation of rapid sand filters, slow sand filters, and pressure filters.
- **Disinfection:** Chlorination (pre, post, breakpoint, and superchlorination), disinfection methods, and introduction to tertiary treatments.

Module 6: Water Distribution System

- Types of water supply systems: continuous, intermittent, gravity, pumping, and combined systems.
- Distribution system layouts: dead-end, gridiron, circular, and radial systems.
- Equalizing storage and types of reservoirs.
- Maintenance considerations for distribution systems.

Module 7: Air Pollution Control

- Types of air pollutants: particulate matter, gases (CO2, NOx, SOx), and volatile organic compounds.
- Sources of air pollution: industrial, vehicular, natural.
- Effects of air pollution on human health and the environment.
- Prevention and control techniques at the source, and the role of control devices (filters, scrubbers).

This structure aims to provide a comprehensive overview of water supply systems and air pollution control while equipping students with practical skills to address real-world challenges. Would you like to add specific lab exercises or case studies?

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture & In-Class Activitie Study • Laboratory • Reading • Assignment (Homework) • Seminar • Report Writing • Final Exam • Preparation for the Final Exam • Mid-Term Exam • Preparation for the Mid-Term Exam • Short Exam and • Preparation for the Short Exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	69	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	56	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	6	10% (10)	5 and 10	LO #1, #2 and #7
	Assignments	5	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Seminar	3	10% (10)	Continuous	All

	Report	5	10% (10)	13	LO #5, #6
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1,2,3	**Quantity Estimation of water:** • Demonstrates knowledge of the Demand of water. Consumption for various purposes. Fire demand, Per capita demand. Factors affecting consumption. Fluctuation in demand. Design period, forecasting population, and design periods for water supply components. • Demonstrates knowledge of the Sources: Surface sources, ground water sources, Infiltration Galleries, Relative merits of sources, assessment & suitability, selection. Demonstrates knowledge of the Intake works: Intakes, type, location, requirement & features.
4,5	• **Water quality** • Demonstrates knowledge of the Impurities in water, their effects and significance water borne diseases, collection of water Samples. • Demonstrates knowledge of the Water analysis physical, chemical and bacteriological. • Demonstrates knowledge of the Water quality standards: I.S & .WHO, Demonstrates knowledge of the Flow diagrams and layouts of different water treatment works.
6,7,8	**Aeration and Filtration** • Demonstrates knowledge of the Aeration: Purpose, type of gravity, aerator & spray aerators. • Demonstrates knowledge of the Sedimentation: Plain and with coagulation, different coagulants used, dose of coagulant, Jar test, coagulant, feeding and mixing devices. • Demonstrates knowledge of the Flocculation, Clariflocculator. • Able to design of sedimentation tanks according to Design criteria. • Demonstrates knowledge of the Filtration: Rapid sand and slow sand filters, filter media, Rate of filtration, under drainage system and washing process, pressure filter. Able to solve Simple design problems on rapid sand filters modifications of filters.
9,10	**Disinfection** • Demonstrates knowledge of the Requirement of good disinfectant, methods of disinfection. • Demonstrates knowledge of the Chlorination: Methods, prechlorination, post chlorination. • Demonstrates knowledge of the Demonstrates knowledge of the Break point chlorination and super chlorination forms of chlorine.

	Demonstrates knowledge of the Introduction to tertiary treatments like Softening, Ion Exchange, Reverse Osmosis, Desalination and Defluoridation.
11,12,13	**Distribution system** • Demonstrates knowledge of the Types of supply - Continuous, and intermittent, Types of system Gravity; Pumping and combined gravity and pumping, Layouts of distributions system, Dead end, Grid iron, Circular system and Radial system. • Demonstrates knowledge of the Maintenance of distribution system. Demonstrates knowledge of the Equalizing storage, Type of storage reservoirs, capacity
14,15	**Air pollution** Demonstrates knowledge of the Introduction to air pollution, various pollutants their sources and their effects on man and material, prevention or air pollution at sources, introduction to control devices.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	*Introduction to Environmental Engineering* (5th Edition). McGraw-Hill Education. *Water Supply and Sanitary Engineering* (13th Edition). S. Chand Publishing *Water Treatment: Principles and Design* (3rd Edition). Wiley-Interscience.	
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**ADVANCED PAVEMENT ENGINEERING**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**BCE 311**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		3	**Semester of Delivery**		2
Administering Department		BCE	**College**	TEMO	
Module Leader	**Dr. Zaid Hazim Al-Saffar**		**e-mail**	Zaid.alsaffar@ntu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		14/10/2024	**Version Number**		2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The student must learn the geometrical engineering design of highways, The structural design of flexible & rigid pavements. The student must learn also, All the site works that may be needed for road construction & maintenance of pavements. The student can be able to accomplish the important tests of soil layers, asphalt and concrete pavements as well as he will have an important information about airport & railway engineering.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students will be able to: 1. **Explain** the key aspects of asphalt pavement construction, including material selection, laying, and compaction techniques. 2. **Describe** the organizational structure and functions of state road and bridge authorities, focusing on their role in highway development and maintenance. 3. **Apply** the principles of flexible pavement design, considering factors such as traffic loading, material properties, and environmental conditions. 4. **Analyze** pavement structures using AASHTO design methodologies to determine layer thicknesses and structural integrity. 5. **Demonstrate** an understanding of rigid pavement design principles, including material selection and structural considerations. 6. **Evaluate** the design and function of joints and reinforcement in rigid pavements to enhance performance and longevity. 7. **Investigate** the causes and effects of pumping in rigid pavements and propose mitigation strategies. 8. **Design** effective drainage systems to improve pavement durability and prevent water-related damage. 9. **Assess** highway maintenance and rehabilitation techniques, including resurfacing, reconstruction, and preservation methods. 10. **Identify and classify** common distresses in both flexible and rigid pavements, providing recommendations for corrective measures. 11. **Manage** the selection and application of asphalt additives to enhance pavement performance and durability.

Indicative Contents المحتويات الإرشادية	8. Asphalt pavement constructions 9. state organization of roads and bridges 10. principle of flexible pavement design. 11. AASHTO structural design 12. principles of rigid pavement design 13. Joints and reinforcing 14. pumping in rigid pavement 15. Drainage systems 16. highway maintenance and rehabilitation 17. identify distresses in flexible and rigid pavement 18. Managing asphalt additives

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture & In-Class Activities • Preliminary & Further Study • Assignment (Homework) • Seminar • Report Writing • Final Exam • Preparation for the Final Exam • Mid-Term Exam • Preparation for the Mid-Term Exam • Short Exam and • Preparation for the Short Exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	53	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5		5 and 10	LO #1, #2, 3, 5 and #7
	Assignments	3		2 and 12	LO #3, #4 and #6, #7
	Seminar	2		Continuous	All
	Report	3		13	LO #5, #6
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #8
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1,2	Demonstrates knowledge about asphalt pavement constructions, placing, spreading, pavers, rollers, field tests, levelling and thickness controlling.
3	Able to identify state organization of roads and bridges
4,5,6	• Demonstrates knowledge about principle of flexible pavement design. • Able to identify method of design for new pavement, AASHTO design method, charts for design. Correctly execute and solve examples in AASHTO structural design
7,8,9	• Demonstrates knowledge about principles of rigid pavement design, layers, fixed and slip forms. Joints and reinforcing, Carries out control of levelling and finishing in addition to pumping in rigid pavement
10	Demonstrates knowledge about Drainage systems, culverts, siphon, ditches and filters
11	Monitors and conducts highway maintenance and rehabilitation

12	Able to identify distresses in flexible pavement
13	Able to identify distresses in rigid pavement
14,15	Managing asphalt additives

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Pavement Design and Materials: A Guide for Engineers** (2009). International Road Assessment Program. **Huang, Y. H. (2004).** *Pavement Analysis and Design* (2nd Edition). Prentice Hall.	
Recommended Texts	**AASHTO (2015).** *AASHTO Design Guide for Flexible Pavements.* American Association of State Highway and Transportation Officials.	
Websites	**Journal of Transportation Engineering (ASCE).** **Road Materials and Pavement Design (Taylor & Francis).** **Transportation Research Record: Journal of the Transportation Research Board.** **International Journal of Pavement Engineering.**	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**NUMERICAL ANALYSIS**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BCE 312**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		3	**Semester of Delivery**		2
Administering Department		BCE	**College**	TEMO	
Module Leader	**Huda SAAD**		**e-mail**	Huda_saad@ntu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Master
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		14/10/2024	**Version Number**		2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• To develop a thorough understanding of numerical methods and their applications in solving mathematical problems. • To equip students with the skills to implement various numerical methods for solving equations, performing interpolation, and executing numerical integration and differentiation.

	• To enable students to solve systems of linear equations using advanced numerical techniques. • To familiarize students with methods for solving differential equations and applying numerical methods
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successful completion of this course unit, students/learners will or will be able to • Demonstrate knowledge of numerical methods and their application in nonlinear equations. • Correctly implement iterative methods for solving equations, including the fixed-point method and Newton-Raphson method. • Execute various interpolation techniques, such as linear interpolation, quadratic interpolation, and Lagrange interpolation. • Perform numerical integration and differentiation using appropriate numerical methods. • Apply numerical methods in linear algebra, including the solution of systems of linear equations using Gauss elimination, LU factorization, and Cholesky method. • Solve systems of linear equations using iterative methods, including Gauss-Seidel and Jacobi methods. • Analyze and solve differential equations using numerical methods, including Euler, modified Euler, and the Runge-Kutta method (4th order).

Indicative Contents
المحتويات الإرشادية
	• **Introduction to Numerical Methods**
	  • Overview of numerical methods and their importance in mathematics and engineering.
	• **Numerical Methods in Nonlinear Equations**
	  • Iterative methods for solving nonlinear equations:
	  ○ Fixed-point method
	  ○ Newton-Raphson method
	• **Interpolation Techniques**
	  • Linear interpolation
	  • Quadratic interpolation
	  • Newton's forward difference formula
	  • Newton's backward difference formula
	  • Lagrange interpolation
	• **Numerical Integration and Differentiation**
	  • Techniques for numerical integration (e.g., Trapezoidal rule, Simpson's rule)
	  • Numerical differentiation methods
	• **Numerical Methods in Linear Algebra**
	  • Systems of linear equations:
	  ○ Gauss elimination
	  ○ LU factorization
	  ○ Cholesky method
	  ○ Gauss-Jordan elimination
	• **Matrix Operations**
	  • Inverse matrix by elimination method

	• Solution of systems of linear equations using iterative methods:
	  ○ Gauss-Seidel iteration
	  ○ Jacobi method
	• Eigenvalues and eigenvectors
	• **Numerical Methods for Differential Equations**
	• Euler method
	• Modified Euler method
	• Runge-Kutta method (4th order)
	• **Applications of Numerical Methods in MATLAB**
	• Practical implementation of numerical methods using MATLAB software for problem-solving and analysis

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture & In-Class Activities • Assignment (Homework) • Report Writing • Final Exam • Preparation for the Final Exam • Mid-Term Exam • Preparation for the Mid-Term Exam • Short Exam and • Preparation for the Short Exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	53	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	6		5 and 10	LO #1, #2, 5 and #7
	Assignments	5		2 and 12	LO #3, #4 and #6,
	Seminar			Continuous	All
	Report			13	LO #5, #6
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1&2&3&4	• Demonstrates knowledge about numerical methods, numerical methods in nonlinear equations. • Correctly implement the solution of equations by iteration: fixed- point method, Newton – Raphson method. Correctly implement Interpolation: linear interpolation, quadratic interpolation, Newton's forward difference formula, Newton's backward difference formula, Lagrange interpolation, numerical integration & differentiation.
5&6&7	• Demonstrates knowledge and correctly implement numerical methods in linear algebra, system of linear equations, Gauss elimination, Lu factorization, Cholesky method, Gauss Jordan elimination. Correctly implement Inverse matrix by elimination method, system of linear equations solution by iteration: Gauss - Seidel Iteration, Jacobi method iteration, Eigen value & Eigen vector.
8&9	Demonstrates knowledge numerical methods for differential equation, Euler method, Modified Euler method, Runge-Kutta method -4th order.
10&11&12 13&14,15	Correctly execute application of numerical methods in Matlab program

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	*Numerical Methods for Engineers* (7th Edition). McGraw-Hill Education. *Numerical Analysis* (10th Edition). Cengage Learning.	
Recommended Texts		
Websites	**MIT OpenCourseWare – Numerical Methods for Engineers.** **Coursera – Numerical Methods for Engineers and Scientists (University of Michigan).**	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**DESIGN OF REINFORCED CONCRETE STRUCTURES**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**BCE 401**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	1 4		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	
Module Leader	**Dr. Hassan M. Ahmed**		**e-mail**	albegmprli@ntu.edu.iq	
Module Leader's Acad. Title	Assis. Prof		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	Students will build on their knowledge of reinforced concrete design to understand the behavior of reinforced concrete and to design practical reinforced concrete components.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this course, students will be able to: ▪ Apply the basic requirements of the American Concrete Institute **ACI 318** design specification. ▪ Introduction and material properties ▪ Design methods (working stress and ultimate strength methods) ▪ Apply the concepts of strain compatibility and equilibrium concepts to determine the strength of RC members ▪ Design simple and continuous RC beams of rectangular cross-sectional shape for flexure. ▪ Design simple and continuous RC beams of any cross-sectional shape for shear, flexure, and deflection. ▪ Design RC beam-columns of any cross-sectional shape (rectangular, doubly, T-beam) ▪ Design RC slabs (one-way and two-way slabs) ▪ Design of RC columns (short and slender columns, tied and spiral columns, and concentrically or uni-axially or bi-axially loaded columns) ▪ Deflection calculations and its limitations
Indicative Contents المحتويات الإرشادية	**Introduction and Material Properties** • Overview of reinforced concrete (RC) and its material properties, including concrete and steel reinforcement characteristics. **Design Methods** • Discussion of design approaches: • Working stress method • Ultimate strength method **Strain Compatibility and Equilibrium Concepts** • Application of strain compatibility and equilibrium principles to determine the strength of reinforced concrete members. **Design of RC Beams** • Design of simple and continuous RC beams with rectangular cross-sectional shapes for flexure. • Design of RC beams with various cross-sectional shapes for shear, flexure, and deflection. **Design of RC Beam-Columns** • Design of RC beam-columns with different cross-sectional shapes (rectangular, doubly reinforced, T-beams). **Design of RC Slabs** • Design principles for one-way and two-way RC slabs. **Design of RC Columns** • Design of short and slender columns, including tied and spiral columns, and columns subjected to concentric, uni-axial, or bi-axial loads. **Deflection Calculations** • Methods for calculating deflection in RC members and an overview of its limitations.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Preliminary & Further Study, Assignment (Homework) Project Work, Seminar, Technical Visit, Final Exam, Mid-Term Exam and Mid-Term Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	72	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	28	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	8		5 and 10	LO #1, #2, 5 and #10
	Assignments	6		2 and 12	LO #2, #4, #8 and #10,
	Project Work	1		Continuous	All
	Seminar	4		6 and 11	LO #5, #6
Summative assessment	**Midterm Exam**	2hr		7	LO #1 - #6
	Final Exam	3hr		16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered

1,2	• **Demonstrates knowledge of the Slender columns :**
	  • Define the slender column,
	  • Concentrically loaded columns.
	  • Compression plus bending
	  • ACI criteria for non-sway frames versus sway frames
	  • ACI moment magnifier method for non-sway frames
	  • ACI moment magnifier method for sway frames
	Second-order analysis for slenderness effects.

3,4,5,6,7,8	• **Able to Analysis and design of slabs**
	  • knowledge of the types of slabs,
	  • Design of one-way slabs, temperature and shrinkage reinforcement,
	  • Behavior of two-way edge supported slabs, and two-way column supported slabs,
	  • Direct design method for column supported slabs, depth limitation of the ACI code,
	  • Equivalent frame method,
	  • Shear design in flat plates and flat slabs,
	The Openings in slabs.

9,10	• **Demonstrate Knowledge about tie and Strut models:**
	  • The Strut and tie methodology,
	  • The ACI provisions for strut and tie models, and their Applications.

11,12	• **Demonstrates knowledge of the Concrete building systems:**
	  • Shear walls, ACI code provisions for shear wall design.
	  • Stair design
	  • Earthquake resistant design principles

13,14,15	**Demonstrates knowledge of the Prestressed Concrete:** • Demonstrates knowledge of the Principles of prestressed concrete, • Demonstrates knowledge of the Methods of prestressing, • Demonstrates knowledge of the prestressing steel, and concrete for prestressed construction.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes

Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** – Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	C – Good	جيد	70 – 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 – 69	Fair but with major shortcomings
	E – Sufficient	مقبول	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
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Module Information معلومات المادة الدراسية					
Module Title	TRANSPORTATION ENGINEERING			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**BCE 402**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	1 4		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	
Module Leader	Zaid Hazim Al-Saffar		**e-mail**	Zaid.alsaffar@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**	Zaid.alsaffar@ntu.edu.iq	
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	To understand the principles of geometric design for various transportation facilities, to know the design of at-grade and grade separated intersections along with design of drainage facilities.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this course, students will be able to: 1. **Introduction to Highway Engineering** o Understand the fundamental principles and practices of highway engineering. o Identify and apply highway survey and location methods. 2. **Highway Functional Classification** o Classify highways based on AASHTO functional classification standards. o Explain the hierarchy of functional highway systems and their applications. 3. **Highway Engineering Components** o Identify and describe the key components of highway engineering. o Analyze the characteristics of drivers and pedestrians and their impact on highway design. 4. **Road Characteristics** o Calculate stopping sight distance, decision sight distance, and passing sight distance. o Determine the minimum turning radius for vehicle maneuverability. 5. **Vehicle Characteristics** o Analyze the static, kinematic, and dynamic characteristics of vehicles and their influence on highway design. 6. **Design of Highway Facilities** o Apply fundamental principles and best practices in the design of highway facilities. 7. **Factors Affecting Geometric Design** o Explain the objectives and principles of geometric highway design. o Assess the impact of traffic volume and speed on geometric design parameters. 8. **Cross-Sectional Elements** o Identify and describe key cross-sectional elements of highways, including: ▪ Travel lanes, shoulders, and medians. ▪ Barriers, curbs, gutters, guardrails, sidewalks, and side slopes. 9. **Highway Alignments and Alternatives** o Evaluate the factors affecting highway alignment and route selection. o Interpret inflection points and analyze topographic terrain maps. 10. **Horizontal Curves** o Differentiate between various types of horizontal curves, including simple circular, compound, reversed (S-curve), and spiral (transition) curves. o Explain the concepts of minimum turning radius and superelevation in curve design. 11. **Vertical Curves**

	○ Analyze crest and sag curves and their impact on visibility and vehicle operation. ○ Determine the minimum curve lengths and grade requirements for safe vertical alignment. 12. **Special Facilities for Heavy Vehicles** ○ Design appropriate climbing lanes and emergency escape ramps for steep grades. 13. **Traffic Flow Elements** ○ Analyze speed-flow-density relationships, gap acceptance, and queuing theory in traffic flow studies. 14. **Capacity and Level of Service (LOS)** ○ Apply the principles of highway capacity and level of service (LOS) analysis for different types of roadways, including: ○ Two-lane highways, freeways, multilane highways, and signalized intersections. 15. **Traffic Volumes and Corrections** ○ Conduct traffic volume studies using various counting methods. ○ Apply correction factors and compute key traffic volume metrics such as AADT, ADT, and DHV. 16. **Traffic Loads on Pavements** ○ Analyze pavement loading using Equivalent Single Axle Load (ESAL), tandem, and tridem axle loads. ○ Evaluate load damage factors, growth factors, and pavement stress analysis. 17. **Principles of Railway Engineering** ○ Identify and describe railway cross-section elements and embankment specifications. 18. **Principles of Airport Engineering** ○ Explain airport orientation principles, runway and taxiway specifications, and the use of signals and markings in airport design.
Indicative Contents المحتويات الإرشادية	• **Introduction to Highway Engineering** • Overview of highway engineering principles and practices. • Highway survey and location methods. • **Highway Functional Classification** • Functional classification of highways according to AASHTO. • Hierarchy of functional systems. • **Highway Engineering Components** • Key components of highway engineering. • Characteristics of drivers and pedestrians. • **Road Characteristics** • Stopping sight distance, decision sight distance, passing sight distance. • Minimum turning radius. • **Vehicle Characteristics** • Static, kinematic, and dynamic characteristics of vehicles. • **Design of Highway Facilities** • Principles and practices for designing highway facilities. • **Factors Affecting Geometric Design** • Objectives of geometric design. • Traffic volume and speed considerations.

	• **Cross-Sectional Elements**
	  • Principles and marginal elements:
	  ○ Travel lane, shoulders, medians.
	  ○ Barriers, curbs, gutters, guardrails, sidewalks, and side slopes.
	• **Highway Alignments and Alternatives**
	  • Highway alignment considerations.
	  • Points of inflection and topography terrain maps.
	• **Horizontal Curves**
	  • Types of horizontal curves:
	  ○ Simple circular curve, compound curve, reversed curve (S-Curve), spiral curve (transition curve).
	  • Concepts of minimum turning radius and superelevation.
	• **Vertical Curves**
	  • Crest and sag curves, undercrossing clear distance.
	  • Minimum lengths and grades.
	• **Special Facilities for Heavy Vehicles**
	  • Design considerations for climbing lanes and emergency escape ramps on steep grades.
	• **Traffic Flow Elements**
	  • Speed-flow-density relationships, gap acceptance, and queuing theory.
	• **Capacity and Level of Service (LOS)**
	  • Principles for highway segments, including:
	  • Two-lane highways, freeways, multilane highways, and signalized intersections.
	• **Traffic Volumes and Corrections**
	  • Traffic counting methods, correction factors, AADT, ADT, and DHV.
	• **Traffic Loads on Pavements**
	  • Equivalent Single Axle Load (ESAL), tandem and tridem axle loads.
	  • Load damage factor, growth factor, and pavement stresses.
	• **Principles of Railway Engineering**
	  • Railway cross-section elements and embankment specifications.
	• **Principles of Airport Engineering**
	  • Airport orientations, runway and taxiway specifications, signals, and markings.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Preliminary & Further Study, Group Work, Assignment (Homework) , Project Work, Seminar, Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	56	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	44	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5		5 and 10	LO #1, #2, 5 and #10
	Assignments	3		2 and 12	LO #2, #4, #8 and #10,
	Project Work	1		Continuous	All
	Seminar	2		6 and 11	LO #5, #6
	Report Writing	1			LO #1 - #6
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #6
	Final Exam	3hr	50% (50)	16	ALL
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1	• Demonstrates knowledge of the: Introduction to highway engineering, Highway survey and location • Demonstrates knowledge of the Highways functional classification according to AASHTO,

	• Demonstrates knowledge of the Hierarchy of functional systems
2,3	• Demonstrates knowledge of the Highway engineering components, characteristics of the driver and pedestrian • Demonstrates knowledge of the Road characteristics, stopping sight distance, decision sight distance, passing sight distance, minimum turning radius
4	• Demonstrates knowledge of the Vehicle characteristics, static, kinematic and dynamic • Able to design of the highway facilities,
5,6	• Demonstrates knowledge of the factors affecting and the Objectives of Geometric Design, traffic volume, traffic speed. • Demonstrates knowledge of the Cross-sectional elements: Principles (travel lane, shoulders & medians) and marginal (barriers, curbs, gutters, guardrails, sidewalks & side slope)
7	• Demonstrates knowledge of the Highway alignments and alternatives, points of inflections, topography terrain maps. • Demonstrates knowledge of the Horizontal curves, simple circular curve, compound curve, reversed Curve (S-Curve), spiral Curve (Transition Curve)
8	• Demonstrates knowledge of the Horizontal curves, simple circular curve, compound curve, reversed Curve (S-Curve), spiral Curve (Transition Curve) • Demonstrates knowledge of the Minimum turning radius, superelevation concepts, curve radius based on SSD
9	• Demonstrates knowledge of the following: Vertical curves, crest and sag curves, under crossing clear distance, minimum length and grades. • Demonstrates knowledge of the following: Special facilities for heavy vehicle on steep grades, climbing lanes, emergency escape ramps
10	• Demonstrates knowledge of the following: Traffic flow elements, speed-flow-density relationships, Gap and Gap acceptance, Queuing theory.
11	• Demonstrates knowledge of the following: Principles of capacity and level of service (LOS) for highway segments, two-lane highways, freeways highway, multilane-highway and signalized intersections • Demonstrates knowledge of the following: Traffic volumes, counting, traffic volume correction factors, AADT, ADT, DHV
13	• Demonstrates knowledge of the following: Traffic loads, equivalent single axle load (ESALs) tandem axle load, tridem axle loads, load damage factor, growth factor, and stresses on pavements.
14	• Demonstrates knowledge of the following: Principles of railway engineering, Railway cross section elements and embankments, specifications • Demonstrates knowledge of the following: Principles of airport engineering, Airport orientations, runway and taxiway specifications, signals and marking.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• **"Highway Engineering"** by Paul H. Wright and Fred L. Mannering • **"Traffic and Highway Engineering"** by Nicholas J. Garber and Lester A. Hoel • **"Principles of Highway Engineering and Traffic Analysis"** by Fred L. Mannering, Walter P. Edwards, and Scott S. Thompson	Yes
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**QUANTITY SURVEYING & ESTIMATING**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**BCE 403**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	
Module Leader	Waseem Thabit		**e-mail**	Waseem.thabit@ntu.edu.iq	
Module Leader's Acad. Title	Assis. Lecturer		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The student will be able to make approximate and detailed estimates of buildings, specify the proper method of measurement, and do the rate analysis for different items

	of works. He will also be able to write the technical specifications for various civil engineering works. Finally, he will get thorough knowledge on the types of contracts and the general and special conditions related to them.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Demonstrate an understanding of the fundamental concepts of estimation, including its definition, benefits, and types. • Apply general rules for quantitative surveys and select appropriate measurement units for various construction items. • Analyze rates for construction work and understand the cost variables related to materials, labor, and equipment. • Perform accurate measurements and record data for construction works, including earthworks and masonry. • Estimate quantities for different construction materials and processes, including concrete and finishing works. • Understand technical specifications and their role in ensuring project quality and cost estimation. • Utilize computer-aided estimation tools effectively for construction project analysis. • Apply valuation principles to determine property values and understand factors influencing valuations.

Indicative Contents
المحتويات الإرشادية
	• **Introduction to Estimation in Engineering Projects**:
	  • Definition and benefits of estimation.
	  • Factors affecting cost estimation.
	  • Types of estimation and practical examples of approximate estimation.
	• **Quantitative Survey Principles**:
	  • Selecting measurement units for various items.
	  • Measurement modes for different construction details.
	• **Rate Analysis**:
	  • Cost variables for materials, labor, and equipment.
	  • Overhead charges and rate analysis difficulties.
	  • Examples of rate analysis in civil engineering construction.
	• **Working Quantities Methods**:
	  • Measurement and abstract sheets.
	  • Excavation and fill works for wall footings.
	  • Methods for calculating lengths of various works (strips and center lines).
	• **Earthworks Estimation**:
	  • Overview of earthworks in engineering projects (irrigation channels, roadway embankments).

	• Calculation methods for earthwork volumes (grid leveling and triangular methods). • **Masonry Works Estimation**: • Basic units and materials for masonry. • Estimation techniques for walls, damp proofing, and various masonry works. • **Concrete Works Estimation**: • Primary materials and mixing processes for concrete. • Estimation of quantities for different concrete elements (footings, beams, columns). • **Finishing Works Estimation**: • Types of finishing works (plastering, painting, coating). • Estimation methods for interior and exterior finishes, including tiles and ceramics. • **Technical Specifications**: • Definition and scope of technical specifications. • Role in quality assurance and cost estimation for engineering projects. • **Computer-Aided Estimation**: • Utilizing spreadsheet applications and software for estimation purposes. • **Valuation Principles**: • Understanding valuation purpose and functions. • Factors affecting property valuations and the valuer's responsibilities.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Preliminary & Further Study, Assignment (Homework) Project Work, Seminar, Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	82	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	43	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5		5 and 10	LO #1, #2, 5 and #8
	Assignments	5		2 and 12	LO #2, #4, and #8,
	Project Work	1		Continuous	All
	Seminar	2		6 and 11	LO #5, #6
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	ALL
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1&2	• Demonstrates knowledge of the Introduction: engineering projects &estimation, definition of estimation, benefits of estimation, factors affecting cost estimation, types of estimation, and practical examples on approximate estimation.
3	• Demonstrates knowledge of the General rules in quantitative survey: Principles in selecting the measurement units of items, various units and measurement modes for different items and details of quantities measuring.
4	• Demonstrates knowledge of rate analysis, cost of materials and labor variables and equipment -hour costs based on overall costs and outputs, Overhead charges, rates for various items of civil engineering construction work, rate analysis difficulties and examples.
5	• Demonstrates knowledge of the Methods of working quantities for various items of works, • Able to perform the Measurement and abstract sheets and recording, excavation and fill works for wall footings, estimation of walls and other items of buildings up to D. P. C. level, methods used to calculate the length of various works: method of strips and center lines method, examples and problems.
6	• Demonstrates knowledge of the Earthworks for various engineering projects: irrigation channels, roadway embankments, • Demonstrates knowledge of the methods used for calculating earthwork quantities and volumes, Mass diagrams, calculations of excavation volumes due to cut works (grid leveling method and triangular method), examples and problems.
7	• Able to perform the Estimation of masonry works, • Demonstrates knowledge of the basic units and materials used, • Able to perform the Estimation of walls construction, damp proofing used, brick works, block works, stone works, examples and problems.
8	• Able to perform the Estimation of concrete works, primary materials used, mixing of concrete materials, types of concrete mixers, calculating quantities of concrete materials, examples and problems
9&10	• Able to perform the Estimation of concrete works quantities for spread and combined footings, Able to perform the Estimation of concrete works quantities for lintels, beams, roofs, columns and stairs
11	• Demonstrates knowledge of the Finishing works (types), • Able to perform the estimation of outside and inside finishing works, plastering, painting, brick and stone coating, glass works, specifications. Able to perform the Estimation of tiles works: tiles, mosaic, ceramic, porcelain, … etc., specifications.
12	• Demonstrates knowledge of the Technical specifications: definition, scope, resources and types of specifications, role of specifications in engineering project quality and estimated cost, technical specifications for various works.
13	• Able to implement the Computer-aided estimation: (using spread sheet applications and other software packages in estimation)

14,15	• Demonstrates knowledge of the Valuation: Principles, purpose and function of valuation, Factors affecting the valuation of properties, Valuer and his duties.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**"Estimating in Building Construction"** by Steven J. Peterson & Frank R. Dagostino –	Yes
Recommended Texts	**"Construction Estimating Using Excel"** by Steven J. Peterson – A practical guide to using spreadsheets for cost estimation. **"Means Building Construction Cost Data"** by R.S. Means – **"Construction Planning, Equipment, and Methods"** by Robert L. Peurifoy & Clifford J. Schexnayder – Covers equipment costing and labor productivity in	
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** – Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	C – Good	جيد	70 – 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 – 69	Fair but with major shortcomings
	E – Sufficient	مقبول	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية			
Module Title	**FOUNDATION ENGINEERING**	**Module Delivery**	
Module Type	**Core**	☒**Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**BCE 404**		
ECTS Credits	**5**		
SWL (hr/sem)	**125**		
Module Level	1 4	**Semester of Delivery**	1
Administering Department	BCE	**College**	TEMO
Module Leader	Dr. Tareq hassan	**e-mail**	tareqrahal@ntu.edu.iq
Module Leader's Acad. Title	Lecture	**Module Leader's Qualification**	Ph.D.

Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	14/10/2024	**Version Number**	2.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	By the end of this course, students will be able to: 1. Understand the principles and importance of soil investigation for foundation design. 2. Explain various methods of subsurface exploration, including auguring, boring, wash boring, and rotary drilling. 3. Apply sampling techniques to obtain representative and undisturbed soil samples for analysis. 4. Conduct and interpret penetration tests (SPT and SCPT) and analyze bore log reports to determine soil strength parameters. 5. Select appropriate foundation types based on soil conditions and bearing capacity requirements. 6. Perform laboratory tests related to soil properties and prepare technical reports. 7. Analyze bearing capacity theories and understand the factors affecting soil bearing capacity. 8. Evaluate bearing capacity from in-situ tests such as SPT, SCPT, and plate load tests. 9. Determine settlement of shallow foundations in granular and clay deposits and assess allowable settlements. 10. Differentiate between types of footings and analyze contact pressure distribution for isolated, combined, and mat foundations. 11. Understand the principles and applications of floating foundations and their role in geotechnical engineering.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this course, students will be able to: 1. Demonstrate knowledge of soil investigation procedures and their significance in foundation engineering. 2. Explain and apply different exploration methods, including auguring, boring, wash boring, and rotary drilling. 3. Utilize appropriate sampling techniques, including split spoon and thin-wall samplers, to collect soil samples. 4. Perform and interpret results from penetration tests (SPT, SCPT) and generate bore log reports. 5. Analyze soil strength parameters and select suitable foundation types based on geotechnical data. 6. Conduct laboratory tests on soil samples and develop professional geotechnical reports. 7. Apply bearing capacity theories and assess factors influencing soil bearing capacity. 8. Interpret in-situ test data (SPT, SCPT, and plate load) to estimate bearing capacity. 9. Calculate settlement of shallow foundations and evaluate total and differential settlements. 10. Differentiate between various footing types (isolated, combined, raft, and floating foundations) and assess their suitability. 11. Design and proportion different types of mat foundations based on soil conditions and structural requirements.
Indicative Contents المحتويات الإرشادية	**Guideline Content** **1. Soil Investigation** • Purpose and importance of soil investigation • Planning a geotechnical site investigation • Soil classification and index properties **2. Methods of Subsurface Exploration** • Auguring and boring techniques • Wash boring and rotary drilling methods • Depth and spacing of boreholes **3. Soil Sampling Techniques** • Representative vs. undisturbed sampling • Split spoon sampler and thin-wall sampler • Sampling procedures and sample preservation **4. Penetration Tests and Bore Log Interpretation** • Standard Penetration Test (SPT) • Static Cone Penetration Test (SCPT) • Bore log preparation and interpretation • Strength parameter determination **5. Foundation Selection Based on Soil Conditions** • Factors influencing foundation type selection

	• Soil strength, settlement, and bearing capacity considerations **6. Laboratory Testing and Reporting** • Essential soil tests for foundation design • Data interpretation and report preparation **7. Bearing Capacity of Soils** • Theories of bearing capacity (Terzaghi, Meyerhof, Hansen, Vesic) • Factors affecting bearing capacity • Estimation of bearing capacity using in-situ tests (SPT, SCPT, plate load test) **8. Settlement Analysis** • Settlement of shallow foundations on granular and clay soils • Total and differential settlement • Allowable settlement criteria **9. Footings and Raft Foundations** • Types of footings (isolated, combined, strip, and mat foundations) • Contact pressure distribution for different footing types • Proportioning of footings and design considerations **10. Mat and Floating Foundations** • Types and applications of mat foundations • Design and proportioning of mat foundations • Floating foundations and their applications in weak soil conditions

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Preliminary & Further Study, Group Work, Assignment (Homework) , Report Writing, Project Work, Seminar, Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	82	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	43	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.8

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	8		5 and 10	LO #1, #2, 4,6,8 and #10
	Assignments	8		2 and 12	LO #2, #4, and #8,
	Project Work	1		Continuous	All
	Seminar	3		6 and 11	LO #5, #8
	Report Writing	3			LO #2,4,6
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #8
	Final Exam	3hr	50% (50)	16	ALL
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1, 2, 3	• Demonstrates knowledge of the Soil investigation – • Demonstrates knowledge of the Methods of exploration – auguring and boring – Wash boring and rotary drilling – Depth of boring – Spacing of borehole – • Demonstrates knowledge of the Sampling techniques – Representative and undisturbed sampling – methods – Split spoon sampler, Thin wall sampler.
4,5	• Demonstrates knowledge of the Penetration tests (SPT and SCPT) – Bore log report – Able to interpret Data– and determine strength parameters – • Able to select the foundation based on soil condition. • Able to conduct the Laboratory tests, and Report writing
6,7,8,9	• Demonstrates knowledge of the Bearing capacity theories, • Demonstrates knowledge of the Factors affecting bearing capacity • Demonstrates knowledge of the Bearing capacity from in-situ tests (SPT, SCPT and plate load)

10,11,12	• Demonstrates knowledge of the Determination of Settlement of shallow foundations on granular and clay deposits – • Demonstrates knowledge of the Total and differential settlement – Allowable settlements.
13,14	• Demonstrates knowledge of the Footing and rafts: • Demonstrates knowledge of the Types of footings – • Demonstrates knowledge of the Contact pressure distribution: Isolated footing – Combined footings – • Demonstrates knowledge of the Types and proportioning – • Demonstrates knowledge of the Mat foundation – Types and applications – Proportioning – • Demonstrates knowledge of the Floating foundation

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Bowles, J.E. *Foundation Analysis and Design*. McGraw-Hill. Das, B.M.. *Principles of Foundation Engineering*. Cengage Learning. Coduto, D.P.. *Foundation Design: Principles and Practices*. Prentice Hall.	No
Recommended Texts	Tomlinson, M.J., & Woodward, J. . *Foundation Design and Construction*. Pearson. Terzaghi, K., Peck, R.B., & Mesri, G. *Soil Mechanics in Engineering Practice*. Wiley.	
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors

	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information
معلومات المادة الدراسية

Module Title	**CONSTRUCTION DRAWING**	**Module Delivery**	
Module Type	**Core**		☒**Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☒ **Practical** ☐**Seminar**
Module Code	**BCE 405**		
ECTS Credits	**4**		
SWL (hr/sem)	**100**		
Module Level	1 4	**Semester of Delivery**	1
Administering Department	BCE	**College**	TEMO
Module Leader	Jasim Mohammed Abid	**e-mail**	jasimabd@ntu.edu.iq
Module Leader's Acad. Title	Assis. Prof	**Module Leader's Qualification**	Master
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	13/10/2024	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Enable students to understand the importance of civil drawing in engineering and industrial fields, as well as its role in communication between engineers and workers. 2. Develop students' skills in reading and drawing structural and engineering plans, including reinforced concrete and steel structures. 3. Equip students with the ability to analyze and draw structural details of multi-story buildings, including foundations, columns, shear walls, slabs, and staircases. 4. Enhance practical understanding of reinforcement detailing in various structural elements such as beams, slabs, and staircases. 5. Familiarize students with steel structures, including column base plate connections, beam-column connections, and different types of steel joints. 6. Introduce students to pre-stressed concrete structures, water tanks, and architectural details, including floors, roofs, doors, and windows.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this course, students will be able to: 1. Demonstrate knowledge of civil drawing fundamentals and their applications in engineering and construction. 2. Read and interpret concrete drawings, including longitudinal and cross-sections of multi-story buildings. 3. Draw and detail reinforced concrete foundations such as isolated, combined, strap, continuous, and raft foundations. 4. Read and draw reinforced concrete columns and cross-sections. 5. Read and draw shear walls and staircases, including types and reinforcement details.

	6. Read and draw reinforced concrete beams, including simple, cantilever, fixed, continuous, and girder beams with reinforcement details. 7. Read and draw different types of reinforced concrete slabs, including one-way slabs, two-way slabs, flat slabs, and ribbed & hollow block slabs with reinforcement details. 8. Read and draw building joints, including expansion joints and construction joints. 9. Demonstrate knowledge of steel drawing, including column base plate connections and beam-column connections (riveted, welded, and bolted). 10. Read and draw pre-stressed concrete elements and water tanks. 11. Read and draw architectural details, including floors, roofs, doors, windows, and finishing methods.
Indicative Contents المحتويات الإرشادية	The course will cover the following topics: 1. **Introduction to Civil Drawing** Definition and importance in engineering and industrial applications Communication between engineers and workers through drawings 2. **Concrete Drawing and Sectioning** Reading and drawing concrete structural details Longitudinal and cross-sections in multi-story buildings Roof, beam, column, staircase, and footing details 3. **Reinforced Concrete Foundations** Types: Isolated, combined, strap, continuous, and raft foundations Reinforcement detailing for each foundation type 4. **Reinforced Concrete Columns and Shear Walls** Reading and drawing columns and cross-sections Shear walls: types and reinforcement detailing 5. **Reinforced Concrete Beams** Types: Simple beam, cantilever beam, fixed beam, continuous beam, girder Reinforcement details, cutoff and bent-up methods 6. **Reinforced Concrete Slabs**

	Types: One-way slabs, two-way slabs, flat slabs, ribbed & hollow block slabs Reinforcement details and structural considerations 7. **Building Joints** Types of joints in buildings Expansion joints and construction joints 8. **Steel Structure Drawings** Column base plate connections Beam and column connections (riveted, welded, bolted) 9. **Pre-stressed Concrete and Water Tanks** Basics of pre-stressed concrete elements Water tank design and reinforcement details 10. **Architectural Drawings** Floors and roofs: types, materials, and finishing methods Doors and windows: types and selection based on function This course provides students with essential drafting skills required for structural and architectural drawings, preparing them for practical applications in civil engineering projects.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Assignment (Homework) , Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	49	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	51	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4		5 and 10	LO #1, #2, 4,6,8 and #10
	Assignments	3		2 and 12	LO #2, #4, and #8,
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1- #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1	• Demonstrates knowledge of the Introduction to define the civil drawing & all application in engineering & industrial fields between the engineer & worker.
2	• Reads and draws Concrete drawing & how to take the longitudinal & cross sections in multistory buildings. Able to Show details of roofs, beams, columns, stairs, and footing.
3	• Reads and draws Reinforced concrete footings, Wall footing, Isolated, Combined, Strap, Continuous, Raft foundations.
4	• Reads and draws Reinforced concrete columns and cross sections.
5	• Reads and draws Shear walls and staircase, type of staircase, reinforcement details
6	• Reads and draws Reinforced concrete beams: • Simple beam, simple beam with cantilever, fixed beam, Continuous beam, Girder, type of reinforcement cut-of and bent-up method.
7,8	• Reads and draws Reinforced concrete slabs (Types of slabs): • One-way slabs, two way slabs, Flat slabs, Ribbed & hollow – block slabs with all reinforcement details.
9	• Reads and Draws Building joints, Types of joints, Expansion joints, and Construction joints.
10	• Demonstrates knowledge of the steel drawing, • Reads and Draws steel column base plat connection
11	• Reads and Draws Beam, and column connections (Riveted, Welded , Bolts)
12	• Reads and Draws Pre-stressed concrete, Water tanks and

13	• Reads and Draws Architectural details: Floors & roofs types, their materials, Finishing methods, Doors & windows, Types of doors & windows according to their uses.
14	• Reads and Draws Elevators
15	• Demonstrates knowledge of the Municipal engineering drawing: • Reads and Draws Water distribution systems: Internal water networks for building (cold & hot), • Reads and Draws Water treatment station, • Reads and Draws Sewage network systems for building.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Ching, F. D. K. . *Building Construction Illustrated.* Wiley. Wakita, O. A., & Linde, R. M. . *The Professional Practice of Architectural Working Drawings.* Wiley. McMullan, R.. *Environmental Science in Building.* Palgrave Macmillan. AutoCAD	Yes
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors

	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**DESIGN OF STEEL STRUCTURES**			**Module Delivery**	
Module Type	**Core**			**☒Theory** **☒ Lecture** **☐ Lab** **☒ Tutorial** **☐ Practical** **☒ Seminar**	
Module Code	**BCE 406**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	1 4		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	
Module Leader	**Dr. Muhammed A. Basheer**		**e-mail**	mbasher@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	After successful completion of this course the student will be able to understand the behavior and design of different types of structural steel

	members and connections. He will gain an educational experience in the design of simple steel structures. Learning Outcomes •Basic understanding of the AISC specifications for design of steel structures. •Knowledge of the design of steel members including connections. •Knowledge of serviceability issues in design.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Demonstrate knowledge of the properties and behavior of steel as a construction material. • Apply design principles for various steel structural components, including beams, columns, and connections. • Analyze the stability and load-carrying capacity of steel structures under different loading conditions. • Utilize relevant design codes and standards in the design process. • Design various types of steel structures, including frames, trusses, and roof systems. • Evaluate the effects of temperature, corrosion, and other environmental factors on steel structures. • Conduct structural analysis using software tools for steel structure design.

Indicative Contents
المحتويات الإرشادية
	• **Introduction to Steel Structures**:
	  • Properties of steel.
	  • Advantages and disadvantages of steel as a construction material.
	  • Overview of steel structure applications.
	• **Design Principles**:
	  • Working stress design (WSD) vs. limit state design (LSD).
	  • Load combinations and factors.
	• **Steel Structural Elements**:
	  • Design of steel beams: bending, shear, and deflection.
	  • Design of steel columns: axial loads and buckling considerations.
	• **Connections in Steel Structures**:
	  • Types of connections: bolted and welded.
	  • Design principles for connections.
	• **Trusses and Frames**:
	  • Analysis and design of trusses.
	  • Design of moment-resisting frames.
	• **Stability Analysis**:
	  • Lateral stability of structures.

	• Bracing systems and their role in stability. • **Serviceability and Durability**: • Deflection limits and vibration analysis. • Effects of temperature and corrosion on steel structures. • **Design Codes and Standards**: • Introduction to AISC, Eurocode, and other relevant codes. • Application of codes in design. • **Software Tools for Structural Analysis**: • Overview of software used for steel structure design. • Practical exercises using design software.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Preliminary & Further Study, Assignment (Homework), Seminar, Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	82	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	43	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	6		5 and 10	LO #1, #2, 4,6,7
	Assignments	5		2 and 12	LO #2, #4, and #7,
	Seminar	1		6 and 11	LO #1- #5
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1- #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
	• **Week 1**: Introduction to Steel Structures and Properties of Steel • **Week 2**: Design Principles: Working Stress and Limit State Design • **Week 3**: Design of Steel Beams: Bending, Shear, and Deflection • **Week 4**: Design of Steel Columns: Axial Loads and Buckling • **Week 5**: Connections in Steel Structures: Types and Design Principles • **Week 6**: Analysis and Design of Trusses • **Week 7**: Design of Moment-Resisting Frames • **Week 8**: Stability Analysis: Lateral Stability and Bracing Systems • **Week 9**: Serviceability and Durability: Deflection Limits and Corrosion • **Week 10**: Design Codes and Standards: AISC and Eurocode • **Week 11**: Introduction to Structural Analysis Software • **Week 12**: Practical Exercises Using Design Software • **Week 13**: Review and Case Studies • **Week 14**: Final Examination Preparation

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• **"Steel Design" by William T. Segui** • **"Structural Steel Design" by Jack C. McCormac and James K. Nelson** • **"Design of Steel Structures" by S. K. Duggal** • **"Steel Structures: Design and Behavior" by Charles G. Salmon and John E. Johnson** • **"AISC Steel Construction Manual" by the American Institute of Steel Construction (AISC)**	Yes
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**INOVATIVE PROJECT -I**			**Module Delivery**	
Module Type	**Core**			☐**Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**BCE 407**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	1 4		**Semester of Delivery**	1	
Administering Department	BCE		**College**	TEMO	
Module Leader	Zaid.alsaffar		**e-mail**	Zaid.alsaffar@ntu.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The student will be able to design, calculate quantities, and plot the architectural, constructional, sanitary, & electrical plans & details for a certain project in civil engineering.

Module Learning Outcomes
 	
مخرجات التعلم للمادة الدراسية
	• **Design Competence**:
	  • Ability to design and create architectural and construction drawings that meet project requirements.
	• **Quantity Calculation**:
	  • Accurately calculate material quantities for architectural, constructional, sanitary, and electrical components.
	• **Plan Plotting**:
	  • Proficiently plot plans using software tools (e.g., AutoCAD, Revit) with clear details.
	• **Integration of Disciplines**:
	  • Integrate architectural, structural, sanitary, and electrical elements in cohesive project plans.
	• **Project Presentation**:
	  • Prepare and present professional project plans, explaining design choices and calculations.

Indicative Contents المحتويات الإرشادية	• **Introduction to Civil Engineering Design**: Overview of civil engineering projects and disciplines. • **Architectural Design Principles**: Basics of architectural layout, compliance with regulations. • **Construction Drawings**: Types of drawings and their purposes, drawing standards. • **Sanitary Engineering Design**: Plumbing layouts and water supply management. • **Electrical Design**: Electrical systems in buildings, integration with other plans. • **Quantity Surveying**: Calculating material quantities and estimation techniques. • **Software Tools**: Introduction to design software for plotting and detailing. • **Project Case Studies**: Analysis of real projects for best practices and lessons learned.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Web Based Learning, Practice at a workplace, Group Work ,Thesis Work, Report Writing ,Final Exam, and Mid-Term Exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	45	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Project Work**	1			
	Seminar	1			
Summative assessment	**Midterm Exam**	1hr	10% (10)		
	Final Exam	1hr	50% (50)		
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1-14	**Different project subjects supervised by teaching staff such as:** • **Thermal insulation and consideration of walls.** • **Ventilation strategy of buildings.** • **Acoustic noise (isolation) of wall and ceiling.**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Module Information معلومات المادة الدراسية					
Module Title	**MATERIALS FOR HERITAGE BUILDINGS**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**BCE 408**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	Harith Ibrahim		**e-mail**	harithali@ntu.edu.iq	
Module Leader's Acad. Title	**Assist.Prof.**		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	▪ By the completion of the course, the student is familiar with the fundamental methodological tools needed to choose and use materials and technologies for the preservation of historic building materials in a way that maximizes their efficacy, compatibility, and longevity.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. By the completion of the course, the student will be familiar with the fundamental methodological tools needed to choose and use materials and technologies for the preservation of historic building materials, ensuring efficacy, compatibility, and longevity. 2. Students will understand the development of ancient building materials, construction methods, and maintenance techniques, with a particular emphasis on stone, wood, and masonry. 3. Students will be able to specify a set of criteria to ensure that materials chosen for conservation and rehabilitation are best suited to each building's requirements in terms of safety, efficiency, compatibility, and cost-effectiveness. 4. Students will learn to manage multiple design variables simultaneously to optimize conservation and rehabilitation strategies

Indicative Contents
المحتويات الإرشادية
	• **Historical Construction Materials:**
	  • Overview of materials like natural stones, fired-clay bricks, wood, cements, and cement-based concrete.
	  • Study of their microstructure, classification, and historical evolution.
	• **Deterioration Processes:**
	  • Examination of pollutants and physical, mechanical, and chemical deterioration, focusing on moisture's role.
	• **Characterization of Old Materials:**
	  • Techniques for characterizing old materials using destructive and non-destructive methods, with case studies and standards.
	• **Restoration Procedures:**
	  • Introduction to restoration, repair, and upkeep of historic buildings, emphasizing performance-based design.
	• **Construction Methods in Heritage Buildings:**
	  • Overview of timber structures, stone, and brick masonry.
	• **Building Techniques and Structural Components:**
	  • Analysis of foundational components like walls, columns, beams, roofs, and arches.
	• **Repair Techniques:**
	  • Discussion on retrofitting masonry and repairing structural timber, including energy retrofitting.
	• **Restoration of Structural Integrity:**

	• Study of pathology in construction, identifying causes of decay and diagnostic methods. • **Cost Control and Facility Management:** • Overview of maintenance procedures and strategies for controlling rehabilitation costs, including Life Cycle Cost Evaluation (LCC).

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Preliminary & Further Study, Assignment (Homework) Project Work, Seminar, Report Writing, Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	52	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	73	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5		5 and 10	LO #1- #4
	Assignments	4		2 and 12	LO #1- #4
	Project Work	1		Continuous	
	Seminar	2		6 and 11	LO #1- #4
Summative assessment	**Midterm Exam**	2hr		7	LO #1- #3

	Final Exam	3hr		16	ALL
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1,2,3	• Historical construction materials included natural stones, fired-clay bricks, binders, mortars, plasters/renders, stuccoes, and finishes, as well as wood, cements, artificial stones, and cement-based concrete. Microstructure and classification. Evolution both historically and technologically. • Pollutants and physical, mechanical, and chemical deterioration processes in historic building materials. Moisture's role in the deterioration of materials • Characterization of old construction materials and their transformation products using destructive and non-destructive diagnostic methods. Case studies. Standards.
4	• Introduction: procedures for historic building restoration, repair, and upkeep. Historic structures should use performance-based building design, a history of construction.
5,6,7	• Construction methods and materials used in heritage buildings • Timber structures: structural timber, wood characteristics. • Stone and brick masonry, including masonry mortar and brick masonry. • 3. Building techniques and structural components: the groundwork, the walls, the piers and columns, the beams, the floors, the roofs and trusses, and the arches and vaults.
8,9,10	• Repair techniques and renovation approaches: • Retrofitting of stone and brick masonry as a method of repair. • Repairs to structural timber. • Energy retrofitting and calculating U-Value • 4. Restoration of historic structures' structural integrity
11,12	• pathological construction • Construct a definition of pathology. Failure, abnormality, and flaw. • Decaying materials and structures have certain causes. Investigative procedure. • Method of diagnosis. For non-destructive building construction inspections, a diagnostic system. • Failed instances. Informational documents regarding defects. An examination of errors and flaws.
13,14,15	• Controlling costs and facility management • Historic building maintenance procedures. • Controlling the costs of rehabilitation initiatives. • Life Cycle Cost Evaluation (LCC).

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**

Required Texts	• **"Historic Building Materials: An Overview"** by James S. McCarthy
	  • A comprehensive look at traditional construction materials and their properties.
	• **"Building Pathology: Deterioration, Diagnostics, and Intervention"** by Andy McDonald
	  • Discusses various deterioration processes and diagnostics for historic buildings.
	• **"Conservation of Historic Buildings"** by Bernard Feilden
	  • A guide to the conservation and restoration of historic structures, focusing on materials and methods.
	• **"Historic Preservation: An Introduction to Its History, Principles, and Practice"** by J. Timothy Kell
	  • Covers the principles and practices of historic preservation, including materials and construction methods.
	• **"Restoration of Historic Buildings: A Guide to Principles and Practices"** by Andrew M. McMillan
		Yes

Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	C - Good	جيد	70 – 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 – 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	ADVANCED FOUNDATION ENGINEERING			**Module Delivery**	
Module Type	**Core**			☒**Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**BCE 409**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	1 4		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	Israa		**e-mail**		
Module Leader's Acad. Title	Assis. Lecturer		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The student will learn the basic of foundation engineering, soil investigation, calculation of bearing capacity of soil, selection and design of different types of foundation.
Module Learning Outcomes	• **Deep Foundations**: Understand and explain the principles of deep foundations.

مخرجات التعلم للمادة الدراسية	• **Types and Uses of Piles**: Identify different types of piles and their applications in construction. • **Construction of Piles**: Describe the construction methods for installing piles. • **Bearing Capacity**: Analyze and calculate the bearing capacity of both single piles and pile groups. • **Load Testing**: Conduct load tests on piles to evaluate their performance. • **Pile Cap Design**: Design pile caps and assess the settlement of piles. • **Lateral Earth Pressure**: Understand the concept of lateral earth pressure and its implications in design. • **Retaining Walls**: Identify the types of retaining walls and their construction methods. • **Design of Concrete Retaining Walls**: Design concrete retaining walls for various applications. • **Sheet Piles**: Understand the types of sheet piles and their uses in construction. • **Design of Sheet Piles**: Design sheet piles to meet project requirements. • **Slope Stability**: Analyze slope stability and identify factors that affect it. • **Expansive Soil**: Recognize the challenges of construction on expansive soils and explore methods to mitigate them.
Indicative Contents المحتويات الإرشادية	• **Deep Foundations**: Study the principles, design criteria, and construction methods for deep foundations. • **Types and Uses of Piles**: Review various pile types (e.g., concrete, steel, timber) and their specific uses in engineering projects. • **Construction of Piles**: Learn installation techniques, including driven piles, bored piles, and screw piles. • **Bearing Capacity**: Explore methods to determine the bearing capacity of individual piles and groups, including theoretical and empirical approaches. • **Load Testing**: Understand the procedures for conducting static and dynamic load tests on piles. • **Pile Cap Design**: Study design principles for pile caps and factors influencing pile settlement. • **Lateral Earth Pressure**: Examine theories of lateral earth pressure (e.g., Rankine, Coulomb) and their application in retaining wall design. • **Retaining Walls**: Investigate different types (gravity, cantilever, anchored) and their design considerations. • **Design of Concrete Retaining Walls**: Apply engineering principles to design effective and safe concrete retaining walls. • **Sheet Piles**: Analyze the role of sheet piles in earth retention and waterfront construction. • **Design of Sheet Piles**: Explore design methods for sheet piles, including factors influencing their performance. • **Slope Stability**: Study methods for assessing slope stability, including the use of stability charts and factor of safety calculations.

	• **Expansive Soil**: Investigate construction techniques and design adaptations required when working with expansive soils.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Preliminary & Further Study, Group Work, Assignment (Homework) , Project Work, Seminar, Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	82	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	43	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	6		5 and 10	LO #2,4,6,8,10
	Assignments	8		2 and 12	LO #3,5,7,9
	Project Work	1		Continuous	
	Seminar	3		6 and 11	LO #1- #4
	Report Writing	3			LO #1- #3
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1- #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1,2	• Demonstrates knowledge of the Deep foundations, • Demonstrates knowledge of the Types and uses of piles, • Demonstrates knowledge of the Construction of piles, • Demonstrates knowledge of the Bearing capacity of single pile, Bearing capacity of pile group, • Able to conduct Load test on piles, • Able to Design of piles cap, and Settlement of piles.
3,4,5	• Demonstrates knowledge of the Lateral earth pressure.
6,7,8	• Demonstrates knowledge of the Retaining walls- types of retaining walls, • Able to Design of concrete retaining walls. • Demonstrates knowledge of the construction of retaining walls
9,10	• Demonstrates knowledge of the Sheet piles- types of sheet piles, • Able to design of sheet piles, • Demonstrates knowledge of the construction of sheet pile
11,12	• Demonstrates knowledge of the Slope stability, Types & factors affecting slope stability
13,14,15	• Demonstrates knowledge of the Expansive soil- methods of construction on expansive soil

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Primary sources: - WILEY J. & INC S., (2011), " SOIL MECHANICS AND FOUNDATIONS" , 3rd Edition, ISBN: 978-1-118-13604-1, August 2011, 784 pages. - BRAJA M. DAS Principles of Foundation Engineering, SI Seventh Edition.	Yes

	• Suggested sources: 1- Edward J., Shyam N., John A. , (2011), "Suggested Analysis and Design Procedures for Combined Footings and Mats" Reported by ACI Committee 336 . 2- Michael B., (2016), "Design methods based upon rapid pile load tests" ISSMGE - ETC 3 International Symposium on Design of Piles in Europe. Leuven, Belgium, 28 & 29• Suggested related links: None.	
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**SAFETY IN CONSTRUCTION**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**BCE 410**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	4		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	**Muhammed Hazim**		**e-mail**		
Module Leader's Acad. Title	Assis Lecturer		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	• To know causes of accidents related to construction activities and human factors associated with these accidents. • To understand the construction regulations and quality assurance in construction. • To have the knowledge in hazards of construction and their prevention methods.

	• To know the working principles of various construction machinery. • To gain knowledge in health hazards and safety in demolition work.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of the course, the students will be able to • Identify the problems, types and causes of accidents in construction industries. • Understand the various hazards during construction work. • Understand the safety procedure for working at heights during construction. • Explain safe operation, inspection and testing of various construction machinery. • List out construction regulations and Indian standards for construction and demolition work.

Indicative Contents
المحتويات الإرشادية
	• **Accident Causes and Management Systems**:
	  • Identify safety challenges and human factors in construction accidents.
	  • Understand pre-contract activities, work permits, and quality assurance.
	  • Learn accident recording and the importance of training.
	• **Hazard Management**:
	  • Safety in excavations, scaffolding, false work, tunneling, and confined spaces.
	  • Address risks in roadworks, power plants, and high-rise constructions.
	• **Working at Heights**:
	  • Review OSHA regulations for fall protection and safe access.
	  • Discuss fall prevention techniques and case studies on accidents.
	• **Construction Machinery Safety**:
	  • Focus on the safe selection and operation of cranes and other machinery.
	  • Learn about inspection checklists and safe use of portable tools.
	• **Demolition Safety**:
	  • Understand safety practices for various demolition methods.
	  • Emphasize pre-survey inspections, site supervision, and fire hazard prevention.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Assignment (Homework), Group Work , Project Work, Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	35	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	15	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4		5 and 10	LO #1- #2
	Assignments	5		2 and 12	LO #1- #2
	Project Work	1		Continuous	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1- #4
	Final Exam	3hr	50% (50)	16	ALL
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1,2	**Demonstrates knowledge about ACCIDENTS CAUSES AND MANAGEMENT SYSTEMS** Problems impeding safety in construction industry- causes of fatal accidents, types and causes of accidents related to various construction activities, human factors associated with these accident – construction regulations, contractual clauses – Pre contract activities, preconstruction meeting - design aids for safe construction – permits to work – quality assurance in construction - compensation – Recording of accidents and safety measures – Education and training
3,4,5	**Demonstrates knowledge and managing HAZARDS OF CONSTRUCTION AND PREVENTION** Excavations, basement and wide excavation, trenches, shafts – scaffolding , types, causes of accidents, scaffold inspection checklist – false work – erection of structural frame work, dismantling – tunneling – blasting, pre blast and post blast inspection – confined spaces – working on contaminated sites – work over water - road works – power plant constructions – construction of high rise buildings.
6,7,8	**Demonstrates knowledge and correctly implement WORKING AT HEIGHTS** Fall protection in construction OSHA 3146 – OSHA requirement for working at heights, Safe access and egress – safe use of ladders- Scaffoldings , requirement for safe work platforms, stairways, gangways and ramps – fall prevention and fall protection , safety belts, safety nets, fall arrestors, controlled access zones, safety monitoring systems – working on fragile roofs, work permit systems, height pass – accident case studies.
9,10,11	**Demonstrates knowledge and correctly implement CONSTRUCTION MACHINERY** Selection, operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crane inspection checklist - builder's hoist, winches, chain pulley blocks – use of conveyors - concrete mixers, concrete vibrators – safety in earth moving equipment, excavators, dozers, loaders, dumpers, motor grader, concrete pumps, welding machines, use of portable electrical tools, drills, grinding tools, manual handling scaffolding, hoisting cranes – use of conveyors and mobile cranes – manual handling.
12,13,14,15	**Demonstrates knowledge and correctly implement SAFETY IN DEMOLITION WORK** Safety in demolition work, manual, mechanical, using explosive - keys to safe demolition, pre survey inspection, method statement, site supervision, safe clearance zone, health hazards from demolition - Indian standard - trusses, girders and beams – first aid – fire hazards and preventing methods – interesting experiences at the construction site against the fire accidents.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• **"Construction Safety Management and Engineering"** by John L. Rynearson, 2014.	Yes

	• **"Safety and Health in Construction"** by C. Rayner, 2016. • **"Occupational Health and Safety in Construction Work"** by J. S. Dorman, 2013.	
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** – Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	C – Good	جيد	70 – 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 – 69	Fair but with major shortcomings
	E – Sufficient	مقبول	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**COMPUTER AIDED DESIGN OF STRUCTURE**			**Module Delivery**	
Module Type	**Core**			☒Theory ☒ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☒ Seminar	
Module Code	**BCE 411**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	**Ban A. Khalil**		**e-mail**	banahmed@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The main objective of this program is to train the student in the use of computers and creating a computer code as well as using commercially available software for the design of Civil Engineering structures.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The student must learn the structural analysis & design for all structures types using the most recent methods including programs such as (STAAD. pro, CONCAD, SAFE, CSI Bridge, Prokon, Epanet and AutoCAD land development desktop AutoCAD land development desktop
Indicative Contents المحتويات الإرشادية	• **Overview of STAAD.Pro**: Introduction to the software, its interface, and capabilities. • **Structural Modeling**: Techniques for creating structural models using different elements. • **Load Cases and Analysis**: Understanding various load cases and how to apply them in design. • **Foundation Design**: Methods for designing different foundation types. • **Steel Structure Design**: Principles of analyzing and designing steel structures. • **Integration with Other Software**: Overview of how STAAD.Pro interacts with other civil engineering software tools.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Laboratory, Assignment (Homework) , Project Work, Seminar, Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية				
	Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**

Formative assessment	**Quizzes**	6		5 and 10	
	Assignments	5		2 and 12	
	Project Work	1		Continuous	
	Seminar	3		6 and 11	
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	
	Final Exam	3hr	50% (50)	16	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
1	• Demonstrates knowledge of the General description of the STAAD. Pro structural program, • Able to Start the Programs, • Able to Create a new Structure.
2,3	• Able to Create the Model (Beam, Column, Slab or plate, wall or surface and solid) using Graphical Interface.
4,5	• Be familiar with the STAAD Pro software components: Menus bar (file, edit, view, tools, select, geometry)
6,7	• Able to execute Application examples of structural engineering in STAAD. pro program (analysis and design of concrete beam, column, slab, shear walls and multi-story building subjected to floor load, wind load, earthquake load temperature load and pre-stress load)
8,9	• Able to analyse and design of foundation (isolated, strip raft and pile footing using STAAD.pro and STAAD. foundation programs)
10,11	• Able to analyse and design of steel structure
12	• Demonstrates knowledge of the Various applications in civil engineering using structural programs such as: ((STAAD. pro, CONCAD, SAFE, CSI Bridge, Prokon, Epanet and AutoCAD)
13	• Able to analyse and design slabs using SAFE program.
14	• Able to analyse and design various types of bridges using CSI Bridge

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	• **"STAAD.Pro Tutorial" by Rakesh R. Sharma** • **"Practical STAAD.Pro: An Engineering Approach" by Srinivasan S.** • **"Structural Analysis and Design with STAAD.Pro" by Rajesh K. Gupta** • **"Introduction to Structural Analysis and Design" by William M. C. McKenzie**	Yes
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**REPAIRS & REHABILITATION OF STRUCTURES**			**Module Delivery**	
Module Type	**Core**			**☒Theory ☒ Lecture ☒ Lab ☒ Tutorial ☒ Practical ☒Seminar**	
Module Code	**BCE 412**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	Hassan Mohammed		**e-mail**	albegmprli@ntu.edu.iq	
Module Leader's Acad. Title	Assis Prof		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	To learn various distress and damages to concrete and masonry structures • To understand the importance of maintenance of structures • To study the various types and properties of repair materials • To assess the damage to structures using various tests • To learn the importance and methods of substrate preparation • To learn various repair techniques of damaged structures, corroded structures
Module Learning Outcomes	By the end of this course students will have the capability/knowledge of • various distress and damages to concrete and masonry structures

مخرجات التعلم للمادة الدراسية	• the importance of maintenance of structures, types and properties of repair materials etc • assessing damage to structures and various repair techniques

Indicative Contents
المحتويات الإرشادية
	• **Distress and Damage in Structures**:
	  • Overview of common types of distress and damage in concrete and masonry structures.
	  • Identification and classification of structural issues.
	• **Importance of Maintenance**:
	  • Understanding the significance of regular maintenance for structural longevity.
	  • Strategies for effective maintenance planning.
	• **Repair Materials**:
	  • Study of different types of repair materials and their properties.
	  • Criteria for selecting appropriate materials for specific repairs.
	• **Damage Assessment**:
	  • Techniques for assessing structural damage using various testing methods.
	  • Interpretation of test results to inform repair decisions.
	• **Substrate Preparation**:
	  • Importance of proper substrate preparation before repairs.
	  • Methods for preparing surfaces to ensure successful bonding of repair materials.
	• **Repair Techniques**:
	  • Overview of various repair techniques for damaged and corroded structures.
	  • Case studies illustrating successful repair implementations.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Assignment (Homework), Laboratory, Project Work , Report Writing ,Seminar Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	53	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5		5 and 10	
	Assignments	5		2 and 12	
	Project Work	1			
	Seminar	3			
	Report Writing	2			
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	
	Final Exam	3hr	50% (50)	16	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1	• **Introduction:** • Demonstrates knowledge of the Maintenance, rehabilitation, repair, retrofit and strengthening, need for rehabilitation of structures.
2	• **Cracks in R.C. buildings** • Demonstrates knowledge of the Various cracks in R.C. buildings, causes and effects
3	• **Maintenance** • Demonstrates knowledge of the Maintenance importance of maintenance, routine and preventive maintenance.
4	• **Damages to masonry structures** • Demonstrates knowledge of the Various damages to masonry structures and causes
5	• **Repair materials** • Demonstrates knowledge of the Various repair materials, Criteria for material selection, Methodology of selection, • Demonstrates knowledge of the Health and safety precautions for handling and applications of repair materials • **Special mortars and concretes**

	• Demonstrates knowledge of the Polymer Concrete and Mortar, Quick setting compounds
6	• **Grouting materials** • Demonstrates knowledge of the Gas forming grouts, Sulfoaluminate grouts, Polymer grouts, Acrylate and Urethane grouts. • **Bonding agents** • Demonstrates knowledge of the Latex emulsions, Epoxy bonding agents.
7	• **Protective coatings** • Demonstrates knowledge of the Protective coatings for Concrete and Steel
8	• **Damage diagnosis and assessment** • Able to conduct Visual inspection, • Able to conduct Non Destructive Test using Rebound hammer, • Able to conduct Ultra sonic pulse velocity, • Able to conduct Semi destructive test, • Able to conduct Probe test, • Able to conduct Pull out test, • Able to conduct Chloride penetration test, • Demonstrates knowledge of the Carbonation, and able to conduct Carbonation depth testing, • Able to conduct Corrosion activity measurement
9	• **Substrate preparation** • Demonstrates knowledge of the Importance of substrate/surface preparation, General surface preparation methods and procedure, Reinforcing steel cleaning • **Crack repair** • Demonstrates knowledge of the Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing, Autogenous healing, Overlays, Repair to active cracks, Repair to dormant cracks.
10	• **Corrosion of embedded steel in concrete** • Demonstrates knowledge of the Corrosion of embedded steel in concrete, Mechanism, Stages of corrosion damage, Repair of various corrosion damaged of structural elements (slab, beam and columns)
11,12	• **Jacketing** • Demonstrates knowledge of the Jacketing, Column jacketing, Beam jacketing, Beam Column joint jacketing, Reinforced concrete jacketing, Steel jacketing, FRP jacketing. • **Strengthening** • Demonstrates knowledge of the Strengthening, Beam shear strengthening, Flexural strengthening
13,14,15	• Renovation & Rehabilitation of Historic Buildings • Demonstrates knowledge of the different types of work on historic buildings defined • Restoration • Renovation • Rehabilitation • 4. Remodel, Repair, Renew, Reconstruct, Recondition, and Adaptive Re-use

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information معلومات المادة الدراسية					
Module Title	**SUSTAINABLE CONSTRUCTION MATERIALS**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**BCE 413**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	1 4		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader	Hiba		**e-mail**	Hibaarch1982@ntu.edu.iq	
Module Leader's Acad. Title	Assis. Lecturer		**Module Leader's Qualification**	Master	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	14/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	By the end of this course, students will be able to: • Understand the concept of sustainability and its critical role in construction practices. • Gain knowledge of construction materials and their resource usage, reserves, and environmental impact. • Learn about the greenhouse effect, global warming, and their link to construction materials. • Understand carbon footprint, embodied energy of materials, and the methods of calculating these factors. • Learn to apply Life Cycle Assessment (LCA) and cost analysis for evaluating sustainability in materials. • Identify and evaluate sustainability rating systems in the construction industry. • Examine the sustainability implications and challenges associated with different construction materials. Assess the sustainability issues related to cement, concrete, asphalt, metals, wood, glass, and masonry
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the completion of this course, students will be able to: • Demonstrate a comprehensive understanding of sustainability in the context of construction materials and methods. • Identify and evaluate the resources and reserves available for construction materials. • Analyze the environmental impact of materials in construction, focusing on the greenhouse effect, global warming, and carbon footprint. • Perform calculations related to carbon footprint, embodied energy, and Life Cycle Assessment (LCA) of materials. • Utilize sustainability rating systems to assess the environmental and economic viability of construction materials. • Investigate sustainability challenges and the environmental implications of cement, concrete, asphalt, metals, wood, glass, and masonry. • Propose strategies for reducing the environmental impact of construction materials in building practices. •
Indicative Contents	1. **Introduction to Sustainability and Its Need**

المحتويات الإرشادية	

Definition and importance of sustainability in construction.
Sustainable construction practices and their global significance.

2. **Resources and Reserves in Construction Materials**
   Overview of material resources used in construction.
   Reserves of natural materials and their long-term availability.
   Strategies for optimizing material usage in construction.
3. **The Greenhouse Effect and Global Warming**
   The science behind the greenhouse effect.
   Impact of construction materials on global warming.
4. **Carbon Footprint of Materials and Calculations**
   Definition of carbon footprint.
   Methods of calculating carbon emissions of construction materials.
   Case studies and real-world examples.
5. **Embodied Energy of Materials and Calculations**
   Concept of embodied energy in construction materials.
   Energy consumed during the production, transport, and installation of materials.
   Methods to calculate embodied energy.
6. **Life Cycle Assessment (LCA) and Cost Analysis**
   Introduction to Life Cycle Assessment and its stages.
   Evaluating environmental and economic impact across a material's lifespan.
   Cost analysis techniques for sustainable material selection.
7. **Sustainability Rating Systems**
   Overview of global sustainability rating systems such as LEED, BREEAM, and Green Star.
   Criteria for rating materials based on sustainability.
8. **Sustainability Implications in Construction Materials**
   The environmental, social, and economic implications of material selection.
   Challenges in selecting sustainable materials.
9. **Sustainability Issues in Cement and Concrete Materials**
   Environmental impact of cement production and concrete mixing.
   Sustainable alternatives and innovations in concrete and cement materials.

	10. **Sustainability Issues in Asphalt Materials** The environmental footprint of asphalt production and usage. Recycling and sustainable practices in asphalt production. 11. **Sustainability Issues in Metals** The impact of metal production on the environment. Sustainable practices in metal selection and usage. 12. **Sustainability Issues in Wood** Wood as a renewable resource: challenges and opportunities. Sustainable forestry practices and their role in construction. 13. **Sustainability Issues in Glass** Environmental impact of glass production and recycling. Sustainable innovations in glass materials for construction. 14. **Sustainability Issues in Masonry** The environmental cost of brick and stone production. Sustainable alternatives in masonry materials.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lecture & In-Class Activities, Assignment (Homework), Report Writing, Seminar, Final Exam, Mid-Term Exam and short Exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	45	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3		5 and 10	
	Assignments	4		2 and 12	
	Seminar	2		6 and 11	
	Report Writing	3			
Summative assessment	Midterm Exam	2hr	10% (10)	7	
	Final Exam	3hr	50% (50)	16	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1	Demonstrates knowledge of the Sustainability and its Need (Introduction)
2	Demonstrates knowledge of the Resources and Reserves in Construction Materials
3	Demonstrates knowledge of the Greenhouse Effect and Global Warming
4	Demonstrates knowledge of the Carbon Footprint of Materials and Calculations
5	Demonstrates knowledge of the Embodied Energy of Materials and Calculations
6	Demonstrates knowledge of the Life Cycle Assessment and Cost Analysis
7	Demonstrates knowledge of the Sustainability Rating Systems
8	Demonstrates knowledge of the Sustainability Implications in Construction Materials
9	Demonstrates knowledge of the Sustainability Issues in Cement and Concrete Materials
10	Demonstrates knowledge of the Sustainability Issues in Asphalt Materials
11	Demonstrates knowledge of the Sustainability Issues in Metals
12	Demonstrates knowledge of the Sustainability Issues in Wood
13	Demonstrates knowledge of the Sustainability Issues in Glass
14	Demonstrates knowledge of the Sustainability Issues in Masonry

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?

Required Texts	• **Sustainability and its Need (Introduction)**:
	  • **Book**: *Sustainable Construction: Green Building Design and Delivery* by Charles J. Kibert.
	  • **Journal**: *Journal of Sustainable Development*.
	• **Resources and Reserves in Construction Materials**:
	  • **Report**: *Global Status Report on Building and Construction* (UN Environment).
	  • **Book**: *Construction Materials: Their Nature and Behaviour* by Chris W. L. Johnson.
	• **Greenhouse Effect and Global Warming**:
	  • **Report**: *Climate Change 2021: The Physical Science Basis* (IPCC).
	  • **Book**: *Global Warming: Understanding the Forecast* by David Archer.
		Yes

Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	C - Good	جيد	70 – 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 – 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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Module Information معلومات المادة الدراسية					
Module Title	**INOVATIVE PROJECT -II**			**Module Delivery**	
Module Type	**Core**			☐**Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**BCE 414**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	4		**Semester of Delivery**	2	
Administering Department	BCE		**College**	TEMO	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	13/10/2024		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The student will be able to design, calculate quantities, and plot the architectural, constructional, sanitary, & electrical plans & details for a certain project in civil engineering.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• **Assess Structural Conditions:** Demonstrate the ability to analyze existing structures to identify damage, assess structural integrity, and determine necessary repairs. • **Apply Repair Techniques:** Gain proficiency in selecting and applying appropriate repair and retrofitting methods for deteriorated or damaged structures. • **Conduct Research and Development:** Exhibit the capability to explore, research, and implement innovative materials and techniques for improving structural performance. • **Restore Historical Buildings:** Show an understanding of the principles and methods required for restoring and rehabilitating historical buildings while preserving cultural heritage. • **Design Sustainable Structures:** Design new structures with an emphasis on sustainability, durability, and efficiency, adhering to modern engineering standards. • **Incorporate Sustainability in Projects:** Apply sustainable construction practices and principles in various building and development projects.
Indicative Contents المحتويات الإرشادية	• **Structural Assessment Projects:** Analyze existing structures to determine damage and repair needs. • **Repair and Retrofit Projects:** Implement various repair techniques on damaged or aging structures. • **Research and Development Projects:** Explore new materials and techniques to improve structural performance. • **Historical Building Restoration Projects:** Preserve cultural heritage through restoration and rehabilitation of historical buildings. • **New Structure Design Projects:** Design new structures focusing on sustainability and efficiency. • **Sustainability Projects:** Apply sustainable engineering principles in construction and development projects.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Web Based Learning, Practice at a workplace, Group Work ,Thesis Work, Report Writing ,Final Exam, and Mid-Term Exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	45	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Project Work**	1			
	Seminar	1			
Summative assessment	**Midterm Exam**	1hr	10% (10)		
	Final Exam	1hr	50% (50)		
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
1-14	• **Different projects supervised by staff members.**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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