المرحلة الثانية

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية (المرحلة الثانية/الفصل الاول)

Module Information

معلومات المادة الدراسية

Module Title	Analytical geometry and differential equations	Module Delivery	
Module Type	B	☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	UOBRS35		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	1
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Zaman Adel Rashid	e-mail	zaman.adel@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	مدرس	Module Leader's Qualification	Ph.D.
Module Tutor		e-mail	
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	1/10/2024	Version Number	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Ministry of Higher Education and Scientific Research - Iraq University of Baghdad College of Science Department of GIS			

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 a comprehensive understanding of analytical geometry and differential equations, equipping them with the necessary skills to solve problems in various fields, including physics, engineering, and economics. The **students will be able to:** **Analytical Geometry:** - Define and understand fundamental concepts in analytical geometry, including points, lines, planes, vectors, curves, and surfaces. - Explain the relationship between geometric objects and their algebraic representations. - Apply geometric transformations and understand their impact on geometric objects. **Problem Solving:** - Determine the equation of a line, plane, or curve given specific conditions. - Find the distance between points, lines, and planes. - Calculate the angle between lines, planes, and vectors. - Analyze and solve geometric problems using analytical methods. **Applications:** - Apply analytical geometry concepts to solve real-world problems in various fields. - Utilize geometric modeling techniques to represent and analyze complex systems. - Understand the role of analytical geometry in computer graphics and other related fields. **Differential Equations:**

	- Define and understand different types of differential equations, including ordinary and partial differential equations. - Explain the concept of order and degree of a differential equation. - Identify the type of differential equation and its appropriate solution method. **Problem Solving:** - Solve first-order and second-order linear differential equations using various methods, including separation of variables, integrating factors, and variation of parameters. - Apply techniques to solve non-linear differential equations. - Utilize numerical methods to approximate solutions to differential equations. **Applications:** - Apply differential equations to model and solve real-world problems in physics, engineering, biology, and other fields. - Understand the role of differential equations in describing phenomena such as population growth, radioactive decay, and heat transfer. - Utilize differential equations to analyze and predict the behavior of complex systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	- Develop a strong foundation in analytical geometry and differential equations: Students will gain a comprehensive understanding of the fundamental concepts and techniques in both areas. - Enhance problem-solving skills and critical thinking abilities: Students will develop the ability to analyze problems, identify appropriate methods, and solve them effectively. - Apply theoretical knowledge to real-world problems: Students will be able to translate theoretical concepts into practical applications and solve real-world problems using the tools learned in the course. - Gain a deeper understanding of the interconnectedness of mathematics and other disciplines: Students will appreciate the role of analytical geometry and differential equations in various fields and understand their importance in solving real-world problems. This course will provide students with a solid foundation in analytical geometry and differential equations, enabling them to excel in their future studies and careers.

Indicative Contents المحتويات الإرشادية	his course will cover a range of topics in analytical geometry and differential equations, providing a solid foundation for students in various fields. Here is an indicative content outline: **I. Analytical Geometry** **1. Fundamentals of Analytical Geometry** * Coordinate systems: Cartesian, polar, cylindrical, and spherical coordinates. * Distance formula and midpoint formula. * Vectors in two and three dimensions: addition, subtraction, scalar multiplication, dot product, cross product. * Lines in two and three dimensions: equation of a line, slope-intercept form, point-slope form, parametric equations, vector form. * Planes in three dimensions: equation of a plane, normal vector, distance from a point to a plane. **2. Conic Sections** * Circle: equation of a circle, standard form, general form. * Parabola: equation of a parabola, focus, directrix, vertex. * Ellipse: equation of an ellipse, foci, major and minor axes, eccentricity. * Hyperbola: equation of a hyperbola, foci, asymptotes, eccentricity. **3. Transformations in Analytical Geometry** * Translations: shifting a geometric object. * Rotations: rotating a geometric object around a point. * Reflections: mirroring a geometric object across a line or plane. * Dilations: scaling a geometric object. **4. Applications of Analytical Geometry** * Geometric modeling: representing and analyzing objects using analytical geometry. * Computer graphics: applying analytical geometry to create and manipulate images. * Optimization problems: using analytical geometry to find optimal solutions in various fields.

II. Differential Equations

1. Introduction to Differential Equations
* Definition and classification of differential equations: ordinary and partial differential equations, order, degree.
* Formation of differential equations from physical problems.
* Existence and uniqueness of solutions.

2. First-Order Differential Equations
* Separable equations: solving by separation of variables.
* Linear equations: solving using integrating factors.
* Exact equations: solving using the method of exact differentials.
* Applications: modeling population growth, radioactive decay, and other phenomena.

3. Second-Order Linear Differential Equations
* Homogeneous equations: finding the general solution using characteristic equations.
* Non-homogeneous equations: finding the particular solution using methods like undetermined coefficients and variation of parameters.
* Applications: modeling oscillations, vibrations, and other physical systems.

4. Numerical Methods for Solving Differential Equations
* Euler's method: approximating solutions using a step-by-step approach.
* Runge-Kutta methods: higher-order methods for more accurate approximations.
* Applications: solving differential equations when analytical solutions are not available.

5. Applications of Differential Equations
* Modeling physical systems: describing the behavior of systems using differential equations.
* Engineering applications: solving problems in mechanics, circuits, and other fields.

* Biology and economics: modeling population dynamics, economic growth, and other phenomena.

This indicative content outline provides a general overview of the course. The specific topics covered and the depth of coverage may vary depending on the instructor and the specific needs of the students.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies

This course requires a blend of theoretical understanding and practical application. Here are some effective learning and teaching strategies to ensure student success:

Learning Strategies:

- **Active Learning:** Encourage active participation through:
  - **Group work:** Students collaborate on problem-solving tasks, fostering discussion and peer learning.
  - **Class discussions:** Engage students in discussions about concepts, applications, and problem-solving strategies.
  - **Interactive exercises:** Utilize online platforms or in-class activities to provide immediate feedback and reinforce learning.
- **Visual Representations:** Utilize visual aids to enhance understanding:
  - **Geometric diagrams:** Draw and analyze geometric objects to visualize concepts and solutions.
  - **Graphs and plots:** Represent functions and solutions of differential equations graphically to gain insights.
  - **Animations and simulations:** Use dynamic visuals to illustrate complex concepts and processes.
- **Real-World Applications:** Connect learning to practical situations:
  - **Case studies:** Analyze real-world problems using analytical geometry and differential equations.

- **Project-based learning:** Students work on projects that involve applying course concepts to solve real-world challenges.
- **Guest lectures:** Invite professionals from relevant fields to share their experiences and demonstrate applications.
- **Technology Integration:** Leverage technology to enhance learning:
  - **Online learning platforms:** Utilize platforms for interactive exercises, quizzes, and access to resources.
  - **Mathematical software:** Use software like GeoGebra, Wolfram Alpha, or MATLAB to visualize concepts, solve problems, and explore applications.
  - **Online tutorials and videos:** Provide access to supplementary learning materials for self-paced learning.

Teaching Strategies:

- **Clear and Concise Explanations:** Present concepts clearly and concisely, using appropriate language and examples.
- **Problem-Solving Demonstrations:** Show step-by-step solutions to various types of problems, emphasizing key concepts and techniques.
- **Regular Assessments:** Use a variety of assessment methods to monitor student progress:
  - **Homework assignments:** Regular assignments to reinforce concepts and practice problem-solving.
  - **Quizzes:** Short assessments to evaluate understanding of key concepts and problem-solving skills.
  - **Midterm and Final Exams:** Comprehensive assessments to evaluate overall understanding and mastery of the course material.
- **Feedback and Support:** Provide timely and constructive feedback on student work to identify areas for improvement. Offer individual and group support to address student difficulties and promote learning.
- **Differentiated Instruction:** Cater to diverse learning styles and needs:
  - **Multiple learning modalities:** Provide materials in various formats (text, audio, video) to cater to different learning preferences.
  - **Flexible pacing:** Allow students to work at their own pace and provide additional support as needed.
  - **Collaborative learning groups:** Group students with different strengths and weaknesses to promote peer learning and support.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**200**		

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 Analytical Geometry: Coordinate Systems, Distance Formula, Midpoint Formula, Vectors in 2D and 3D.
Week 2	Vectors, Dot Product, Cross Product: Dot Product, Cross Product, Applications of Vectors.
Week 3	Lines in 2D and 3D: Equation of a Line, Slope-Intercept Form, Point-Slope Form, Parametric Equations, Vector Form.
Week 4	Planes in 3D: Equation of a Plane, Normal Vector, Distance from a Point to a Plane.
Week 5	Conic Sections: Circle: Circle, Equation of a Circle, Standard Form, General Form.
Week 6	Conic Sections: Parabola: Equation of a Parabola, Focus, Directrix, Vertex.
Week 7	Midterm Exam
Week 8	Conic Sections: Ellipse, Equation of an Ellipse, Foci, Major and Minor Axes, Eccentricity.
Week 9	Conic Sections: Hyperbola, Equation of a Hyperbola, Foci, Asymptotes, Eccentricity with an applications of Analytical Geometry: Geometric Modeling, Computer Graphics, Optimization Problems.
Week 10	Introduction to Differential Equations: Definition and Classification of Differential Equations, Order, Degree, Formation of Differential Equations, Existence and Uniqueness of Solutions
Week 11	First-Order Differential Equations: Separable and Linear: Separable Equations, Linear Equations, Integrating Factors
Week 12	First-Order Differential Equations: Exact Equations and Applications: Exact Equations, Applications of First-Order Differential Equations
Week 13	Second-Order Linear Differential Equations: Homogeneous: Homogeneous Second-Order Linear Differential Equations, Characteristic Equations

Week 14	Second-Order Linear Differential Equations: Non-Homogeneous Second-Order Linear Differential Equations, Method of Undetermined Coefficients, Variation of Parameters
Week 15	Applications of Differential Equations: Modeling Physical Systems, Engineering Applications, Biology
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. **Calculus: Early Transcendentals** by James Stewart 2. **Calculus: Early Transcendentals** by Ron Larson and Bruce Edwards. 3. **Thomas' Calculus: Early Transcendentals** by George B. Thomas, Jr. and Maurice D. Weir.	Yes
Recommended Texts	1. **Elementary Differential Equations and Boundary Value Problems** by William E. Boyce and Richard C. DiPrima. 2. **Differential Equations with Boundary-Value Problems** by Dennis G. Zill and Michael R. Cullen. 3. **A First Course in Differential Equations** by Dennis G. Zill.	Yes
Websites	1. Khan Academy. 2. MIT Open Courseware 3. and Wolfram Alpha	

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 II		Module Delivery	
Module Type		B	☒ **Theory**	
Module Code		UOB207	☒ **Lecture**	
ECTS Credits		٣	☒ **Lab**	
			☐ **Tutorial**	
SWL (hr/sem)		**75**	☐ **Practical**	
			☐ **Seminar**	
Module Level			**Semester of Delivery**	1
Administering Department	Remote sensing and GIS department		**College**	college of science
Module Leader	Hala Abdusalam Jasim		**e-mail**	E-mail Hala.abd@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	مدرس مساعد		**Module Leader's Qualification**	Master

Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	1/10/2024	**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	• To introduce students to fundamental programming concepts using Python. • To develop problem-solving skills and logical thinking through coding exercises. • To provide hands-on experience with Python for data manipulation and analysis. • To prepare students for advanced topics in computer science and software development.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Understand and apply basic programming constructs: variables, data types, and control structures. • Develop, test, and debug Python programs. • Use Python libraries for data handling and analysis. • Write reusable and modular code using functions and modules. • Implement data structures such as lists. • Apply object-oriented programming concepts in Python.

Indicative Contents المحتويات الإرشادية	• Introduction to Python and its environment. • Basic syntax and semantics of Python. • Control structures: loops and conditionals. • Functions: definition, scope, and recursion. • Data structures: lists. • File handling and exceptions. • Introduction to libraries for data analysis (e.g., pandas, numpy).

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	• Lectures to introduce theoretical concepts. • Practical lab sessions for hands-on experience. • Weekly assignments to reinforce learning. • Group projects to encourage collaboration. • Continuous assessment through quizzes and tests.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**200**		

	Ministry of Higher Education and Scientific Research - Iraq University of Baghdad College of Science Department of GIS	

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	Learning Programming with Python Values and Variables
Week 2	Integer and String Values
Week 3	Identifiers User Input String Formatting
Week 4	Expressions and Arithmetic Expressions - Arithmetic -Examples
Week 5	Conditional Statements Boolean – expressions If/Else – statement Other – Conditional Expressions
Week 6	introduction to loops in python (**Type of Loops**)

Week 7	Iteration Loops -
Week 8	Introduction -to Using Functions
Week 9	Functions and -Modules
Week 10	Writing Functions -1Function -
Week 11	Basics Parameter –Passing Custom - Functions vs Standard Functions Refactoring -
Week 12	Writing Functions – 2 Global - Variables
Week 13	Making – Functions ReusableFunctions as -
Week 14	Data Objects Using Objects - String, File - Objects
Week 15	Introduction to Lists Building Lists
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي العملي

	Material Covered
Week 1	Introduction to Python environment and basic commands.
Week 2	Working with variables and data types.
Week 3	Control structures: loops and conditionals.
Week 4	Functions: definition and usage.
Week 5	Advanced function features and error handling.
Week 6	Working with lists and list operations.

Week 7	Dictionaries and sets: creation and manipulation.
Week 8	File I/O: reading from and writing to files.
Week 9	Exception handling and debugging techniques.
Week 10	Introduction to Python libraries for data analysis.
Week 11	Advanced data structures and algorithms.
Week 12	Project work and application of concepts.
Week 13	Review and reinforcement of key concepts.
Week 14	Final project presentations.
Week 15	Revision and exam preparation.
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources		
		مصادر التعلم والتدريس
	Severance, Charles. Python for everybody: Exploring Data using python 3. Charles Severance, 2016.	**Available in the Library?**
Required Texts	Python for Everybody: Exploring Data in Python 3, by Charles Severance	No
Recommended Texts	• Automate the Boring Stuff with Python, by Al Sweigart • Learning Python, by Mark Lutz	No

Websites	• Python Official Documentation • W3Schools Python Tutorial • GeeksforGeeks Python

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
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	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
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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	**Geodesy**	**Module Delivery**
Module Type	**C**	☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**
Module Code	**UOBRS33**	
ECTS Credits	٥	
SWL (hr/sem)	١٢٥	

Module Level		**Semester of Delivery**	٢
Administering Department	Type Dept. Code	**College**	Type College Code
Module Leader	Ahlam Ali Hussain م.د. احلام علي حسين	**e-mail**	ahlam.ali@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	مدرس	**Module Leader's Qualification**	Ph.D.
Module Tutor	م. هدى وجود عبدالودود	**e-mail**	
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	1/10/2024	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	**Semester**	Three
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. Understand the fundamental concepts and principles of geodesy, including the Earth's shape, size, and gravity field, and the reference systems used to describe them. 2. Develop an understanding of the techniques and methods used in geodetic measurements, including terrestrial, airborne, and space-based techniques. 3. Become familiar with the geodetic datum systems used to describe the Earth's surface, including the International Terrestrial Reference Frame (ITRF), the World Geodetic System (WGS), and local datum systems. 4. Develop proficiency in geodetic data analysis and interpretation, including error analysis, data quality assessment, and geodetic modeling. 5. Understand the applications of geodesy in various fields, including navigation, surveying, mapping, geophysics, and Earth sciences. 6. Gain familiarity with geodetic software and tools used in data acquisition, processing, and analysis, including Geographic Information Systems (GIS), Global Navigation Satellite Systems (GNSS) software, and remote sensing software. 7. Develop critical thinking and problem-solving skills in applying geodetic principles and techniques to real-world problems. 8. Gain an awareness of the ethical, social, and legal implications of geodetic data collection and analysis, including issues related to privacy, security, and data sharing.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate an understanding of the fundamental concepts and principles of geodesy, including the Earth's shape, size, and gravity field, and the reference systems used to describe them. 2. Apply the techniques and methods used in geodetic measurements, including terrestrial, airborne, and space-based techniques. 3. Analyze and interpret geodetic data using appropriate tools and techniques, including error analysis, data quality assessment, and geodetic modeling. 4. Evaluate and compare the different geodetic datum systems used to describe the Earth's surface, including the International Terrestrial Reference Frame (ITRF), the World Geodetic System (WGS), and local datum systems. 5. Apply geodetic principles and techniques to real-world problems in various fields, including navigation, surveying, mapping, geophysics, and Earth sciences. 6. Use geodetic software and tools effectively to acquire, process, and analyze geodetic data. 7. Demonstrate critical thinking and problem-solving skills in applying geodetic principles and techniques to real-world problems. 8. Evaluate the ethical, social, and legal implications of geodetic data collection and analysis, including issues related to privacy, security, and data sharing. 9. Communicate effectively, both orally and in writing, about geodetic concepts, methods, and results to diverse audiences. 10. Demonstrate an appreciation for the importance of geodesy in various fields and its impact on society.

Indicative Contents المحتويات الإرشادية	1. Introduction to Geodesy: Overview of geodesy, history of geodesy, and the role of geodesy in various fields. The Earth's shape and size, and the reference systems used to describe them. 2. Geodetic Measurements: Techniques and methods used in geodetic measurements, including terrestrial, airborne, and space-based techniques. Geodetic instruments and sensors, including global navigation satellite systems (GNSS), gravimeters, and remote sensing. 3. Geodetic Datum Systems: Overview of geodetic datum systems used to describe the Earth's surface, including the International Terrestrial Reference Frame (ITRF), the World Geodetic System (WGS), and local datum systems. Transformation between datum systems. 4. Geodetic Data Analysis: Error analysis and data quality assessment in geodetic measurements. Geodetic modeling and parameter estimation. Analysis of time-series data. 5. Geodetic Applications: Overview of geodetic applications in various fields, including navigation, surveying, mapping, geophysics, and Earth sciences. Case studies and examples of geodetic applications. 6. Geodetic Software and Tools: Overview of geodetic software and tools used in data acquisition, processing, and analysis. Geographic Information Systems (GIS), GNSS software, and remote sensing software. 7. Geodetic Ethics and Social Implications: Ethical, social, and legal implications of geodetic data collection and analysis, including issues related to privacy, security, and data sharing. The role of geodesy in sustainable development and global governance. 8. Future Directions in Geodesy: Emerging trends and future directions in geodesy, including new technologies, data sources, and applications. The role of geodesy in addressing global challenges.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	1. Lectures: Lectures can be used to introduce students to theoretical concepts and principles in geodesy. Lectures can also be used to provide an overview of geodetic techniques, methods, and applications. 2. Case Studies: Case studies can be used to illustrate the practical applications of geodesy in various fields. Case studies can also be used to highlight the challenges and limitations of geodetic measurements and modeling. 3. Laboratory Exercises: Laboratory exercises can be used to provide students with hands-on experience in using geodetic instruments, sensors, and software. Laboratory exercises can also be used to reinforce theoretical concepts and principles.

	4. Data Analysis Projects: Data analysis projects can be used to provide students with experience in data acquisition, processing, and analysis using geodetic software and tools. Data analysis projects can also be used to develop critical thinking and problem-solving skills.
	5. Fieldwork: Fieldwork can be used to provide students with experience in conducting geodetic measurements and surveys in real-world settings. Fieldwork can also be used to provide students with an appreciation for the challenges and limitations of geodetic measurements in the field.
	6. Guest Speakers: Guest speakers can be used to provide students with an opportunity to learn from experts in the field of geodesy. Guest speakers can also be used to provide students with an awareness of the practical applications of geodesy in various fields.
	7. Group Projects: Group projects can be used to provide students with an opportunity to work collaboratively on real-world geodetic problems. Group projects can also be used to develop communication and teamwork skills.
	8. Online Resources: Online resources, such as videos, podcasts, and interactive simulations, can be used to supplement classroom learning and provide students with additional opportunities to learn and practice geodetic concepts and principles.

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

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**200**

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	1- Geodetic Surveying:- 1-1 History of surveying 2-1 Departments of surveying science 3-1 Surveying work 4-1 Geodesy

	5-1 Geodesy and surveying
Week 2	1- Geodetic Surveying:- 6-1 History of geodesy 7-1 Applications of geodesy 6-1 Sections of geodesy
Week 3	2- Coordinates and calculations on the surface of the Earth:- 1-2 The shape of the Earth 2-2 Coordinate systems 3-2 Geographic or geodetic coordinates 4-2 Spherical coordinates
Week 4	2- Coordinates and calculations on the surface of the Earth:- 4-2 Spherical coordinates 5-2 Cartesian geodetic coordinates 6-2 Converting between coordinates
Week 5	2- Coordinates and calculations on the surface of the Earth:- 7-2 Projecting maps 8-2 Projected coordinate systems
Week 6	3- Earth geodesy and networks of constants:- 1-3 Types of geostationary networks 2-3 Horizontal geostationary networks (triangle networks) 1-2-3 degree grids of triangles
Week 7	3- Earth geodesy and networks of constants:- 2-2-3 Steps to create triangle networks 3-2-3 Robustness of triangle networks

Week 8	Midterm Exam
Week 9	3- Earth geodesy and networks of constants:- 4-2-3 Obstacles in monitoring triangle networks 5-2-3 Conditions in triangle networks 6-2-3 Conditions for adjusting triangle networks
Week 10	3- Earth geodesy and networks of constants:- 3-3 Vertical geostationary networks (Robert networks)
Week 11	4- Setting geodetic networks:- 1-5 Sources and types of errors 2-4 General statistical principles 3-4 The principle of weight in cadastral measurements
Week 12	4- Setting geodetic networks:- 4-4 Network settings 5-4 Adjusting by the sum of least squares is 1-5-4 Adjusting the least squares for observational equations
Week 13	4- Setting geodetic networks:- 2-5-4 Adjusting least squares for nonlinear equations 3-5-4 Setting the least squares for condition equations
Week 14	5- Advanced Geodetic Surveying:- 1-5- Geodesic frame of reference
Week 15	5- Advanced Geodetic Surveying:- 2-5- Physical Geodetic
Week 16	Preparatory week before the final Exam

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Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي العملي

	Material Covered
Week 1	1- **Introduction to Geodetic surveying** • Geodetic surveying sections
Week 2	2- **Coordinate Systems** • Organize coordinates • Types of coordinate systems • Set of spatial coordinates
Week 3	2- **Coordinate Systems** • A set of geographic coordinates • Plane coordinate system.
Week 4	2- **Coordinate Systems** • The relationship between spatial and geographic coordinates • Calculating the length and deviation of a side given its plane coordinates
Week 5	3- **Triangle Networks and Geodesic Budget** • Degrees of triangle networks • A comparison table between the degrees of triangle networks.
Week 6	3- **Triangle Networks and Geodesic Budget** • Types of networks • Where is the milk? • Geodetic budget and its types
Week 7	3- **Triangle Networks and Geodesic Budget** • Accurate budget. • Budget purposes • Accurate scale • Exact dictionaries • Features of dictionaries:
Week 8	Midterm Exam
Week 9	3- **Triangle Networks and Geodesic Budget** • Precautions to be taken into account: Make an accurate budget • Necessary corrections to meteorology 2 mesa

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	College of Science	
	Department of GIS	

	• Triangle budget
Week 10	**4- Constructing a triangle network** • Exploration and pinpointing • Conditions for choosing a base line • Identify the device used for monitoring
Week 11	**4- Constructing a triangle network** • Types of total station devices • Total Station Device (Power Set 2010) • The main parts of the device
Week 12	**4- Constructing a triangle network** • Device care • How to use the device • General sketch of the selected network: • Meteorological errors and overcoming them
Week 13	**5- Monitoring and correcting the triangle grid** • Observations of horizontal and vertical angles • Meteorological table for angles • Table of vertical angle observations • Base line measurement • Corrections to the measured distance to the base line
Week 14	**5- Monitoring and correcting the triangle grid** • Adjusting the grid (calculating average horizontal angle observations(• Correcting network shapes • Explain how to solve a quadrilateral with two diagonals observed by the approximate method • Table No. (1) to adjust the quadrilateral shape with the observed diagonals • Explain how to solve a quadrilateral with a center
Week 15	**5- Monitoring and correcting the triangle grid** • Solution table for the concentric figure • Final corrected angles of the mesh • Calculate the side lengths of the network • Calculating the deviations of the mesh sides • Calculate the levels of grid points using the triangular budget • Drawing a network of triangles using a real-time computer (AutoCAD program(• The final general shape of the triangle network

Week 16	Preparatory week before the final Exam

Learning and Teaching Resources

<div dir="rtl">مصادر التعلم والتدريس</div>

	Text	Available in the Library?
Required Texts	1. "Geodesy" by Wolfgang Torge: This book provides a comprehensive overview of geodesy, including topics such as the Earth's gravity field, geodetic datums, and geodetic measurements. It is suitable for both undergraduate and graduate students. 2. "Physical Geodesy" by Bernhard Hofmann-Wellenhof, Helmut Moritz, and Martin Langer: This book provides a detailed treatment of physical geodesy and its applications, including topics such as satellite geodesy, geoid determination, and Earth rotation. It is suitable for graduate students and researchers. 3. "Geodetic Reference Frames: IAG Symposium Munich, Germany, 9-14 October 2006" edited by Markus Rothacher, Thomas Beutler, and Christian Rizos: This book provides an overview of the International Association of Geodesy (IAG)	No
Recommended Texts	1. "Introduction to Geodesy: The History and Concepts of Modern Geodesy" by James R. Smith: This book provides an introduction to the history and concepts of modern geodesy, including topics such as geodetic datums, reference frames, and satellite geodesy. 2. "Geodetic Deformation Monitoring: From Geophysical to Engineering Roles" by Nico Sneeuw and Chris Rizos: This book provides a comprehensive treatment of geodetic deformation monitoring, including topics such as geodetic networks, data analysis, and interpretation of results. 3. "Geodesy: The Concepts" by Petr Vaníček and Edward J. Krakiwsky: This book provides an in-depth treatment of geodetic concepts and principles, including topics such as geodetic coordinates, Earth's gravity field, and geopotential theory.	No

Websites	• NOAA's National Geodetic Survey (NGS) - https://www.ngs.noaa.gov/ The NGS is responsible for establishing geodetic control networks in the U.S. and its territories. The website has a lot of information on geodetic datums, coordinate systems, positioning techniques, and GIS data. • National Space-Based Positioning, Navigation, and Timing (PNT) Center of Excellence - https://spacecenter.gwu.edu/ This center focuses on all aspects of space-based PNT, which includes GNSS topics relevant for geodesy. The website has resources, news, and educational materials. • GEO++ - http://geopp.unil.ch/ This site provides free educational materials on geodesy and geospatial technologies. It includes slides, videos, and exercises, primarily focused on GNSS geodesy. • European Space Agency (ESA) GNSS website - https://www.esa.int/Applications/Observing_the_Earth/GNSS ESA has multiple GNSS satellites and provides information and data useful for geodesy, including precise GPS/GNSS orbit products.

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	Geographic Information Systems I		Module Delivery	
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	UOBRS34			
ECTS Credits	7			
SWL (hr/sem)	175			
Module Level	1	Semester of Delivery		1
Administering Department	Type Dept. Code	College	Type College Code	
Module Leader	Ebtesam Fadeal Khanjer	e-mail	ebtesam.khanjer@sc.uobaghdad.edu.iq	
Module Leader's Acad. Title	Professor	Module Leader's Qualification		Ph.D.
Module Tutor	Reem Shihab Hameed	e-mail	reem.hameed1204@sc.uobaghdad.edu.iq	
Peer Reviewer Name	Name	e-mail	E-mail	
Scientific Committee Approval Date	1/10/2024	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. Understanding the basics of GIS: Students should be able to define GIS, understand its applications, and identify the components of a GIS system. 2. Understanding spatial data: Students should be able to differentiate between different types of spatial data, such as vector and raster data, and understand how to represent and manipulate spatial data. 3. GIS software proficiency: Students should be able to use GIS software, such as ArcGIS or QGIS, to perform basic GIS tasks, such as creating maps, analyzing spatial data, and querying databases. 4. Data management: Students should be able to organize, manage, and store spatial data, including creating and managing spatial databases. 5. Coordinate systems and projections: Students should be able to understand the importance of coordinate systems and map projections in GIS, and be able to select and use appropriate coordinate systems and projections for their GIS projects. 6. Cartography: Students should be able to create effective maps using GIS software, including selecting appropriate symbology, creating map layouts, and communicating spatial information effectively.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define GIS, identify its components, and explain its applications in various fields. 2. Differentiate between vector and raster data, and use GIS software to represent and manipulate spatial data. 3. Use GIS software to create maps, analyze spatial data, and query databases. 4. Organize, manage, and store spatial data, including creating and managing spatial databases. 5. Select and use appropriate coordinate systems and projections for GIS projects. 6. Create effective maps using GIS software, including selecting appropriate symbology, creating map layouts, and communicating spatial information effectively. 7. Perform basic spatial analysis tasks, such as overlaying and buffering spatial data, and interpret the results of these analyses.

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	8. Identify and explain real-world applications of GIS, such as urban planning, environmental management, and disaster response.
	9. Apply ethical principles when working with spatial data, including issues related to privacy, data ownership, and data accuracy.
	10. Effectively communicate and collaborate with others on GIS projects, including presenting GIS analyses and contributing to group projects.
	11. Evaluate the strengths and limitations of GIS technology and its potential impact on society.
	12. Demonstrate proficiency in using GIS software and tools through completing GIS projects and assignments.
Indicative Contents المحتويات الإرشادية	1. Introduction to GIS: Definition of GIS, history of GIS, and explanation of its applications in various fields.
	2. Spatial Data: Vector and raster data, coordinate systems and projections, data formats, and data sources.
	3. GIS Software: Overview of popular GIS software, such as ArcGIS or QGIS, and introduction to basic GIS functionalities.
	4. Data Management: Data input, data organization, data storage, data retrieval, and metadata.
	5. Cartography: Map design principles, cartographic elements, and map production using GIS software.
	6. Spatial Analysis: Spatial queries, spatial analysis operations, and spatial statistics.
	7. Real-world Applications: Examples of GIS applications in various fields, such as urban planning, environmental management, and disaster response.
	8. Data Ethics: Ethical considerations and principles related to GIS data collection, processing, and dissemination.
	9. Group Projects: Collaborative projects in which students apply GIS concepts and skills to real-world problems and situations.
	10. GIS Project Management: Project planning, project design, and project implementation.
	11. GIS Project Presentation: Presentation of GIS projects using appropriate communication tools.

Learning and Teaching Strategies

	استراتيجيات التعلم والتعليم
Strategies	1. Lectures: The instructor can deliver lectures to introduce GIS concepts, theories, and applications. Lectures can involve multimedia resources, such as slides, videos, and animations, to enhance learning.

2. Hands-on Exercises: Students can work on hands-on exercises to apply GIS concepts and skills using GIS software. Exercises can involve data manipulation, map creation, and spatial analysis.

3. Group Projects: Students can work in groups to apply GIS concepts and skills to real-world problems and situations. Group projects can involve data collection, data analysis, and map production.

4. Case Studies: The instructor can present case studies that illustrate GIS applications in various fields, such as urban planning, environmental management, and disaster response. Case studies can involve guest speakers, field trips, or online resources.

5. Discussions: Students can participate in class discussions to exchange ideas, ask questions, and reflect on GIS concepts and applications. Discussions can be guided by prompts or questions and can involve small group or whole class formats.

6. Tutorials: The instructor can provide tutorials to help students master GIS software tools and functionalities. Tutorials can involve step-by-step instructions, screenshots, and video demonstrations.

7. Assessments: Students can be assessed using a variety of methods, such as quizzes, exams, assignments, and presentations. Assessments can test students' knowledge, skills, and critical thinking abilities.

8. Online Resources: The instructor can provide online resources, such as videos, tutorials, blogs, and discussion forums, to support learning outside the classroom. |
| **Student Workload (SWL)** | |

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**200**		

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 GIS - Definition of GIS - Brief history of GIS - Components of a GIS system - Applications of GIS
Week 2	GIS Software - Overview of popular GIS software (e.g. ArcGIS or QGIS) - Basic GIS functionalities - File formats and data types used in GIS
Week 3	Spatial Data - Vector and raster data - Coordinate systems and projections - Data sources (e.g. GPS, remote sensing)
Week 4	Data Management - Data input and editing - Data storage and retrieval - Metadata
Week 5	Cartography - Map design principles - Cartographic elements - Map production using GIS software
Week 6	Why GIS: Advantages of GIS GIS Development
Week 7	GIS Application Major Services in GIS
Week 8	Exam

Week 9	: Accuracy and Error - Sources of error in GIS data - Measures of accuracy - Error propagation
Week 10	Geographic coordinate system (GCS) Graticule Spheroids and spheresWorld Geodetic System Datums
Week 11	Web GIS - Overview of web GIS - Web mapping and web services - Open data and open source GIS
Week 12	projected coordinate systems Conic (tangent) , Projection types A cone is placed over a globe Cylindrical Projection Planar projection
Week 13	Final Project Planning - Collaborative project in which students apply GIS concepts and skills to a real-world problem or situation - Project planning and design
Week 14	: Final Project Implementation - Implementation of the final project - Troubleshooting and problem-solving

Week 15	Final Project Presentation - Presentation of GIS project using appropriate communication tools - Course wrap-up and revie
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي العملي

	Material Covered
Week 1	Introduction of GIS (software package) and tools -Arc Map(Arc Toolbox, Arc Object, Arc Seen) -Arc Catalog
Week 2	Spatial Data - Vector Data (Point, Line, polyline, Polygon) - Coordinate systems and projections
Week 3	Data Management - Data input and editing - Data storage and retrieval
Week 4	Vector Data - Geodatabase -Query
Week 5	Spatial Data - Raster Data - Metadata
Week 6	Pre-processing Raster Data -Image correction

	- Composite bands
Week 7	Pre-processing Raster Data -Clipping - Mosaic
Week 8	**Exam**
Week 9	Environmental management applications - Spectral indices
Week 10	Conversion Tools
Week 11	Cartography Tools
Week 12	Geographic reference
Week 13	Spatial Analyst Tools
Week 14	Present projects in package form
Week 15	Map Layout
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**

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Required Texts	1. "Getting to Know ArcGIS" by Michael Law and Amy Collins - This book provides an introduction to ArcGIS software and covers basic GIS concepts, data management, map design, and spatial analysis. 2. "Mastering QGIS" by Kurt Menke, GISP, Dr. Richard Smith Jr., and Dr. Luigi Pirelli - This book provides a comprehensive guide to QGIS software and covers basic to advanced GIS concepts, data management, map design, and spatial analysis. 3. "Introduction to Geographic Information Systems" by Kang-Tsung Chang - This book provides an overview of GIS technology and covers basic to intermediate GIS concepts, spatial data, data management, and spatial analysis. 4. "The GIS 20: Essential Skills" by Gina Clemmer - This book provides a practical guide to essential GIS skills and covers data preparation, data analysis, map creation, and data sharing. 5. "GIS Fundamentals: A First Text on Geographic Information Systems" by Paul Bolstad - This book provides an introduction to GIS technology and covers basic GIS concepts, spatial data, data management, and spatial analysis.	No

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Recommended Texts	1. "GIS Tutorial 1: Basic Workbook" by Wilpen L. Gorr and Kristen S. Kurland - This book provides a hands-on introduction to ArcGIS software and covers basic GIS concepts, data management, map design, and spatial analysis. 2. "Discovering GIS and ArcGIS Pro" by Bradley A. Shellito - This book provides an introduction to GIS technology and covers basic GIS concepts, data management, map design, and spatial analysis using ArcGIS Pro software. 3. "GIS for Dummies" by Michael N. DeMers - This book provides a comprehensive introduction to GIS technology and covers basic GIS concepts, data management, map design, and spatial analysis. 4. "Map Use: Reading, Analysis, Interpretation" by A. Jon Kimerling, Aileen R. Buckley, and Phillip C. Muehrcke - This book provides a comprehensive guide to cartographic design and map interpretation, including an overview of GIS technology. 5. "Python Scripting for ArcGIS" by Paul A. Zandbergen - This book provides an introduction to Python programming for GIS applications using ArcGIS software.	No

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Websites	1. Esri: [https://www.esri.com/en-us/home ↗](https://www.esri.com/en-us/home) - This website provides resources for ArcGIS software, including tutorials, documentation, and forums. 2. QGIS: [https://qgis.org/en/site/ ↗](https://qgis.org/en/site/) - This website provides resources for QGIS software, including tutorials, documentation, and plugins. 3. USGS Earth Explorer: [https://earthexplorer.usgs.gov/ ↗](https://earthexplorer.usgs.gov/) - This website provides free access to satellite imagery data from the USGS. 4. OpenStreetMap: [https://www.openstreetmap.org/ ↗](https://www.openstreetmap.org/) - This website provides free and open-source map data that can be used in GIS applications. 5. GeoNet: [https://community.esri.com/t5/geoevents/ct-p/geoevents ↗](https://community.esri.com/t5/geoevents/ct-p/geoevents) - This website provides a community forum for GIS professionals and users to share knowledge and resources. 6. GIS Lounge: https://www.gislounge.com/ - This website provides news, tutorials, and articles related to GIS technology and applications. 7. Geoawesomeness: https://geoawesomeness.com/ - This website provides news, tutorials, and articles related to geospatial technology and applications.

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

Module Information		
معلومات المادة الدراسية		
Module Title	Meteorology and climate change	**Module Delivery**
Module Type	**C**	☒ Theory

Module Code	**UOBRS36**	☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
ECTS Credits	4	
SWL (hr/sem)	100	

Module Level	1	Semester of Delivery	1
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Muna Hussein Ahmed Diab	e-mail	muna.h@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	مدرس	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	1/10/2014	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	Meteorology and climate change are important areas of study that involve understanding the Earth's atmosphere, weather patterns, and the impact of human activities on the environment. Below are some learning objectives for these topics: 1. Understand the basic principles of meteorology: Students should be able to understand the fundamental principles of meteorology, including the structure and composition of the Earth's atmosphere, the factors that influence weather patterns, and the different types of weather phenomena.

	2. Identify the causes and effects of climate change: Students should be able to identify the causes of climate change, including natural and human-induced factors, and understand the potential impact of climate change on the environment, ecosystems, and human societies. 3. Analyze climate data: Students should be able to analyze climate data, including temperature, precipitation, and atmospheric conditions, and use this data to identify trends and patterns in weather and climate. 4. Evaluate the impact of human activities on the environment: Students should be able to evaluate the impact of human activities on the environment, including the emission of greenhouse gases, deforestation, and land use changes, and understand how these activities contribute to climate change. 5. Design strategies to mitigate and adapt to climate change: Students should be able to design and evaluate strategies to mitigate and adapt to climate change, including reducing greenhouse gas emissions, promoting renewable energy sources, and developing climate-resilient infrastructure. 6. Communicate effectively about meteorology and climate change: Students should be able to communicate effectively about meteorology and climate change, including explaining scientific concepts and data to different audiences, and engaging in discussions about policy and societal impacts. Overall, these learning objectives aim to provide students with a comprehensive understanding of meteorology and climate change, and enable them to apply this knowledge to address the challenges and opportunities presented by these important topics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Meteorology and climate change are complex and evolving fields of study with significant societal and environmental implications. Below are some learning outcomes that can be achieved through the study of meteorology and climate change: 1. Understand the Earth's atmosphere: Students will be able to describe the structure and composition of the Earth's atmosphere, and explain how it interacts with the rest of the Earth's systems.

	2. Analyze weather patterns: Students will be able to use meteorological data to analyze weather patterns, including temperature, precipitation, atmospheric pressure, and wind direction and speed. 3. Evaluate climate change data: Students will be able to evaluate and interpret climate change data, including temperature trends, sea level rise, and changes in precipitation patterns, to assess the impact of climate change on the environment and human societies. 4. Identify the causes of climate change: Students will be able to identify the natural and human-induced causes of climate change, including deforestation, greenhouse gas emissions, and land use changes. 5. Evaluate the impact of climate change: Students will be able to evaluate the impact of climate change on the environment, ecosystems, and human societies, including the potential for increased frequency and severity of extreme weather events. 6. Develop strategies to mitigate and adapt to climate change: Students will be able to develop and evaluate strategies to mitigate and adapt to climate change, including reducing greenhouse gas emissions, promoting renewable energy sources, and developing climate-resilient infrastructure. 7. Communicate effectively about meteorology and climate change: Students will be able to communicate effectively about meteorology and climate change, including explaining scientific concepts and data to different audiences, and engaging in discussions about policy and societal impacts. Overall, the study of meteorology and climate change can equip students with the knowledge and skills to understand the complex interactions between the Earth's atmosphere and the environment, and to develop strategies to address the challenges and opportunities presented by climate change.
Indicative Contents	Meteorology and climate change are complex fields that require a comprehensive understanding of the Earth's atmosphere, weather patterns, and the impact of human activities on the environment. Below

المحتويات الإرشادية	are some indicative contents that can be covered in a course on meteorology and climate change:

1. Introduction to Meteorology:

- The Earth's atmosphere and its composition

- The factors that influence weather patterns

- The different types of weather phenomena

2. Climate Change:

- The natural and human-induced causes of climate change

- The impact of climate change on the environment, ecosystems, and human societies

- Climate change mitigation and adaptation strategies

3. Atmospheric Science:

- The physics and chemistry of the atmosphere

- The role of the atmosphere in climate and weather patterns

- The impact of atmospheric pollution on human health and the environment

4. Climate Data and Analysis:

- Understanding climate data, including temperature, precipitation, and atmospheric conditions

- Using climate data to identify trends and patterns in weather and climate

- Evaluating the impact of climate change on the environment and human societies

5. Climate Modeling: |

- The principles of climate modeling

- The different types of climate models and their applications

- The limitations and uncertainties of climate modeling

6. Policy and Societal Impacts:

- The role of policy in addressing climate change

- The impact of climate change on vulnerable populations, including low-income communities and indigenous peoples

- The ethical considerations of climate change and environmental justice

7. Communication and Outreach:

- Effective communication strategies for explaining scientific concepts and data to different audiences

- Engaging in discussions about policy and societal impacts of climate change

- Communicating about climate change in the media and in public discourse

Overall, these indicative contents aim to provide students with a comprehensive understanding of meteorology and climate change, and enable them to apply this knowledge to address the challenges and opportunities presented by these important topics.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies

Meteorology and climate change are complex and multidisciplinary fields that require a variety of teaching and learning strategies to engage students and facilitate their understanding. Below are some learning and teaching strategies that can be used in a course on meteorology and climate change:

1. Lectures: Lectures can be used to introduce key concepts and theories, and to provide a broad overview of the subject matter. Lectures can be supplemented with multimedia resources such as videos, animations, and images to help students visualize abstract concepts.

2. Discussions: Discussions can be used to encourage active learning and critical thinking. Students can be encouraged to participate in group discussions and debates on topics related to meteorology and climate change. This can help students develop their communication and analytical skills.

3. Hands-on Exercises: Hands-on exercises can be used to help students apply theoretical concepts to real-world situations. For example, students can be asked to analyze climate data or use climate models to predict future climate scenarios. This can help students develop their problem-solving skills and enhance their understanding of the subject matter.

4. Case Studies: Case studies can be used to help students understand the impact of climate change on different regions and populations. Students can be asked to analyze case studies and develop strategies to mitigate or adapt to the impact of climate change. This can help students develop their critical thinking and decision-making skills.

5. Field Trips: Field trips can be used to help students observe and experience meteorological phenomena and climate change impacts first-hand. For example, students can visit weather stations, climate research centers, or other sites related to meteorology and climate change. This can help students develop their observational and data collection skills.

6. Online Resources: Online resources such as videos, podcasts, and interactive simulations can be used to supplement classroom instruction and provide additional learning opportunities for students. These resources can be used to engage students and enhance their understanding of complex concepts.

Overall, these learning and teaching strategies aim to provide students with a dynamic and engaging learning experience, and enable them to develop the skills and knowledge needed to address the challenges and opportunities presented by meteorology and climate change.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem)		Structured SWL (h/w)	
الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem)		Unstructured SWL (h/w)	
الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem)	**200**		
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 #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)

	Ministry of Higher Education and Scientific Research - Iraq University of Baghdad College of Science Department of GIS	

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Meteorology - The Earth's atmosphere and its composition - The factors that influence weather patterns - The different types of weather phenomena
Week 2	Introduction to Meteorology - The Earth's atmosphere and its composition - The factors that influence weather patterns - The different types of weather phenomena
Week 3	Atmospheric Science - The physics and chemistry of the atmosphere - The role of the atmosphere in climate and weather patterns - The impact of atmospheric pollution on human health and the environment
Week 4	Atmospheric Science - The physics and chemistry of the atmosphere - The role of the atmosphere in climate and weather patterns - The impact of atmospheric pollution on human health and the environment
Week 5	Climate Data and Analysis - Understanding climate data, including temperature, precipitation, and atmospheric conditions - Using climate data to identify trends and patterns in weather and climate - Evaluating the impact of climate change on the environment and human societies
Week 6	Climate Data and Analysis - Understanding climate data, including temperature, precipitation, and atmospheric conditions - Using climate data to identify trends and patterns in weather and climate - Evaluating the impact of climate change on the environment and human societies
Week 7	Climate Modeling - The principles of climate modeling - The different types of climate models and their applications - The limitations and uncertainties of climate modeling
Week 8	Climate Modeling - The principles of climate modeling

	- The different types of climate models and their applications - The limitations and uncertainties of climate modeling
Week 9	Climate Change - The natural and human-induced causes of climate change - The impact of climate change on the environment, ecosystems, and human societies - Climate change mitigation and adaptation strategies
Week 10	Climate Change - The natural and human-induced causes of climate change - The impact of climate change on the environment, ecosystems, and human societies - Climate change mitigation and adaptation strategies
Week 11	Policy and Societal Impacts - The role of policy in addressing climate change - The impact of climate change on vulnerable populations, including low-income communities and indigenous peoples - The ethical considerations of climate change and environmental justice
Week 12	Policy and Societal Impacts - The role of policy in addressing climate change - The impact of climate change on vulnerable populations, including low-income communities and indigenous peoples - The ethical considerations of climate change and environmental justice
Week 13	Communication and Outreach - Effective communication strategies for explaining scientific concepts and data to different audiences - Engaging in discussions about policy and societal impacts of climate change - Communicating about climate change in the media and in public discourse
Week 14	Communication and Outreach - Effective communication strategies for explaining scientific concepts and data to different audiences - Engaging in discussions about policy and societal impacts of climate change - Communicating about climate change in the media and in public discourse
Week 15	Review and Synthesis - Recap of key concepts and themes covered in the course - Discussion and analysis of current events related to meteorology and climate change - Final project or exam
Week 16	**Preparatory week before the final Exam**

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Learning and Teaching Resources

<div dir="rtl">مصادر التعلم والتدريس</div>

	Text	Available in the Library?
Required Texts	There are many excellent books and resources available on meteorology and climate change. Below are some required texts that can be used in a course on meteorology and climate change: 1. "Meteorology Today" by C. Donald Ahrens: This book provides a comprehensive introduction to meteorology, including an overview of the Earth's atmosphere, weather patterns, and the impact of human activities on the environment. 2. "Climate Change: A Very Short Introduction" by Mark Maslin: This book provides a concise overview of climate change, including the science behind climate change, the impact of climate change on the environment and human societies, and the policy and societal responses to climate change. 3. "Global Warming: The Complete Briefing" by John Houghton: This book provides a detailed overview of global warming, including the causes and effects of climate change, the science behind climate modeling, and the policy and societal responses to climate change. 4. "The Weather Makers: How Man Is Changing the Climate and What It Means for Life on Earth" by Tim Flannery: This book provides a compelling account of the impact of human activities on the environment and the consequences of climate change for the future of life on Earth. 5. "The Sixth Extinction: An Unnatural History" by Elizabeth Kolbert: This book provides a sobering account of the impact of climate change on the planet's biodiversity and the potential for a sixth mass extinction. Overall, these required texts provide a comprehensive understanding of meteorology and climate change, and enable students to engage with the complex issues and challenges presented by these important topics.	No

Recommended Texts	In addition to the required texts, there are many other excellent books and resources available on meteorology and climate change. Below are some recommended texts that can be used in a course on meteorology and climate change: 1. "The Physics of Climate" by William D. Nordhaus: This book provides a detailed overview of the physical principles underlying climate change, including the role of greenhouse gases, feedback mechanisms, and climate variability. 2. "Climate Change Science: A Modern Synthesis" by G. Thomas Farmer and John Cook: This book provides a comprehensive overview of the scientific evidence for climate change, including the role of human activities in driving climate change and the observed impacts of climate change on the environment and human societies. 3. "The Climate Casino: Risk, Uncertainty, and Economics for a Warming World" by William D. Nordhaus: This book provides a detailed analysis of the economic and policy implications of climate change, including the costs and benefits of different policy options for mitigating and adapting to climate change. 4. "The End of Ice: Bearing Witness and Finding Meaning in the Path of Climate Disruption" by Dahr Jamail: This book provides a personal account of the impact of climate change on the environment and human societies, and the emotional and spiritual responses to the crisis of climate change. 5. "Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming" edited by Paul Hawken: This book provides a comprehensive overview of the solutions and strategies for addressing climate change, including the role of renewable energy, carbon sequestration, and lifestyle changes. Overall, these recommended texts provide a deeper understanding of the science, policy, and societal aspects of meteorology and climate change, and enable students to engage with the complex and pressing issues presented by these important topics.	No

Websites	There are many excellent websites available on meteorology and climate change that can be used as supplementary resources in a course on meteorology and climate change. Below are some recommended websites:

There are many excellent websites available on meteorology and climate change that can be used as supplementary resources in a course on meteorology and climate change. Below are some recommended websites:

1. National Oceanic and Atmospheric Administration (NOAA) - The NOAA website provides a wealth of information on weather, climate, and oceanography, including real-time weather data, climate models, and educational resources for students and educators.
2. National Aeronautics and Space Administration (NASA) - The NASA website provides a range of resources on climate change, including satellite data on climate variables, climate models, and educational resources for students and educators.
3. Intergovernmental Panel on Climate Change (IPCC) - The IPCC website provides the latest scientific information on climate change, including the physical science basis of climate change, impacts, adaptation, and mitigation.
4. Climate Central - Climate Central provides a range of resources on climate change, including scientific research, news and analysis, and educational resources for students and educators.
5. The Climate Reality Project - The Climate Reality Project provides a range of resources on climate change, including educational resources, advocacy tools, and news and analysis.

Overall, these websites provide a wealth of information and resources on meteorology and climate change, and enable students to engage with the latest scientific research and policy developments in these important fields.

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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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 Energy	Module Delivery	
Module Type	C	☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	UOBRS32		
ECTS Credits	3		
SWL (hr/sem)	**75**		
Module Level		Semester of Delivery	
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Sundus abd alabass Albakry	e-mail	sundus.abdullah@sc.uobaghdad.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	1/10/2024	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	Here are some potential learning objectives related to sustainable energy: 1. Define sustainable energy and explain its importance in mitigating climate change and promoting environmental sustainability. 2. Identify different sources of sustainable energy, such as solar, wind, hydropower, geothermal, and bioenergy, and describe their advantages and disadvantages. 3. Analyze the economic, social, and environmental impacts of transitioning to sustainable energy systems, including job creation, energy independence, and reduced greenhouse gas emissions. 4. Evaluate the technological and policy barriers to scaling up sustainable energy systems and propose strategies for overcoming these barriers. 5. Apply principles of energy efficiency to reduce energy consumption and optimize the use of sustainable energy sources. 6. Demonstrate knowledge of energy storage technologies, including batteries, pumped hydro storage, and thermal energy storage, and explain their role in enabling the integration of renewable energy into the grid. 7. Critically evaluate the role of fossil fuels in the current energy system and propose strategies for phasing out their use in favor of sustainable energy sources. 8. Understand the social and cultural dimensions of sustainable energy transitions, including community engagement, stakeholder involvement, and equitable access to energy resources. 9. Analyze case studies of successful sustainable energy projects and apply lessons learned to real-world challenges in the energy sector. 10. Develop a comprehensive understanding of sustainable energy policy frameworks, including international agreements, national regulations, and local initiatives, and propose strategies for advancing sustainable energy policy goals.
Module Learning Outcomes	Here are some possible learning outcomes for a course on sustainable energy: 1. Understand the principles of sustainable energy, including the environmental, social, and economic benefits and challenges of different sustainable energy options. 2. Analyze the feasibility and potential of different sustainable energy technologies, including solar, wind, hydropower, geothermal, and bioenergy, as well as energy storage and policy frameworks.

مخرجات التعلم للمادة الدراسية	3. Evaluate the role of sustainable energy in mitigating climate change and promoting environmental sustainability, and the potential for sustainable energy to transform the energy system.
	4. Apply interdisciplinary approaches to sustainable energy problem-solving, including integration of engineering, economics, policy, and social sciences.
	5. Critically assess the social and cultural dimensions of sustainable energy transitions, including community engagement and stakeholder involvement, and strategies for promoting equitable access to sustainable energy resources.
	6. Develop and present sustainable energy project proposals, incorporating technical, economic, and policy considerations.
	7. Evaluate the potential for sustainable energy job creation and entrepreneurship, and develop strategies for promoting sustainable energy job creation and business development.
	8. Understand the policy and regulatory frameworks for sustainable energy adoption and promotion, and develop strategies for advancing sustainable energy policy goals.
	9. Analyze the technological, policy, and social barriers to sustainable energy adoption, and develop strategies for overcoming these barriers.
	10. Understand the role of sustainable energy in national and global energy systems, and evaluate the potential for sustainable energy to promote energy security and international cooperation.
Indicative Contents المحتويات الإرشادية	Here are some possible indicative contents for a course on sustainable energy: 1. Introduction to Sustainable Energy - Definition and importance of sustainable energy - Overview of sustainable energy technologies and their impacts on the environment, society, and economy - Historical and current global energy trends and their implications 2. Energy Efficiency - Principles of energy efficiency and conservation - Strategies for reducing energy consumption in buildings, transportation, and industry - Case studies of successful energy efficiency initiatives 3. Solar Energy - Principles of solar energy conversion - Types of solar panels and their efficiency - Applications of solar energy in residential, commercial, and industrial settings - Solar energy policy and regulatory frameworks 4. Wind Energy

	- Principles of wind energy conversion
	- Types of wind turbines and their efficiency
	- Applications of wind energy in residential, commercial, and industrial settings
	- Wind energy policy and regulatory frameworks
	5. Hydropower
	- Principles of hydropower generation
	- Types of hydropower systems and their efficiency
	- Advantages and disadvantages of hydropower
	- Hydropower policy and regulatory frameworks
	6. Geothermal Energy
	- Principles of geothermal energy conversion
	- Types of geothermal systems and their efficiency
	- Applications of geothermal energy in residential, commercial, and industrial settings
	- Geothermal energy policy and regulatory frameworks
	7. Bioenergy
	- Principles of bioenergy conversion
	- Types of bioenergy systems and their efficiency
	- Applications of bioenergy in residential, commercial, and industrial settings
	- Bioenergy policy and regulatory frameworks
	8. Energy Storage
	- Principles of energy storage
	- Types of energy storage systems, including batteries, pumped hydro storage, and thermal energy storage
	- Role of energy storage in enabling the integration of renewable energy into the grid
	- Energy storage policy and regulatory frameworks
	9. Fossil Fuels
	- Overview of the role of fossil fuels in the current energy system
	- Environmental and social impacts of fossil fuel use
	- Strategies for phasing out fossil fuels in favor of sustainable energy sources
	- Fossil fuel policy and regulatory frameworks
	10. Sustainable Energy Policy
	- Overview of international and national sustainable energy policy frameworks
	- Case studies of successful sustainable energy policy initiatives
	- Strategies for advancing sustainable energy policy goals
	- Sustainable energy policy and regulatory frameworks
	11. Technological Barriers to Sustainable Energy Adoption
	- Overview of technological barriers to scaling up sustainable energy systems

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	- Case studies of successful technological innovations in sustainable energy
	- Strategies for overcoming technological barriers to sustainable energy adoption
	12. Policy Barriers to Sustainable Energy Adoption
	- Overview of policy barriers to scaling up sustainable energy systems
	- Case studies of successful policy initiatives in sustainable energy
	- Strategies for overcoming policy barriers to sustainable energy adoption
	13. Social and Cultural Dimensions of Sustainable Energy Transitions
	- Overview of community engagement and stakeholder involvement in sustainable energy transitions
	- Case studies of successful community-based sustainable energy projects
	- Strategies for promoting equitable access to sustainable energy resources
	14. Sustainable Energy Job Creation and Entrepreneurship
	- Overview of job creation and entrepreneurship in the sustainable energy sector
	- Case studies of successful sustainable energy job creation and entrepreneurship initiatives
	- Strategies for promoting sustainable energy job creation and entrepreneurship
	15. Sustainable Energy Project Presentations and Group Work
	- Students work in groups to develop and present sustainable energy project proposals, incorporating technical, economic, and policy considerations
	- Peer review and feedback on project proposals
	16. Course Review and Future Directions
	- Review of course content and learning outcomes
	- - Discussion of potential future directions in sustainable energy research, policy, and practice.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Here are some potential learning and teaching strategies for sustainable energy: 1. Use case studies and real-world examples to illustrate the economic, social, and environmental impacts of sustainable energy systems. This can help students understand the practical implications of sustainable energy and motivate them to pursue careers in the field.

2. Incorporate hands-on activities and experiments to help students understand the principles of energy efficiency, renewable energy, and energy storage. For example, students could build their own solar panels or wind turbines and test their performance under different conditions.

3. Use multimedia resources, such as videos, interactive simulations, and web-based tools, to help students visualize complex concepts and understand how sustainable energy systems work.

4. Encourage collaboration and teamwork by assigning group projects that require students to work together to design and implement sustainable energy solutions. This can help students develop their communication and problem-solving skills while also fostering a sense of community and shared purpose.

5. Invite guest speakers from the sustainable energy industry to share their insights and experiences with students. This can provide students with valuable networking opportunities and help them understand the practical challenges and opportunities in the field.

6. Use inquiry-based learning strategies to help students develop critical thinking skills and engage with complex sustainability challenges. For example, students could be asked to investigate the environmental impacts of a particular energy source, or to propose ways to overcome technological or policy barriers to sustainable energy adoption.

7. Incorporate field trips to sustainable energy facilities, such as wind farms, solar power plants, or hydropower installations. This can help students understand how sustainable energy systems operate in the real world and provide inspiration for their own sustainable energy projects.

8. Use formative assessments, such as quizzes, group discussions, and short writing assignments, to gauge student understanding and provide feedback on their

progress. This can help students stay engaged and motivated while also providing instructors with valuable insights into areas where students may need additional support.

9. Foster a culture of sustainability in the classroom by modeling sustainable behaviors, such as using energy-efficient lighting and equipment, reducing waste, and encouraging sustainable transportation options. This can help students understand the importance of sustainable practices in their daily lives and inspire them to make positive changes in their communities.

10. Encourage students to engage with sustainable energy issues beyond the classroom by participating in extracurricular activities, such as sustainability clubs, internships, or volunteer opportunities. This can help students develop their leadership skills and build their resumes while also contributing to the broader sustainability movement.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

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 Sustainable Energy - Definition and importance of sustainable energy - Overview of sustainable energy technologies and their impacts on the environment, society, and economy - Historical and current global energy trends and their implications
Week 2	Energy Efficiency - Principles of energy efficiency and conservation - Strategies for reducing energy consumption in buildings, transportation, and industry - Case studies of successful energy efficiency initiatives
Week 3	Solar Energy - Principles of solar energy conversion

	- Types of solar panels and their efficiency
	- Applications of solar energy in residential, commercial, and industrial settings
	- Solar energy policy and regulatory frameworks
Week 4	Wind Energy
	- Principles of wind energy conversion
	- Types of wind turbines and their efficiency
	- Applications of wind energy in residential, commercial, and industrial settings
	- Wind energy policy and regulatory frameworks
Week 5	Hydropower
	- Principles of hydropower generation
	- Types of hydropower systems and their efficiency
	- Advantages and disadvantages of hydropower
	- Hydropower policy and regulatory frameworks
Week 6	Geothermal Energy
	- Principles of geothermal energy conversion
	- Types of geothermal systems and their efficiency
	- Applications of geothermal energy in residential, commercial, and industrial settings
	- Geothermal energy policy and regulatory frameworks
Week 7	Bioenergy
	- Principles of bioenergy conversion
	- Types of bioenergy systems and their efficiency
	- Applications of bioenergy in residential, commercial, and industrial settings
	- Bioenergy policy and regulatory frameworks
Week 8	Energy Storage
	- Principles of energy storage

	- Types of energy storage systems, including batteries, pumped hydro storage, and thermal energy storage - Role of energy storage in enabling the integration of renewable energy into the grid - Energy storage policy and regulatory frameworks
Week 9	Fossil Fuels - Overview of the role of fossil fuels in the current energy system - Environmental and social impacts of fossil fuel use - Strategies for phasing out fossil fuels in favor of sustainable energy sources - Fossil fuel policy and regulatory frameworks
Week 10	Sustainable Energy Policy - Overview of international and national sustainable energy policy frameworks - Case studies of successful sustainable energy policy initiatives - Strategies for advancing sustainable energy policy goals - Sustainable energy policy and regulatory frameworks
Week 11	Technological Barriers to Sustainable Energy Adoption - Overview of technological barriers to scaling up sustainable energy systems - Case studies of successful technological innovations in sustainable energy - Strategies for overcoming technological barriers to sustainable energy adoption
Week 12	Policy Barriers to Sustainable Energy Adoption - Overview of policy barriers to scaling up sustainable energy systems - Case studies of successful policy initiatives in sustainable energy - Strategies for overcoming policy barriers to sustainable energy adoption
Week 13	Social and Cultural Dimensions of Sustainable Energy Transitions - Overview of community engagement and stakeholder involvement in sustainable energy transitions - Case studies of successful community-based sustainable energy projects

	- Strategies for promoting equitable access to sustainable energy resources
Week 14	Sustainable Energy Job Creation and Entrepreneurship - Overview of job creation and entrepreneurship in the sustainable energy sector - Case studies of successful sustainable energy job creation and entrepreneurship initiatives - Strategies for promoting sustainable energy job creation and entrepreneurship
Week 15	Sustainable Energy Project Presentations and Group Work - Students work in groups to develop and present sustainable energy project proposals, incorporating technical, economic, and policy considerations - Peer review and feedback on project proposals
Week 16	Course Review and Future Directions - Review of course content and learning outcomes - Discussion of potential future directions in sustainable energy research, policy, and practice.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?

		Ministry of Higher Education and Scientific Research - Iraq University of Baghdad College of Science Department of GIS	

Required Texts	Here are some potential required texts for a course on sustainable energy: 1. Renewable and Efficient Electric Power Systems, by Gilbert M. Masters and Wendell H. Shepard. This textbook provides a comprehensive overview of renewable energy sources and their integration into the electric power grid, with a focus on energy efficiency and sustainability. 2. Sustainable Energy: Choosing Among Options, by Jefferson W. Tester, Elisabeth M. Drake, Michael J. Driscoll, and Michael W. Golay. This textbook provides a balanced and comprehensive analysis of different sustainable energy options, including solar, wind, hydropower, geothermal, and bioenergy, as well as energy storage and policy frameworks. 3. Energy for Sustainability: Technology, Planning, Policy, by John Randolph and Gilbert M. Masters. This textbook provides a comprehensive overview of sustainable energy technologies, planning frameworks, and policy initiatives, with a focus on interdisciplinary approaches and practical applications. 4. Introduction to Renewable Energy, by Vaughn C. Nelson. This textbook provides an introduction to renewable energy technologies, including solar, wind, hydropower, geothermal, and bioenergy, as well as energy storage and policy frameworks. 5. Sustainable Energy Systems Engineering: The Complete Green Building Design Resource, by Peter Gevorkian. This textbook provides a practical guide to designing and implementing sustainable energy systems, including solar, wind, hydropower, geothermal, and bioenergy, as well as energy storage and policy frameworks.	No

Recommended Texts	Here are some potential recommended texts for a course on sustainable energy: 1. Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming, edited by Paul Hawken. This book provides a comprehensive overview of the top 100 solutions to global warming, including sustainable energy solutions such as solar, wind, and geothermal energy. 2. The New Grand Strategy: Restoring America's Prosperity, Security, and Sustainability in the 21st Century, by Mark Mykleby, Patrick Doherty, and Joel Makower. This book provides a vision for a sustainable and prosperous future, with a focus on sustainable energy and a new national security strategy. 3. Reinventing Fire: Bold Business Solutions for the New Energy Era, by Amory Lovins. This book provides a comprehensive plan for transitioning to a sustainable energy future, with a focus on energy efficiency and renewable energy technologies. 4. Energy Transitions: History, Requirements, Prospects, by Vaclav Smil. This book provides a historical perspective on energy transitions and the challenges and opportunities of transitioning to a sustainable energy system, with a focus on energy efficiency and renewable energy technologies. 5. Energy for Future Presidents: The Science Behind the Headlines, by Richard A. Muller. This book provides an overview of the science and technology behind sustainable energy solutions, as well as the economic, social, and environmental factors that influence their adoption.	No

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Websites	1. National Renewable Energy Laboratory (NREL) - https://www.nrel.gov/ NREL is a leading research center focused on renewable energy and energy efficiency. Their website provides information on research, technology development, and policy analysis related to solar, wind, hydropower, geothermal, and bioenergy. 2. International Energy Agency (IEA) - https://www.iea.org/ The IEA is an intergovernmental organization focused on promoting sustainable energy policies and technologies. Their website provides analysis and data on global energy trends, as well as reports and publications related to sustainable energy. 3. Clean Energy Ministerial (CEM) - https://www.cleanenergyministerial.org/ CEM is a global forum of energy ministers focused on advancing clean energy policies and technologies. Their website provides information on initiatives and programs related to sustainable energy, as well as case studies and best practices from around the world. 4. Rocky Mountain Institute (RMI) - https://rmi.org/ RMI is a nonprofit organization focused on accelerating the transition to a sustainable energy future. Their website provides information on research, consulting services, and policy analysis related to energy efficiency, renewable energy, and sustainable transportation. 5. Energy.gov - https://www.energy.gov/ Energy.gov is the official website of the U.S. Department of Energy, providing information on programs and initiatives related to sustainable energy, including research, development, and deployment of renewable energy technologies. 6. Solar Energy Industries Association (SEIA) - https://www.seia.org/ SEIA is a trade association representing the solar energy industry in the United States. Their website provides information on policy and regulatory issues, market trends, and research related to solar energy. 7. American Wind Energy Association (AWEA) - https://www.awea.org/ AWEA is a trade association representing the wind energy industry in the United States. Their website provides information on policy and regulatory issues, market trends, and research related to wind energy. 8. The International Renewable Energy Agency (IRENA) - https://www.irena.org/ IRENA is an intergovernmental organization focused on promoting the adoption of renewable energy technologies worldwide. Their website provides analysis and data on global renewable energy trends, as well as reports and publications related to renewable energy.

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	The crimes of the Ba'ath regime	Module Delivery

Ministry of Higher Education and Scientific Research - Iraq **University of Baghdad** **College of Science** **Department of GIS**		

Module Type		**Core**	☒ **Theory**
Module Code	UOB105		☒ **Lecture**
ECTS Credits		**2**	☐ **Tutorial**
SWL (hr/sem)		**50**	☐ **Practical**
			☐ **Seminar**

Module Level	1	**Semester of Delivery**	1
Administering Department	S	**College**	Type College Code
Module Leader	Ghofran alawi	**e-mail**	• ghofran.alawi1204a@colaw.uobaghdad.edu.iq
Module Leader's Acad. Title	Assistant teacher	**Module Leader's Qualification**	
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	1/10/2024	**Version Number**	1.0

Relation with other Modules	
	العلاقة مع المواد الدراسية الأخرى
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	
Module Objectives أهداف المادة الدراسية	يهدف هذا المقرر الدراسي إلى تعزيز فهم الطلاب للجرائم والانتهاكات التي وقعت خلال فترة نظام البعث في العراق وتأثيرها على الأفراد والمجتمع، وتشجيع التحليل والنقاش حول هذه القضايا المهمة. ومن ابرز الأهداف للمادة الدراسية هي اني يكون الطالب قادراً على أن : ١. فهم مفهوم الجرائم وأقسامها.

	٢. دراسة جرائم نظام البعث والقوانين المتعلقة بها. ٣. التعرف على الجرائم النفسية والاجتماعية وآثارها على الفرد والمجتمع. ٤. تحليل الانتهاكات القانونية في العراق، بما في ذلك الانتهاكات لحقوق الإنسان والجرائم ذات الصلة. ٥. فهم الجرائم البيئية وآثارها، بما في ذلك التلوث وتدمير المدن والقرى وتجفيف الأهوار. دراسة جرائم المقابر الجماعية وفهم أحداث المقابر والتصنيف الزمني لها في العراق.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	مخرجات التعلم للمادة الدراسية هي: ١. فهم مفهوم الجرائم وقدرة الطلاب على تصنيف الجرائم وفقًا لأقسامها. ٢. تحليل جرائم نظام البعث وفهم القوانين المتعلقة بها، بما في ذلك الجرائم الدولية. ٣. القدرة على التعرف على الجرائم النفسية لنظام البعث وفهم الآثار النفسية لجرائم نظام البعث على الأفراد والمجتمع. ٤. القدرة على التعرف على الجرائم الاجتماعية لنظام البعث الآثار الاجتماعية لجرائم نظام البعث على الأفراد والمجتمع. ٥. التعرف على الانتهاكات القانونية لنظام البعث في العراق وفهم أنواع الانتهاكات ومكان احتجاز الأفراد. ٦. التعرف على صور انتهاكات حقوق الإنسان وجرائم السلطة التي وقعت خلال فترة نظام البعث ٧. التعرف على الانتهاكات السياسية والعسكرية لنظام البعث ٨. فهم الجرائم البيئية لنظام البعث والقدرة على تحليل تأثيرها على البيئة والمجتمع. ٩. دراسة جرائم المقابر الجماعية لنظام البعث فهم الأحداث المرتبطة بجرائم المقابر الجماعية وتصنيفها زمنيًا.
Indicative Contents المحتويات الإرشادية	المحتويات الإرشادية في مادة اللغة تشمل مجموعة من المفاهيم والمواضيع التي يتم تغطيتها خلال عملية التعلم. ومن بين المحتويات الإرشادية المهمة: ١. تعريف الجريمة لغة واصطلاحًا، مفهوم الجريمة، اقسام الجريمة ٢. جرائم نظام البعث وفق توثيق قانون المحكمة الجنائية العراقية العليا عام ٢٠٠٥ ٣. الجرائم النفسية والاجتماعية وأثارها ٤. عسكرة المجتمع، موقف النظام البعثي من الدين ٥. انتهاكات القوانين العراقية، صور انتهاكات حقوق الإنسان وجرائم السلطة ٦. بعض قرارات الانتهاكات السياسية والعسكرية لنظام البعث ٧. أماكن السجون والاحتجاز لنظام البعث ٨. الجرائم البيئية لنظام البعث في العراق ٩. جرائم المقابر الجماعية ١٠. أحداث مقابر الإبادة الجماعية المرتكبة من النظام البعثي في العراق التصنيف الزمني لمقابر الإبادة الجماعية في العراق للمدة ١٩٦٣م - ٢٠٠٣م
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	استراتيجيات التعلم والتعليم المستخدمة في مادة جرائم حزب البعث البائد تشمل مجموعة متنوعة من النهج

والتقنيات التي تعزز عملية التعلم للطلاب. من بين هذه الاستراتيجيات:

١. التفاعل النشط: يتم تشجيع الطلاب على المشاركة والمشاركة الفعالة في الدروس من خلال المناقشات الجماعية والأنشطة التفاعلية.

٢. التعلم التعاوني: يشجع التعاون والتعاون بين الطلاب من خلال العمل الجماعي والمشاريع الجماعية، حيث يتعاون الطلاب مع بعضهم البعض لتحقيق أهداف التعلم المحددة.

٣. استخدام التقنيات الحديثة: يستفيد الطلاب من استخدام التكنولوجيا في عملية التعلم، مثل استخدام الحواسيب والإنترنت للبحث والتعلم الذاتي.

٤. توفير ردود فعل فورية: يتم توفير ردود فعل وتقييم مستمر للطلاب، سواء عن طريق التقييمات الشفهية أو الكتابية، مما يساعدهم على تحسين أدائهم وتطوير مهاراتهم.

التنويع في وسائل التواصل: يتم استخدام مجموعة متنوعة من وسائل التواصل والتعليم، مثل المحاضرات التوضيحية، والمناقشات الجماعية، والأنشطة العملية، والعروض التقديمية، لتلبية احتياجات وأساليب التعلم المختلفة للطلاب.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.13
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**	١	10% (١٠)	3	LO #1, 2
	Assignments	١	١٠% (10)	٨	LO #5-٨
	Projects.	١	١٠% (10)	١١	LO #١-١٠
	Report	1	10% (10)	14	LO # 1-١١
Summative assessment	**Midterm Exam**	2 hours	10% (١٠)	7	LO # 1-6
	Final Exam	3 hours	50% (50)	16	All
Total assessment			100%(100Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	تعريف الجريمة لغةً واصطلاحًا، مفهوم الجريمة، اقسام الجريمة
Week 2	جرائم نظام البعث وفق توثيق قانون المحكمة الجنائية العراقية العليا عام ٢٠٠٥
Week 3	الجرائم النفسية لنظام البعث وفهم الآثار النفسية لجرائم نظام البعث على الأفراد والمجتمع.
Week 4	الجرائم الاجتماعية لنظام البعث وفهم الآثار الاجتماعية لجرائم نظام البعث على الأفراد والمجتمع.
Week 5	انتهاكات القوانين العراقية
Week 6	بعض قرارات الانتهاكات السياسية والعسكرية لنظام البعث
Week 7	امتحان نصف الفصل
Week 8	الجرائم البيئية لنظام البعث في العراق (التلوث الحربي وسياسة الأرض المحروقة)
Week 9-10	تجفيف الاهوار و تجريف بساتين النخيل والأشجار والمزروعات

Week 11-12	جرائم المقابر الجماعة واحداث مقابر الإبادة الجماعية المرتكبة من النظام البعث في العراق
Week 13-14-15	التصنيف الزمني لمقابر الإبادة الجماعية في العراق للمدة من (١٩٦٣-٢٠٠٣) م
Week 16	التهيئة للامتحان النهائي

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	منهاج وزارة التعليم العالي والبحث العلمي العراقية ـ جرائم نظام البعث في العراق ٢٠٢٣	Yes
Recommended Texts		No
Websites	The Collage E-Library	

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
Fail Group (0 – 49)	**E -** Sufficient	مقبول	50 - 59	Work meets minimum criteria
	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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المرحلة الثانية

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية (المرحلة الثانية/الفصل الثاني)

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

	Module Information معلومات المادة الدراسية	
Module Title	Arabic Language II	**Module Delivery**
Module Type	C	☒Theory ☒Lecture ☒Lab ☐Tutorial ☐Practical
Module Code	UOB205	
ECTS Credits	2	

SWL (hr/sem)		50	☐Seminar	
Module Level	U		**Semester of Delivery**	2
Administering Department	Type Dept. Code	**College**		Type College Code
Module Leader	Leqaa faleh owdaa flaih	**e-mail**		leqaa.falih@ircoedu.uobaghdad.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)	**e-mail**		E-mail
Peer Reviewer Name	Name	**e-mail**		E-mail
Scientific Committee Approval Date	1/10/2024	**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		**التعريف بقواعد اللغة العربية**
Module Learning Outcomes		**لغة عربية سليمة بقواعد وشعر وادب عربي**

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مخرجات التعلم للمادة الدراسية	
Indicative Contents المحتويات الإرشادية	

<table>
<tr><td colspan="2" align="right">**Learning and Teaching Strategies**
استراتيجيات التعلم والتعليم</td></tr>
<tr><td>**Strategies**</td><td></td></tr>
</table>

<table>
<tr><td colspan="2" align="right">**Student Workload (SWL)**
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</td></tr>
</table>

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل			**200**

<table>
<tr><td colspan="5" align="right">**Module Evaluation**
تقييم المادة الدراسية</td></tr>
<tr><td></td><td>**Time/Number**</td><td>**Weight (Marks)**</td><td>**Week Due**</td><td>**Relevant Learning Outcome**</td></tr>
<tr><td align="right">**Quizzes**</td><td>2</td><td>10% (10)</td><td>5 and 10</td><td>LO #1, #2 and #10, #11</td></tr>
</table>

Formative assessment	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	الظواهر اللغويَّة: الترادف ، المشترك اللفظي، التضاد.
Week 2	قواعد كتابة الألف اللينة في آخر الكلمة.
Week 3	الإستثناء.
Week 4	الحال.
Week 5	التمييز.
Week 6	المفاعيل الخمسة: المفعول به، المفعول فيه، المفعول المطلق، المفعول لأجله، المفعول معه.
Week 7	حروف الجر ومعانيها.
Week 8	امتحان نصف الفصل
Week 9	الاسم المذكر والمؤنث.
Week 10	الحروف من حيث النطق والكتابة: اللام الشمسية والقمرية، الحذف والزيادة.
Week 11	الوقف.
Week 12	نص من سورة لقمان.
Week 13	الشاعر المتنبي.
Week 14	الشاعرة نازك الملائكة.

Week 15	.الظواهر اللغويَّة: الترادف ، المشترك اللفظي، التضاد
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي العملي

	Material Covered

Learning and Teaching Resources
مصادر التعلم والتدريس

		Text	**Available in the Library?**
Required Texts		الانترنيت	No
Recommended		الكتب	No
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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(0 – 49)	**F –** Fail	راسب	(0-44)	Considerable amount of work required

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MODULE DESCRIPTION FORM

Module Information
معلومات المادة الدراسية

Module Title	Digital Image Processing II		**Module Delivery**
Module Type	C		☒ **Theory**
Module Code	**UOBRS43**		☒ **Lecture**
ECTS Credits	8		☒ **Lab** ☐ **Tutorial**
SWL (hr/sem)	200		☐ **Practical** ☐ **Seminar**
Module Level	1	**Semester of Delivery**	2
Administering Department	Type Dept. Code	**College**	Type College Code
Module Leader	Bushra ali ahmed	**e-mail**	Bushra.a@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail

Scientific Committee Approval Date	1/10/2024	**Version Number**	1.0

Relation with other Modulesالعلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Digital Image Processing	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contentsأهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectivesأهداف المادة الدراسية	Here are some learning objectives for a course on digital image processing: 1. To understand the sensing, acquisition and storage of digital images. 2. To study the image fundamentals and mathematical transforms necessary for image processing. 3. To understand the digital processing systems and corresponding terminology. 4. To understand the base image transformation domains and methods. 5. To have an understanding of colour models, type of image representations and related statistics. 6. To study the image enhancement techniques. 7. To study image restoration. Finally, this course is designed to give undergraduate students all the fundamentals in 2-D digital image processing with emphasis in image processing techniques, image filtering design and applications.

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	After completing a course on digital image processing , students should be able to:
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Have a clear understanding of the principals the Digital Image Processing terminology used to describe features of images. 2. Have a good understanding of the mathematical foundations for digital manipulation of images; image acquisition; preprocessing; Fourier domain processing. 3. Be able to write programs using Matlab language for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing; and compression. 4. Have knowledge of the Digital Image Processing Systems. 5. Be able to understand the documentation for, and make use of, the MATLAB library and MATLAB Digital Image Processing Toolbox (IPT). 6. Learn and understand the Image Enhancement in the Spatial Domain. 7. Learn and understand the Image Enhancement in the Frequency Domain. 8. Understand the Image Restoration, Representation and Description. Finally, The students would get a firm foundation in 2-D image processing and be able to handle real-world image processing problems.
Indicative Contents المحتويات الإرشادية	Here are some indicative contents that may be covered in a course on digital image processing : 1. Image sources and generation 2. Image sampling and quantization 3. Same basic relationship between pixels 4. Intensity transformations and spatial filtering background. 5. Some Basic Intensity Transformation Functions 6. Histogram Processing 7. Fundamentals of Spatial Filtering 8. Smoothing Spatial Filters 9. Sharpening Spatial Filters 10. Combining Spatial Enhancement Methods 11. The Discrete Fourier Transform (DFT) of one Variable 12. Extension to Functions of Two Variables 13. Some Properties of the 2-D Discrete Fourier Transform 14. The Basics of Filtering in the Frequency Domain

	15. Image Smoothing Using Frequency Domain Filters
	16. Image Sharpening Using Frequency Domain Filters
	17. Basic Image Rrestoration techniques

Learning and Teaching Strategies ستراتيجيات التعلم والتعليم	
Strategies	Here are some learning and teaching strategies that may be effective for a course on Digital image processing : 1. Lectures: Lectures can provide an overview of key concepts and techniques in digital image processing. 2. Education: provide lectures and printed sources from the modern, diverse and rich sources including examples 3. Education: Harnessing smart blackboard to the goal of teaching students and explain the steps the solution and extraction results 4. Education: resolving some questions, with intent to contain mistakes and make the students extracted error 5. Learning: asking questions and inquiries and making the student turn into a teaching explanation and solution on the blackboard at that point, brainstorming method 6. Learning: questions directly and consequently all students to learn the extent of interaction and the rest to be paid attention to 7. Learning: Each specific group and explain its interaction between students with questions and answers and provide an environment that enables the student to lecture management or debate. 8. Instructors can use slides, diagrams, and other visual aids to help students understand complex topics. 9. Online resources: Online resources such as interactive tutorials, video lectures, and online forums can supplement classroom instruction and provide students with additional opportunities to learn image processing.

<table>
<tr><td></td><td colspan="5">10. Assessments: Assessments can help students measure their understanding of course material and provide instructors with feedback on the effectiveness of their teaching. Assessments can include quizzes, exams, and projects. By using a combination of these learning and teaching strategies, instructors can create a dynamic and engaging learning environment that helps students develop the knowledge and skills they need to succeed in the field of digital image processing.</td></tr>
</table>

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي الغير المنتظم للطالب خلال الفصل		**Unstructured SWL (h/w)** الحمل الدراسي الغير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي للطالب خلال الفصل		**200**	

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 and Digital Image Fundamentals: The origins of Digital Image Processing. Examples of Fields that Use Digital Image Processing. Fundamentals Steps in Image Processing. Elements of Digital Image Processing.
Week 2	Introduction And Digital Image Fundamentals : Image Sampling and Quantization, Some basic relationships like Neighbours, Connectivity, Distance Measures between pixels. Translation, Scaling, Rotation and Perspective Projection of image
Week 3	Introduction And Digital Image Fundamentals: Linear and Non-Linear Operations • Digital image Representation. Reading, Displaying, Writing Images using MATLAB. Data Classes, Image Types using MATLAB
Week 4	Digital image Representation: Converting Between data classes and Image Types. Image Enhancement in the Spatial Domain: Some basic Gray Level Transformations. Histogram Processing
Week 5	Image Enhancement in the Spatial Domain: Enhancement Using Arithmetic and Logic operations Combining Spatial Enhancement Methods. Basics of Spatial Filters
Week 6	Image Enhancement in the Spatial Domain: Smoothening and Sharpening Spatial Filters.
Week 7	Image Enhancement in the Frequency Domain: Introduction to Fourier Transform and the frequency Domain. Computing and visualizing the 2D DFT.
Week 8	Convolution and correlation. Image Enhancement in the Frequency Domain: Smoothing Frequency Domain Filters
Week 9	Image Enhancement in the Frequency Domain: Sharpening Frequency Domain Filters. Homomorphic Filtering. Wavelet Transform. Haar Transform.
Week 10	Image Restoration: A model of The Image Degradation / Restoration Process. Noise Models. Restoration in the presence of Noise Only Spatial Filtering.
Week 11	Image Restoration: Periodic Noise Reduction by Frequency Domain Filtering. Linear Position-Invariant Degradations. Estimation of Degradation Function.
Week 12	Image Restoration: Inverse filtering. Wiener filtering

Week 13	Image Restoration: Geometric Mean Filter. Geometric Transformations.
Week 14	Object Recognition: Patterns and Pattern Classes. Decision-Theoretic Methods. Structural Methods
Week 15	Course review, final project presentations, and exam preparation.
Week 16	**Preparatory week before the final Exam**
Delivery Plan (Weekly Lab. Syllabus)المنهاج الاسبوعي للمختبرات	
	Material Covered
Week 1	Image reading and Printing.
Week 2	Reducing the Number of Intensity Levels in an Image.
Week 3	Zooming and Shrinking Images by Pixel Replication.
Week 4	Zooming and Shrinking Images by Bilinear Interpolation.
Week 5	Arithmetic Operations.
Week 6	Image Enhancement Using Intensity Transformations.
Week 7	Histogram Equalization.
Week 8	Spatial Filtering.
Week 9	Enhancement Using the Laplacian.
Week 10	Unsharp Masking.
Week 11	Convolution and correlation

Week 12	Degradation model
Week 13	Image Restoration using different fiters
Week 14	Image Restoration using different fiters
Week 15	Course review, final project presentations, and exam preparation.
Week 16	**Preparatory week before the final Exam**

		in the Library?
Required T	Here are some required texts for a course on digital image processing: 1. Digital Image Processing, Second Edition by Rafel C. Gonzalez and Richard E. Woods, Pearson Education 2. Digital Image Processing by Bhabatosh Chanda and Dwijesh Majumder, PHI 2. 3.Fundamentals of Digital Image Processing by Anil K Jain, PHI 4. Digital Image Processing Using Matlab, Rafel C. Gonzalez and Richard E. Woods, Pearson Education.	No
Recommendec	Here are some recommended texts for a course on digital image processing: 1. Al Bovik (ed.), "Handbook of Image and Video Processing", Academic Press, 2000. 2. 2. A.K. Jain, "Fundamentals of Digital Image Processing", Prentice-Hall, Addison-Wesley, 1989. 3. M. Petrou, P. Bosdogianni, "Image Processing, The Fundamentals", Wiley, 1999. 4. P.Ramesh Babu, Digital Image Processing. Scitech Publications., 2003. 5. Bernd Jähne, Digital Image Processing, Springer-Verlag Berlin Heidelberg 2005. 6. B. Jähne, "Practical Handbook on Image Processing for Scientific Applications", CRC Press, 1997. 7. J. C. Russ. The Image Processing Handbook. CRC, Boca Raton, FL, 4th edn., 2002. 8. J. S. Lim, "Two-dimensional Signal and Image Processing" Prentice-Hall, 1990. 9. Rudra Pratap, Getting Started With MATLAB 7. Oxford University Press, 2006 10. W. K. Pratt. Digital image processing, PIKS Inside. Wiley, New York, 3rd, edn., 2001. 11. Stephane Marchand-Maillet, Yazid M. Sharaiha, Binary Digital Image Processing, A Discrete Approach, Academic Press, 2000.	No

**Learning and Teaching
Resources**مصادر التعلم

Ministry of Higher Education and Scientific Research - Iraq **University of Baghdad** **College of Science** **Department of GIS**			

والتدريس		

		Text	**Available**
Website	1. www.imageprocessingplace.com (required). Text book website) 2. www.mathworks.com (MATLAB documentation) 3. en.wikipedia.org/wiki/Digital image processing (General image processing concepts)		

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

	Ministry of Higher Education and
	Scientific Research - Iraq
	University of Baghdad
	College of Science
	Department of GIS

Module Information

معلومات المادة الدراسية

		Module Delivery
Module Title	**English Language II**	
Module Type	**S**	☒Theory
Module Code	**UOB206**	☒Lecture
ECTS Credits	**2**	☐Tutorial
SWL (hr/sem)	**50**	☐Practical ☐Seminar

Module Level	U	**Semester of Delivery**	2
Administering Department	Type Dept. Code	**College**	Type College Code
Module Leader	Obaida Mohammed Sami Ahmed Ismail	**e-mail**	obaida.m@dcec.uobaghdad.edu.iq
Module Leader's Acad. Title	مدرس مساعد	**Module Leader's Qualification**	Master
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	1/10/2024	**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

	Ministry of Higher Education and Scientific Research - Iraq University of Baghdad College of Science Department of GIS	

Module Objectives أهداف المادة الدراسية	a pre-intermediate level course aiming to build and further improve language proficiency for second year students/ college of science, 1. Listening Objectives: • Understand and respond appropriately to a variety of spoken English in familiar contexts. • Comprehend main ideas, specific details, and implied information in spoken texts. • Develop listening strategies to enhance understanding. 2. Speaking Objectives: • Engage in conversations on a range of topics using appropriate vocabulary and grammar. • Express opinions, preferences, and experiences. • Develop speaking strategies for effective communication, such as turn-taking and seeking clarification. 3. Reading Objectives: • Read and understand a variety of texts, including articles, stories, and informational passages. • Comprehend main ideas, details, and implied information in written texts. • Develop reading strategies for comprehension and vocabulary acquisition. 4. Writing Objectives: • Write coherent paragraphs and short texts on different topics. • Express ideas clearly and logically using appropriate grammar and vocabulary. • Develop writing strategies for organization, coherence, and accuracy. 5. Grammar and Vocabulary Objectives: • Develop a solid understanding and usage of a wide range of grammatical structures appropriate for the pre-intermediate level. • Expand vocabulary knowledge to include a broader range of words, idiomatic expressions, and collocations. • Apply grammar and vocabulary knowledge to express oneself accurately and effectively. 6. Pronunciation and Intonation Objectives: • Improve pronunciation accuracy of individual sounds, stress patterns, and intonation. • Use appropriate rhythm, stress, and intonation for effective communication.

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	• Recognize and produce connected speech features to enhance fluency and naturalness. 7. Cultural Awareness Objectives: • Develop an understanding of cultural practices, customs, and social norms in English-speaking countries. • Demonstrate cultural sensitivity and adapt communication accordingly. • Recognize the impact of culture on language use and communication styles.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Learner training is essential to the achievement of the Learning Outcomes. 1. Listening and Speaking: • Understand and respond appropriately to a range of everyday spoken English in familiar contexts. • Engage in conversations and discussions on a variety of topics using appropriate language and strategies. • Comprehend and extract information from spoken texts, such as interviews, dialogues, and narratives. 2. Reading: • Read and understand a variety of texts, including articles, stories, and informational passages. • Comprehend main ideas, details, and specific information from the texts. • Apply reading strategies to infer meaning from context and make predictions. 3. Writing: • Write coherent and well-organized paragraphs and short texts on various topics. • Express ideas and opinions clearly and concisely. • Demonstrate control of grammar, vocabulary, and sentence structures appropriate for the pre-intermediate level. 4. Grammar and Vocabulary: • Understand and use a wide range of grammatical structures and tenses, including present perfect, past simple, future forms, and conditionals. • Expand vocabulary knowledge to include a broader range of words, idiomatic expressions, and collocations. • Apply grammar and vocabulary in context to enhance communication skills. 5. Pronunciation and Intonation:

	• Develop accurate pronunciation of individual sounds and common word stress patterns. • Use appropriate intonation and stress patterns to convey meaning effectively. • Understand and produce connected speech features, such as linking sounds and contractions. 6. Cultural Awareness: • Gain insights into cultural practices, traditions, and customs in English-speaking countries. • Develop intercultural competence and sensitivity in communication. • Understand cultural influences on language use and behavior.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1: Greetings and Introductions • Vocabulary: Greetings, introductions, personal information • Grammar: Present simple, present continuous, subject pronouns, possessive adjectives • Skills: Listening to and giving personal information, role-playing introductions, writing short personal profiles 2: Daily Routines • Vocabulary: Daily activities, time expressions • Grammar: Present simple, adverbs of frequency, prepositions of time • Skills: Talking about daily routines, describing habits and schedules, writing a daily routine diary 3: Family and Relationships • Vocabulary: Family members, relationships, adjectives to describe people • Grammar: Possessive 's, can/can't, imperatives • Skills: Talking about family members, describing people's appearance and personality, writing about a family member 4: Free Time and Hobbies • Vocabulary: Leisure activities, hobbies, sports • Grammar: Present simple vs. present continuous, question words • Skills: Discussing leisure activities, talking about hobbies and interests, writing about favorite pastimes 5: Shopping and Money

- Vocabulary: Shops, money, prices, clothes
- Grammar: Countable and uncountable nouns, plurals, quantifiers
- Skills: Role-playing shopping conversations, describing clothes, writing a shopping list

6: Travel and Transportation

- Vocabulary: Means of transport, travel destinations, directions
- Grammar: Present perfect, past simple, adverbs of time
- Skills: Discussing travel experiences, giving and following directions, writing about a memorable trip

7: Food and Eating Habits

- Vocabulary: Food items, meals, cooking, restaurants
- Grammar: Countable and uncountable nouns, articles, some/any
- Skills: Talking about food preferences, ordering in a restaurant, writing a recipe

8: Health and Well-being

- Vocabulary: Health issues, symptoms, remedies
- Grammar: Should/shouldn't, modals for advice and obligation
- Skills: Discussing health problems, giving advice, writing a health blog post

9: Jobs and Careers

- Vocabulary: Professions, job descriptions, skills
- Grammar: Past continuous, comparatives and superlatives
- Skills: Talking about jobs and career aspirations, describing job experiences, writing a resume

10: Future Plans and Ambitions

- Vocabulary: Future forms (will, going to, present continuous), ambitions, goals
- Grammar: Future forms, time clauses
- Skills: Discussing future plans, setting goals, writing a letter to your future self

11: Technology and Communication

- Vocabulary: Communication devices, social media, technology-related terms
- Grammar: Present perfect continuous, future continuous, indirect questions
- Skills: Discussing technology and its impact, describing communication habits, writing an email or text message

12: Environment and Sustainability

- Vocabulary: Environmental issues, natural disasters, conservation
- Grammar: Conditional sentences, passive voice
- Skills: Discussing environmental concerns, expressing opinions on sustainability, writing an article on environmental conservation

13: Culture and Traditions

- Vocabulary: Festivals, customs, cultural practices
- Grammar: Reported speech, relative clauses
- Skills: Talking about cultural events, comparing traditions, writing a description of a cultural celebration

14: Education and Learning

- Vocabulary: School subjects, learning methods, educational institutions
- Grammar: Past perfect, modals for possibility and certainty
- Skills: Discussing educational experiences, describing favorite subjects, writing an opinion essay on the benefits of education

15: Travel and Tourism

- Vocabulary: Tourist attractions, accommodation, travel experiences
- Grammar: Comparative and superlative adjectives, phrasal verbs
- Skills: Talking about travel preferences, recommending destinations, writing a travel blog post or itinerary

	Learning and Teaching Strategies
	استراتيجيات التعلم والتعليم
Strategies	

1.Communicative Approach: Emphasize communicative activities that promote interaction among students. Encourage pair and group work, role-plays, and discussions to practice language skills in meaningful contexts.

2.Integrated Skills: Integrate the four language skills (speaking, listening, reading, and writing) in lessons to create a balanced approach to language learning. Provide opportunities for students to use and develop these skills simultaneously.

3.Vocabulary Expansion: Incorporate vocabulary-building exercises and activities throughout the course. Use real-life contexts, visuals, and practical examples to help students learn and remember new words.

4.Grammar Focus: Teach and reinforce grammar structures in a systematic and progressive manner. Provide clear explanations, examples, and practice exercises to ensure students understand and can apply the grammar rules correctly.

5.Authentic Materials: Include authentic texts, such as articles, newspaper clippings, songs, and videos, to expose students to real-world language usage. This helps develop their reading and listening comprehension skills and exposes them to cultural aspects of English-speaking countries.

6.Cultural Awareness: Integrate cultural topics and discussions into the lessons to foster cultural awareness and sensitivity. Encourage students to share their own cultural backgrounds and experiences to promote understanding and appreciation of diverse perspectives.

7.Error Correction: Provide constructive feedback and error correction during speaking and writing activities. Help students identify and correct their mistakes, focusing on accuracy while encouraging fluency and self-expression.

8.Technology Integration: Utilize technology tools, such as interactive whiteboards, online resources, and language learning apps, to engage students and enhance their language learning experience. Incorporate multimedia materials for listening and speaking practice.

9.Regular Assessment: Assess students' progress regularly through quizzes, tests, and assignments. Provide timely feedback to guide their learning and address areas that need improvement.

10. Individualization: Cater to the individual needs and learning styles of students. Offer differentiated tasks and activities to ensure all learners are appropriately challenged and supported.

11. Cooperative Learning: Promote collaboration and teamwork among students through pair work, group projects, and peer feedback. This encourages active participation and a supportive learning environment.

12. Review and Revision: Schedule regular review sessions to consolidate previously learned material. Encourage students to revise and practice independently, providing resources for self-study and additional practice.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	109	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	91	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل			200

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	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
	New Headway Plus provides an integrated skills course with each unit divided into grammar, vocabulary, skills work and everyday English segments as follows:
Week 1	Getting to know you p6 **Tenses** *Present, past, future* p6 Questions

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		Where were you born?
		What do you do? p6
		Question words
		Who …?, Why …?,
		How much …? p7
		Right word, wrong word
		Verbs of similar meaning
		speak/talk, *say/tell*
		Adjectives and nouns that go
		together
		Prepositions
		to, from, at, about, of, on, in, etc.
		Words with two meanings
		I met my husband on a blind date.
		Dates are good for you. p12
		Social expressions
		Have a good weekend!
		Same to you.
		p13
Week 2		Whatever makes you happy p14
		Present tenses
		Present Simple
		She lives alone in Bristol. p14
		Present Continuous
		She's planning … p14
		have/have got

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		He has his own company.
		I've got an idea for … p15
		Things I like doing
		play games
		have a lie-in
		get up late p17
		Making conversation
		What a lovely day it is today!
		Are you having a good time in London?
		Have a good weekend! p21
Week 3		What's in the news? p22
		Past tenses
		Past Simple
		How far did he walk?
		I had a shower last night. p23
		Past Continuous
		I was having a shower when … p23
		Adverbs
		drive carefully
		speak furiously
		work hard p28
		Saying when
		What's the date today?

		It's June the twentysecond.
		When did you last go
		to the cinema?
		Two weeks ago. p29
Week 4		## Eat, drink, and be merry!
		p30
		Quantity
		much and *many*
		How much milk?
		How many eggs? p31
		some and *any*
		some apples, any bananas p31
		a few, a little, a lot/lots of p31
		something / someone / somewhere p32
		Articles
		a shopkeeper, an old village,
		the north of England, He came
		by bus. p32
		Food
		apples, beer, bread, cake p36
		Shopping
		newsagent's, chemist's,
		off-licence p36
		Can you come for dinner?
		Would you like some
		more rice?
		Could you pass the

		salt, please?
		How would you like your coffee?
		This is delicious! p37
Week 5		## Looking forward
		p38
		Verb patterns
		want/hope to do
		like/enjoy doing
		looking forward to doing
		'd like to p38
		Future forms
		going to, *will* and Present Continuous
		I'm going to stay with a friend.
		I'll call or text you.
		I'm working late this evening. p40
		Phrasal verbs – literal
		move back
		take away
		grow up p44
		Phrasal verbs – idiomatic
		give up
		take off
		look after p44
		Expressing doubt and certainty
		Of course he will.
		He might do.

		Mmm … maybe.
		I doubt it.
		No chance. p45

Week 6		## The way I see it
		p46
		What … like?
		What's your teacher like? p46
		Comparative and superlative adjectives
		big, bigger, biggest
		good, better, best p47
		as … as
		It isn't as hot as Dubai. p47
		Relative pronouns
		who/that/which/where p110
		Synonyms and antonyms
		lovely, beautiful
		brilliant, terrible p52
		What's on?
		How much is it to go
		in the museum?
		Is it open on Sunday?
		What film is suitable
		for children? p53
Week 7		Mid-term Exam
Week 8		## Living history
		p54
		Present Perfect

	John has lived there for three years. p55
	for and *since*
	for two hours
	since six o'clock p55
	ever and *never*
	Have you ever been …?
	I've never been to South America. p56
	Present Perfect or Past Simple
	Have you had an ordinary job?
	I worked in a restaurant. p57
	Word endings
	Jobs
	philosopher, historian, economist p57
	Nouns and adjectives
	competition, famous p57
	Word stress
	danger, dangerous
	invite, invitation p57
	Agree with me!
	It's wonderful, isn't it?
	You come from Scotland, don't you?
	It wasn't easy, was it?
	You've lived here for years, haven't you?
	p61

		Girls and boys
		p62
		have to
		She has to train hard.
		I don't have to train every day.
		Do you have to work at weekends? p63
		should
Week 9		*You should show him this letter.* p64
		must
		He must get professional help. p64
		Things to wear
		belt, cap, boots, jumper, make-up p68
		Materials
		leather, wool, denim, cotton p68
		Situations
		job interview, party, beach holiday p68
		At the doctor's
		a sore throat, flu, food poisoning
		I've got a fever.
		My body aches.
		My glands are swollen.
		p69

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Week 10		**Time for a story**
		p70
		Past Perfect
		They had walked twenty miles. p71
		Narrative tenses
		They saw a bear.
		They were looking for work. p71
		Joining sentences
		although, because
		when, while, before, after, as, until,
		as soon as p72
		Feelings
		angry, nervous, delighted,
		stressed p76
		Exclamations with so and such
		I was so scared!
		It was such a shock!
		We had such terrible weather!
		I've got so much work!
		p77
Week 11		**Our interactive world**
		p78
		Passives
		Mobile phones are used by almost

		6 billion people.
		The first mobile phone call was made in 1973.
		Camera phones have been sold since 2002.
		Landline telephones will be replaced by mobile phones. p79
		Words that go together
		Noun + noun
		text message, businessman p81
		Verb + noun
		take notes, send a text message p81
		Adverb + adjective
		well-known, badly-behaved p81
		On the phone
		07700 900333
		Can I speak to Patrick, please?
		I'm calling because …
		Sorry, you're breaking up …
		p85
Week 12		Life's what you make it! p86

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	Present Perfect Continuous *He's been making programmes* *since 2007.* *How long has she been working* *there?* p87 Present Perfect Simple versus Continuous *He's made three programmes.* *He's been teaching for three years.* p87 **Birth, marriage, death** *pregnant, born* *engaged, divorced* *funeral, died of* p92 **Good news, bad news** *Congratulations!* *That's fantastic news!* *What a shame!* *I'm so sorry.* p93
Week 13	Just wondering … p94 **First conditional *if + will*** *If it's sunny, we'll go for a picnic.* *We won't go out if it rains.* p95 *going to* and *might* *What are you going to do tonight?* *I might go out …* p95 **Second conditional *if + would*** *If I had a brother, I'd play with him.*

		If I were you, I'd stop smoking. p96
		Prepositions
		connected to
		on a date
		listen to
		think about p100
		Thank you and goodbye!
		It's late. I must be
		going now.
		Thank you for a lovely
		evening.
		My pleasure!
		p101
Week 14		**Living in a stately home**
		Living history
		Chatsworth House and
		the family who call it
		home p58
		A family history
		David Taylor Bews
		from Perth, Australia
		researches his family
		history p60
		What do you think?
		Stately homes
		Aristocracy
		Inherited wealth p58
		Talking about you
		Have you ever …? p57

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		The lives of your grandparents p60 **What do you think?** Family history p60 **A biography** Ordering paragraphs: Two Kennedys Researching facts about a famous person and writing a biography p111
Week 15		**Families with all boys or all girls** *Sons and daughters* The parents of four daughters swap homes with the parents of four sons p66 **Heptathlon champion** An interview with Jessica Ennis – Britain's first world heptathlon champion p65 **What do you think?** Talking about successful people p65 Pros and cons of all-girl or all-boy families The ideal family p66 **Dress person X** Describing an outfit p68 **Letters and emails** Formal and informal

		expressions
		Dear Sir or Madam,
		Yours sincerely,
		Hi Cathy,
		Love Steve
		Writing a formal letter to a language school and an email to an English friend p112
Week 16		**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	The core textbook is *Soars, John and Liz, (2011), New Headway Plus Pre-Intermediate Student's Book, Special Edition, Oxford University Press*	Yes
Recommended Texts	New Headway Plus provides an integrated skills course with each unit divided into grammar, vocabulary, skills work and everyday English segments	No
Websites	Oxford University Press: The New Headway series is published by Oxford University Press. Visit their website at www.oup.com and search for "New Headway Plus, Special Edition, pre-Intermediate" or browse their English language teaching section for information on the course.	

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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information	
	معلومات المادة الدراسية
Module Title — Hydrology	Module Delivery

Module Type		C	☒Theory ☒Lecture ☒Lab ☐Tutorial ☐Practical ☐Seminar
Module Code		**UOBRS44**	
ECTS Credits		3	
SWL (hr/sem)		75	

Module Level		U0	Semester of Delivery		2
Administering Department		Type Dept. Code	College		Type College Code
Module Leader		Eman ahmed mohamedali	e-mail		Iman.ali@sc.uobaghdad.edu.iq
Module Leader's Acad. Title		مدرس	Module Leader's Qualification		Ph.D.
Module Tutor		Name (if available)	e-mail		E-mail
Peer Reviewer Name		Name	e-mail		E-mail
Scientific Committee Approval Date		1/10/2024	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	1. Understand the hydrological cycle and the processes that drive it. 2. Describe the different types of precipitation and their measurement methods. 3. Explain the factors that affect evapotranspiration and the techniques used to estimate it.

أهداف المادة الدراسية	4.	Understand infiltration processes and soil water properties, and describe water movement in soils.
	5.	Describe groundwater properties, aquifer types, and groundwater flow.
	6.	Understand surface water properties, streamflow measurement, and streamflow hydrographs.
	7.	Explain hydrologic routing methods and flood routing.
	8.	Understand snow accumulation and melt processes, snow water equivalent, and snowmelt modeling.
	9.	Describe water quality parameters, sources of pollution, and water quality modeling.
	10.	Understand watershed characteristics, watershed modeling, and water resources planning.
	11.	Develop an understanding of water resources planning and management, water allocation, and water conservation.
	12.	Understand the impacts of climate change on hydrology, adaptation strategies, and mitigation measures.
	13.	Develop conceptual and physical models for hydrological modeling and understand model calibration and validation.
	14.	Apply GIS applications in hydrology, spatial analysis, and modeling.
	15.	Interpret remote sensing data for hydrology, including image interpretation and classification techniques.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1.	Describe the hydrological cycle and its components, including precipitation, evapotranspiration, infiltration, groundwater, and surface water hydrology.
	2.	Analyze and interpret different types of precipitation data and understand their measurement methods.
	3.	Demonstrate an understanding of evapotranspiration processes, including the factors that affect it and the techniques used to estimate it.
	4.	Analyze soil water properties and water movement in soils, including infiltration processes.
	5.	Evaluate groundwater properties, aquifer types, and groundwater flow and understand their role in the hydrological cycle.
	6.	Analyze surface water properties, streamflow measurement, and streamflow hydrographs.
	7.	Apply hydrologic routing methods and understand flood routing.

	8. Develop models for snow accumulation and melt processes, snow water equivalent, and snowmelt modeling.
	9. Evaluate water quality parameters, sources of pollution, and water quality modeling techniques.
	10. Apply watershed modeling techniques and understand water resources planning.
	11. Evaluate water resources planning and management strategies, including water allocation and conservation.
	12. Evaluate the impacts of climate change on hydrology and develop adaptation and mitigation strategies.
	13. Develop and apply conceptual and physical models for hydrological modeling and understand model calibration and validation.
	14. Apply GIS applications in hydrology, including spatial analysis and modeling.
	15. Analyze remote sensing data for hydrology, including image interpretation and classification techniques
Indicative Contents المحتويات الإرشادية	1. Introduction to Hydrology - Overview of hydrology - Key concepts and terminology - Hydrological cycle - Water balance 2. Precipitation - Types of precipitation - Measurement methods for precipitation - Spatial and temporal variability of precipitation 3. Evapotranspiration - Measurement methods for evapotranspiration - Factors affecting evapotranspiration - Techniques used to estimate evapotranspiration

	4. Infiltration and Soil Water - Infiltration processes - Soil water properties - Water movement in soils 5. Groundwater - Groundwater properties - Aquifer types - Groundwater flow 6. Surface Water Hydrology - Surface water properties - Streamflow measurement - Streamflow hydrographs 7. Hydrologic Routing - Routing methods - Hydrologic models - Flood routing 8. Snow Hydrology - Snow accumulation and melt processes - Snow water equivalent - Snowmelt modeling 9. Water Quality - Water quality parameters - Sources of pollution - Water quality modeling 10. Watershed Hydrology

- Watershed characteristics
- Watershed modeling
- Water resources planning

11. Water Resources Management
- Water resources planning and management
- Water allocation
- Water conservation

12. Climate Change and Hydrology
- Impacts of climate change on hydrology
- Adaptation strategies
- Mitigation measures

13. Hydrological Modeling
- Conceptual and physical models
- Model calibration and validation

14. GIS in Hydrology
- GIS applications in hydrology
- Spatial analysis
- Modeling

15. Remote Sensing in Hydrology
- Remote sensing data for hydrology

- Image interpretation

- Classification techniques

16. Review and Assessment

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	Scientific Research - Iraq
	University of Baghdad
	College of Science
	Department of GIS

	- Review of course material
	- Assessment of learning outcomes.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1. Lectures: Lectures can be used to introduce key concepts and theories related to hydrology. Lectures can be delivered in person or online and can include multimedia materials and real-world case studies.
	2. Discussions: Discussions can be used to encourage students to reflect on hydrological concepts and to share their own experiences and insights. Discussions can be facilitated in person or online and can be structured as small group discussions or as whole-class discussions.
	3. Problem-based learning: Problem-based learning can be used to encourage students to apply hydrological concepts to real-world problems. Students can work in groups to solve problems related to hydrology and present their solutions to the class.
	4. Field trips: Field trips can be used to give students hands-on experience with hydrological concepts. Field trips can include visits to watersheds, groundwater wells, and monitoring stations.
	5. Laboratory exercises: Laboratory exercises can be used to give students hands-on experience with hydrological concepts. Laboratory exercises can include experiments related to precipitation, evapotranspiration, infiltration, and groundwater flow.

	6. Computer simulations: Computer simulations can be used to model hydrological processes and to help students understand complex hydrological concepts. Simulations can be used to model surface water hydrology, groundwater flow, and water quality. 7. Assignments: Assignments can be used to assess students' understanding of hydrological concepts. Assignments can include problem sets, case studies, and research papers. 8. Group projects: Group projects can be used to encourage collaboration and teamwork among students. Group projects can include watershed modeling or water resources planning projects. 9. Guest lectures: Guest lectures can be used to bring in experts from industry or academia to share their experiences and insights related to hydrology. 10. Online resources: Online resources such as videos, online lectures, and interactive simulations can be used to supplement in-class instruction and to provide students with additional learning opportunities.

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem)			200

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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 #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 Hydrology - Overview, key concepts and terminology, hydrological cycle, and water balance.

Week 2	Precipitation - Types of precipitation, measurement methods, and spatial and temporal variability.
Week 3	Evapotranspiration - Measurement methods, estimation techniques, and factors affecting evapotranspiration.
Week 4	Infiltration and Soil Water - Infiltration processes, soil water properties, and water movement in soils.
Week 5	Groundwater - Groundwater properties, aquifer types, and groundwater flow.
Week 6	Surface Water Hydrology - Surface water properties, streamflow measurement, and streamflow hydrographs.
Week 7	Hydrologic Routing - Routing methods, hydrologic models, and flood routing.
Week 8	Snow Hydrology - Snow accumulation and melt processes, snow water equivalent, and snowmelt modeling.
Week 9	Water Quality - Water quality parameters, sources of pollution, and water quality modeling.
Week 10	Watershed Hydrology - Watershed characteristics, watershed modeling, and water resources planning.
Week 11	Water Resources Management - Water resources planning and management, water allocation, and water conservation.
Week 12	Climate Change and Hydrology - Impacts of climate change on hydrology, adaptation strategies, and mitigation measures.
Week 13	Hydrological Modeling - Conceptual and physical models, model calibration, and validation.
Week 14	GIS in Hydrology - GIS applications in hydrology - Spatial analysis - Modeling

Week 15	Remote Sensing in Hydrology - Remote sensing data for hydrology, image interpretation, and classification techniques.
Week 16	Review and Assessment - Review of course material - Assessment of learning outcomes.

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي العملي	
	Material Covered
Week 16	Preparatory week before the final Exam

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

Required Texts	1. "Applied Hydrology" by Ven Chow, David Maidment, and Larry Mays (McGraw Hill Education, 1988) This text provides an introduction to hydrological concepts and covers topics such as precipitation, evapotranspiration, infiltration, and groundwater. 2. "Hydrology and Floodplain Analysis" by Philip B. Bedient, Wayne C. Huber, and Baxter E. Vieux (Pearson, 2013) This text covers topics such as surface water hydrology, watershed modeling, and floodplain analysis. 3. "Groundwater Hydrology" by David Keith Todd and Larry W. Mays (Wiley, 2005) This text provides an in-depth coverage of groundwater hydrology, including groundwater properties, aquifer types, and groundwater flow. 4. "Water Resources Engineering" by Larry W. Mays (Wiley, 2010) This text covers topics such as water resources planning and management, water allocation, and water conservation. 5. "GIS and Geocomputation for Water Resource Science and Engineering" by Barnali Dixon and Venkatesh Uddameri (Wiley, 2016) This text covers the use of GIS in hydrology, including spatial analysis and modeling.	No

Recommended Texts	1. "Introduction to Hydrology" by Warren Viessman Jr. and Gary L. Lewis (Pearson, 2003) This text provides an introduction to hydrological concepts and covers topics such as precipitation, evapotranspiration, infiltration, and groundwater. 2. "Principles of Snow Hydrology" by David R. DeWalle and Albert Rango (Cambridge University Press, 2008) This text covers topics such as snow accumulation and melt processes, snow water equivalent, and snowmelt modeling. 3. "Handbook of Applied Hydrology" edited by Ven Chow (McGraw Hill Education, 1989) This comprehensive text covers a wide range of topics in hydrology, including surface water hydrology, groundwater hydrology, and water quality. 4. "Hydrology: An Introduction" by Wilfried Brutsaert (Cambridge University Press, 2005) This text provides an introduction to hydrological concepts and covers topics such as precipitation, evapotranspiration, infiltration, and groundwater. 5. "Groundwater in Geologic Processes" by Steven M. Gorelick and Richard L. Bras (Cambridge University Press, 2003) This text covers topics related to groundwater geology, including groundwater recharge, subsurface flow, and groundwater-surface water interactions. 6. "Water Resources Systems Planning and Management" by S. P. Simonovic (CRC Press, 2002) This text covers topics related to water resources planning and management, including water allocation, water supply, and water demand management.	No

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Websites	1. USGS Water Resources - Provides access to extensive data on water resources in the United States, including streamflow and groundwater data, water quality data, and water-use data. (https://water.usgs.gov) 2. National Weather Service - Provides access to weather forecasts, severe weather alerts, and climate data. (https://www.weather.gov) 3. Global Runoff Data Centre - Provides access to global runoff data, including long-term runoff data and data on extreme events. https://www.bafg.de/GRDC/EN/Home/homepage_node.html 4. National Oceanic and Atmospheric Administration - Provides access to data on oceanic and atmospheric conditions, including sea surface temperature, ocean currents, and atmospheric circulation. (https://www.noaa.gov 5. World Meteorological Organization - Provides access to global weather and climate data, including historical climate data and climate change information. https://public.wmo.int/en 6. Hydrology Research Group at the University of Saskatchewan - Provides access to research publications and resources related to hydrology, including snow hydrology, groundwater, and water quality. (https://www.usask.ca/hydrology/) 7. Hydrology and Water Resources at the University of Arizona - Provides access to research publications and resources related to hydrology and water resources, including surface water hydrology, groundwater, and water resources planning and management. (https://www.hwr.arizona.edu/)

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	**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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	**Numerical Analysis**		**Module Delivery**
Module Type	B		☒Theory
Module Code	**UOBRS41**		☒Lecture
ECTS Credits	5		☒ Lab
SWL (hr/sem)	125		☐Tutorial ☐Practical ☐Seminar
Module Level		UG	**Semester of Delivery**	2
Administering Department		**College**	

Module Leader		Farah Alaa Adnan	e-mail		farah.alaa@sc.uobaghdad.edu.iq
Module Leader's Acad. Title		مدرس	Module Leader's Qualification		Ph.D.
Module Tutor			e-mail		
Peer Reviewer Name		Name	e-mail		E-mail
Scientific Committee Approval Date		1/10/2024	Version Number		

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. Having the knowledge of the ways to solve some problems in numerical ways using computers. 2. Having the knowledge of how to find the derivatives and integrations using numerical methods. 3. Having the knowledge of how to solve matrix with large dimensions. 4. Having the ability of interpolation to functions and how to find a function if we know only some points. 5. Using numerical methods to solve integrations which have no known solutions.

	6. Solving some problems - making some research in Libraries and using internet.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Solving some problems in numerical ways using computers. 2. Finding the derivatives and integrations using numerical methods. 3. Solving matrix with large dimensions. 4. Making interpolation to functions and how to find a function if we know only some points. 5. Solving integrations which have no known solutions-making. 6. Search in Libraries and using internet.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Numerical errors • Root finding for functions of one variable • Root finding for functions of several variables • Solving linear equation systems • Interpolation by polynomials • Numerical integration • Numerical differentiation • Initial value problems for ordinary differential equations • Boundary value problems for ordinary differential equations

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

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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

Student Workload (SWL)	
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا	
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) 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 #10, #11
	Assignments	6	10% (10)	2,3,6,8,10 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	Basic concepts: round-off errors, floating point arithmetic, Convergence.
Week 2	Numerical solution of Nonlinear Equations, Root Finding (Solving Transcending Equations) Bisection method, Steps Algorithm, Examples with Some Properties.
Week 3	Numerical solution of Nonlinear Equations, Root Finding (Solving Transcending Equations) Newton's method Steps Algorithm, Examples with Some Properties
Week 4	Secant Method Steps Algorithm, Examples with Some Properties.
Week 5	false position Method Steps Algorithm, Examples with Some Properties.
Week 6	Fixed Point Method Steps Algorithm, Examples with Some Properties.
Week 7	Mid-term Exam
Week 8	Vectors, Matrices, Linear Equations, zero matrix, identity :System of Linear Equations matrix, with examples.
Week 9	Matrix Arithmetic Operations, Determinant of a MATRICES, : System of Linear Equations adding and Multiplying Matrices, with examples.

Week 10	Types of matrices, symmetric matrix and upper/lower triangle matrix, Augmented Matrix with examples.
Week 11	Method of Elimination: Standard and Matrix form, number of solutions, one, infinite, no solutions, Operations That Produce Equivalent Systems with examples.
Week 12	Forward Elimination with examples.:Gaussian Elimination
Week 13	Backward Substitution with examples. :Gaussian Elimination
Week 14	Gauss-Jordon Method: Solve system of equations by using G-J method with examples.
Week 15	Review.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي العملي	
	Material Covered
Week 1	Preliminaries of Computing with MatLab.
Week 2	Learning the statements (words used in programming)
Week 3	Bisection method Steps Algorithm, Examples with Some Properties in MatLab
Week 4	Newton's method Steps Algorithm, Examples with Some Properties in MatLab
Week 5	Secant Method Steps Algorithm, Examples with Some Properties in MatLab.
Week 6	false position Method Steps Algorithm, Examples with Some Properties in MatLab.
Week 7	Mid-term Exam

Week 8	Fixed Point Method Steps Algorithm, Examples with Some Properties in MatLab.
Week 9	Vectors, Matrices, Linear Equations, zero matrix, identity matrix, with examples in MatLab.
Week 10	Determinant of a MATRICES, adding and Multiplying Matrices, with examples in MatLab.
Week 11	Types of matrices, symmetric matrix and upper/lower triangle matrix, Augmented Matrix with examples in MatLab.
Week 12	Standard and Matrix form, number of solutions, one, infinite, no solutions, Operations That Produce Equivalent Systems with examples in MatLab.
Week 13	Forward Elimination with examples in MatLab.:Gaussian Elimination
Week 14	Backward Substitution. with examples in MatLab.:Gaussian Elimination
Week 15	Review.
Week 16	**Preparatory week before the final Exam**

	Learning and Teaching Resources مصادر التعلم والتدريس	
	Text	**Available in the Library?**
Required Texts	9th , R.L. Burden and J.D. Faires: (book). Numerical Analysis 2011.	Yes
Recommended Texts	An Introduction to Numerical Analysis, Endre Süli, David F. Mayers (book). 2003	Yes
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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	C - Good	جيد	70 - 79	Sound work with notable errors
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	F – Fail	راسب	(0-44)	Considerable amount of work required

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	Remote Sensing software packages	**Module Delivery**
Module Type	C	☒Theory ☒Lecture ☒Lab
Module Code	UOBRS45	

ECTS Credits	4	☐Tutorial ☐Practical ☐Seminar	
SWL (hr/sem)	100		
Module Level	U0	Semester of Delivery	2
Administering Department	Remote sensing and GIS department	College	college of science
Module Leader	Raghda A. Ali Sinan Sameer Mahmood	e-mail	E-mail raghda.Ali@sc.uobaghdad.edu.iq senan.samir@sc.uobaghdad.edu.iq
Module Leader's Acad. Title	Sinan Sameer Mahmood , Raghda A. Ali	Module Leader's Qualification	Master
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	1/10/2024	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	1. Understand the fundamental concepts of remote sensing and satellite image analysis. This includes knowledge of image processing techniques, spectral bands, data formats, coordinate systems, etc.

أهداف المادة الدراسية	2. Get familiarity with major remote sensing software packages like ERDAS Imagine, ENVI, QGIS, ArcGIS, SNAP, etc. Learn how to install, navigate and perform basic tasks in these software. 3. Learn to process and analyze satellite imagery using the software. This includes tasks like image visualization, enhancement, classification, change detection, mosaicing, etc. 4. Understand how to access and download satellite imagery from sources like USGS, Landsat, Copernicus, NASA, etc and prepare the data for analysis. 5. Be able to interpret and map results from image analysis using the software. This includes producing thematic maps, probability maps, land cover maps, land use maps, etc. 6. Apply remote sensing techniques and software to solve real world problems and case studies related to land use planning, natural resource management, environmental monitoring, etc. 7. Develop skills to automate repetitive tasks using scripting languages like Python in combination with the software for efficient large scale analysis. The main focus of the course would be on providing hands-on training and practical exercises to develop key skills for analyzing remote sensing data using popular software tools. The theoretical concepts and case studies would help illustrate real life applications of the techniques learned.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Students will be able to install, navigate and execute basic commands in major remote sensing software packages like ERDAS Imagine, ENVI, QGIS, ArcGIS, SNAP, etc. 2. Students will be able to visualize, manipulate and analyze satellite imagery and remote sensing data using different software tools. This includes tasks like pseudo coloring, image enhancement, band math, spectral interpretation, image classification, etc. 3. Students will be able to access and download satellite imagery from sources like USGS, Landsat, Copernicus, NASA and prepare them for analysis in the software. 4. Students will be able to produce thematic maps, land cover maps, probability maps and other geospatial outputs from satellite image analysis using the software. 5. Students will be able to apply knowledge of remote sensing software packages to solve real world problems like land use mapping, natural resource management, environmental monitoring, change detection, etc. 6. Students will be able to automate repetitive tasks in the software using Python or other scripting languages to improve efficiency of large scale analysis.

	7. Students will understand the limitations and strengths of different software packages for specific remote sensing and GIS applications.
	8. Students will develop the ability to interpret and evaluate results from satellite image analysis using remote sensing software packages.
	In summary, the main focus of learning outcomes for this course would be on developing practical skills for processing, analyzing and interpreting remote sensing data using software, as well applying the techniques to solve geospatial problems. The automation of tasks would also be an important component of the outcomes.
Indicative Contents المحتويات الإرشادية	1. Introduction
	- What is remote sensing?
	- Types of remote sensing data
	- Brief history and applications
	- Overview of software packages
	2. Important Concepts
	- Image coordinates and projections
	- Image geometry and anomalies
	- Spectral bands and indices
	- Image formats and file types
	3. Software Introduction
	- Demonstrations of major packages like ERDAS Imagine, ENVI, QGIS, ArcGIS, etc
	- Interface, tools, functionality of each software
	- Pros and cons for different applications
	4. Data Access and Preparation

- Sources of satellite data

- Downloading and preparing data for analysis

- Rectification, subsetting, layer stacking, etc.

5. Image visualization

- RGB composite color images

- Histogram stretching

- Filtering and enhancement techniques

6. Image Classification

- Supervised and unsupervised methods

- Accuracy assessment

- Thematic map production

7. Change Detection

- Image differencing

- Change vector analysis

- Post-classification comparison

8. Mapping and Reporting

- Producing maps, tables and reports from results

- Statistical analysis of geospatial data

9. Automation Using Python/Scripting

	- Automating repetitive tasks
	- Handling large volumes of data efficiently
	10. Applications
	- Case studies for land use mapping, crop monitoring, disaster monitoring, urban planning, etc.
	The course would likely spend around 2/3 of content/time on hands-on practical sessions and 1/3 on theoretical foundations and real-world applications. The main software demonstrations and exercises would be distributed across the relevant topics to provide an integrated learning experience.
	The key is to focus on developing essential job-ready skills while also anchoring those skills in an understanding of fundamental principles and application to real problems.

<table>
<tr><td colspan="2" align="center">Learning and Teaching Strategies
استراتيجيات التعلم والتعليم</td></tr>
<tr><td>Strategies</td><td>1. Hands-on lab sessions: The majority of the course time should be spent doing practical exercises and labs on the software. This is the best way for students to develop and demonstrate the core skills. The labs can cover topics like image pre-processing, image enhancement, classification, mapping, scripting, etc.

2. Lectures: Short lectures can be used to introduce key concepts, techniques and software tools. Lectures should focus on the essential theoretical background needed to understand and apply the skills in the labs.</td></tr>
</table>

	3. Real-world case studies: Case studies on applying remote sensing software to solve real problems can be used to illustrate practical applications of the techniques. Students can discuss and analyze the case studies.
	4. Student projects: Assigning students a mini-project to apply what they have learned to a real-world problem can help consolidate their skills. Students can work individually or in small groups on the projects.
	5. Software demonstrations: Demonstrating key functions of the software and giving students hands-on practice during lectures and labs can increase engagement and learning.
	6. Recordings: Recording lectures and lab sessions can allow students to review concepts and refer back to demonstrations. This is especially useful for complex tasks.
	7. Discussion forums: Online discussion forums can allow students to ask questions, discuss assignments, and help each other. This promotes collaborative learning.
	8. Scripting templates: Providing Python or other scripting templates/examples can get students started with automating tasks in the software. They can then customize the scripts for their own needs.
	9. Student presentations: Having students present their project findings and maps to the class can help develop their communication skills. Peer feedback can also improve their work.
	10. An emphasis on active and experiential learning strategies like hands-on labs, projects and real-world applications, combined with lecture-based instruction of foundational concepts, would likely be most effective for a remote sensing software packages course.

Student Workload (SWL)		
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا		
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200	

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 Remote Sensing and Software Packages : - Overview of remote sensing and its applications - Introduction to different remote sensing software packages - Installation and setup of software packages
Week 2	Image Processing Basics - Image enhancement techniques - Spatial and spectral resolution - Image classification techniques
Week 3	Image Processing with ENVI - Introduction to ENVI software - Importing, viewing, and manipulating images - Spectral analysis and image enhancement in ENVI
Week 4	Image Processing with ArcGIS - Introduction to ArcGIS software - Importing and processing remote sensing data in ArcGIS - Georeferencing and image rectification
Week 5	Image Processing with QGIS - Introduction to QGIS software - Importing and processing remote sensing data in QGIS

	- Creating and editing vector data
Week 6	Radar Remote Sensing with SARscape - Introduction to SAR remote sensing - Overview of SARscape software - Radar image processing, analysis, and interpretation
Week 7	Lidar Remote Sensing with LP360 - Introduction to Lidar remote sensing - Overview of LP360 software - Lidar data processing, analysis, and interpretation
Week 8	Hyperspectral Remote Sensing with ENVI - Introduction to hyperspectral remote sensing - Overview of ENVI software for hyperspectral data analysis - Hyperspectral data processing, analysis, and interpretation
Week 9	: Remote Sensing Data Fusion with ERDAS Imagine - Introduction to data fusion - Overview of ERDAS Imagine software - Image fusion techniques and applications
Week 10	Remote Sensing for Land Use/Land Cover Mapping with eCognition - Introduction to eCognition software - Object-based image analysis for land use/land cover mapping - Feature extraction and classification techniques
Week 11	Remote Sensing for Vegetation Analysis with ENVI - Vegetation indices and their applications - Overview of ENVI software for vegetation analysis

	- Vegetation mapping and classification techniques
Week 12	Remote Sensing for Water Resources Management with ArcGIS - Overview of ArcGIS software for water resources management - Hydrological modeling using remote sensing data - Flood mapping and analysis
Week 13	Remote Sensing for Climate Change Studies with QGIS - Overview of QGIS software for climate change studies - Remote sensing for climate change impact assessment - Climate change adaptation and mitigation strategies
Week 14	Remote Sensing for Disaster Management with ERDAS Imagine - Overview of ERDAS Imagine software for disaster management - Disaster risk assessment using remote sensing data - Emergency response planning and management
Week 15	Remote Sensing for Urban Planning with eCognition - Overview of eCognition software for urban planning - Object-based image analysis for urban land use and land cover mapping - Urbanization monitoring and management
Week 16	Emerging Trends and Future Directions in Remote Sensing - Overview of emerging trends in remote sensing - Future directions in remote sensing research and development - Discussion of potential applications and impact of remote sensing in various fields.

Delivery Plan (Weekly Lab. Syllabus)

	Ministry of Higher Education and Scientific Research - Iraq University of Baghdad College of Science Department of GIS	

المنهاج الاسبوعي العملي

	Material Covered
Week 1	Introduction to Remote Sensing and Software Packages - Overview of remote sensing and its applications - Introduction to different remote sensing software packages - Installation and setup of software packages Lab Exercises: - Installing and setting up software packages - Exploring the user interface of different software packages
Week 2	: Image Processing Basics - Image enhancement techniques - Spatial and spectral resolution - Image classification techniques Lab Exercises: - Image enhancement using different techniques - Spatial and spectral resolution analysis - Image classification using different techniques
Week 3	Image Processing with ENVI - Introduction to ENVI software - Importing, viewing, and manipulating images - Spectral analysis and image enhancement in ENVI

	Lab Exercises: - Importing and viewing images in ENVI - Spectral analysis and image enhancement using ENVI tools
Week 4	Image Processing with ArcGIS - Introduction to ArcGIS software - Importing and processing remote sensing data in ArcGIS - Georeferencing and image rectification Lab Exercises: - Importing and processing remote sensing data in ArcGIS - Georeferencing and image rectification using ArcGIS tools
Week 5	: Image Processing with QGIS - Introduction to QGIS software - Importing and processing remote sensing data in QGIS - Creating and editing vector data Lab Exercises: - Importing and processing remote sensing data in QGIS - Creating and editing vector data using QGIS tools
Week 6	Radar Remote Sensing with SARscape - Introduction to SAR remote sensing - Overview of SARscape software - Radar image processing, analysis, and interpretation

	Lab Exercises:
	- Importing and processing radar images in SARscape
	- Radar image processing, analysis, and interpretation using SARscape tools
Week 7	Radar Remote Sensing with SARscape
	- Introduction to SAR remote sensing
	- Overview of SARscape software
	- Radar image processing, analysis, and interpretation
	Lab Exercises:
	- Importing and processing radar images in SARscape
	- Radar image processing, analysis, and interpretation using SARscape tools
Week 8	Hyperspectral Remote Sensing with ENVI
	- Introduction to hyperspectral remote sensing
	- Overview of ENVI software for hyperspectral data analysis
	- Hyperspectral data processing, analysis, and interpretation
	Lab Exercises:
	- Importing and processing hyperspectral data in ENVI
	- Hyperspectral data processing, analysis, and interpretation using ENVI tools
Week 9	: Remote Sensing Data Fusion with ERDAS Imagine
	- Introduction to data fusion
	- Overview of ERDAS Imagine software
	- Image fusion techniques and applications

	Lab Exercises: - Image fusion using ERDAS Imagine tools - Image classification using fused images
Week 10	Remote Sensing for Land Use/Land Cover Mapping with eCognition - Introduction to eCognition software - Object-based image analysis for land use/land cover mapping - Feature extraction and classification techniques Lab Exercises: - Object-based image analysis using eCognition tools - Feature extraction and classification using eCognition tools
Week 11	Remote Sensing for Vegetation Analysis with ENVI - Vegetation indices and their applications - Overview of ENVI software for vegetation analysis - Vegetation mapping and classification techniques Lab Exercises: - Vegetation index calculation and analysis using ENVI tools - Vegetation mapping and classification using ENVI tools
Week 12	Remote Sensing for Water Resources Management with ArcGIS - Overview of ArcGIS software for water resources management - Hydrological modeling using remote sensing data - Flood mapping and analysis

	Lab Exercises: - Hydrological modeling using ArcGIS tools - Flood mapping and analysis using ArcGIS tools
Week 13	Remote Sensing for Climate Change Studies with QGIS - Overview of QGIS software for climate change studies - Remote sensing for climate change impact assessment - Climate change adaptation and mitigation strategies Lab Exercises: - Climate change impact assessment using QGIS tools - Climate change adaptation and mitigation strategies using remote sensing data
Week 14	Remote Sensing for Disaster Management with ERDAS Imagine - Overview of ERDAS Imagine software for disaster management - Disaster risk assessment using remote sensing data - Emergency response planning and management Lab Exercises: - Disaster risk assessment using ERDAS Imagine tools - Emergency response planning and management using remote sensing data
Week 15	Remote Sensing for Urban Planning with eCognition - Overview of eCognition software for urban planning - Object-based image analysis for urban land use and land cover mapping - Urbanization monitoring and management

	Lab Exercises: - Object-based image analysis for urban land use and land cover mapping using eCognition tools - Urbanization monitoring and management using remote sensing data
Week 16	Emerging Trends and Future Directions in Remote Sensing - Overview of emerging trends in remote sensing - Future directions in remote sensing research and development - Discussion ofpotential applications and impact of remote sensing in various fields. Lab Exercises: - Research and analysis of emerging trends in remote sensing - Discussion of potential applications and impact of remote sensing in various fields.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?

Required Texts	1. Remote Sensing Image Analysis: Including the Spatial Domain by John A. Richards and Xiuping Jia. This book provides good overview of fundamental remote sensing image processing and analysis concepts and techniques. The chapters on basic radiometric and geometric correction, image enhancement, classification and change detection provide relevant theoretical background for the course. 2. Object-Based Image Analysis: A Primer by Guido Barneveld. This book gives an overview of the key concepts and methods in object-based image analysis. It can serve as a concise reference for understanding object-based analysis in remote sensing software like ENVI and ERDAS Imagine. 3. Remote Sensing Digital Image Analysis: An Introduction by John A. Richards. This book gives an excellent overview of digital image processing and analysis techniques for remote sensing. It covers theoretical concepts as well as practical approaches for application of remote sensing techniques. The chapters provide relevant background reading material for topics covered in both the lectures and labs. In addition to the texts, it would also be helpful to provide lab manuals/ tutorials for the hands-on exercises with ENVI and ERDAS Imagine. These could be based on sample imagery and data provided for the course. Links to online documentation and resources for the software can also be given to aid the students. Overall, a combination of theoretical texts, software-specific reference books and lab/tutorial manuals would provide all the necessary resources for the remote sensing software packages course. The students can refer these based on their requirements for the lectures, readings and lab sessions.	No
Recommended Texts	1. Remote Sensing and Image Interpretation by Lillesand et al. - This is a comprehensive textbook that covers all the fundamental principles and techniques of remote sensing. 2. ERDAS Field Guide by ERDAS Inc. - A hands-on guide to using ERDAS Imagine software for remote sensing applications. 3. QGIS Map Design by Anita Graser - A practical approach to learning QGIS mapping software for GIS professionals and students.	No

Websites	• Software package websites:
	
	- ERDAS Imagine: https://hexagongeospatial.com/products/produits/erdas-imagine
	  Provides tutorials, documentation and learning resources for ERDAS Imagine.
	- ENVI: https://www.harrisgeospatial.com/Software-Technology/ENVI.aspx
	  Contains user guides, tutorials and a knowledge base for ENVI software.
	- QGIS: https://www.qgistutorials.com/
	  An excellent resource with free video tutorials and training materials for QGIS.
	- ArcGIS: https://www.esri.com/training/
	  ESRI's training portal has free and paid courses, tutorials and lessons for ArcGIS.
	
	• Data sources:
	
	- USGS Earth Explorer: https://earthexplorer.usgs.gov/
	  Access to a wide variety of satellite imagery from USGS.
	- Copernicus Open Access Hub: https://scihub.copernicus.eu/
	  Download Sentinel satellite imagery for free from the European Space Agency.
	
	• Useful tutorials and resources:
	
	- GIS Geography: https://gisgeography.com/category/remote-sensing
	  Tutorials and articles on remote sensing and GIS topics.
	- GIS Lounge: https://www.gislounge.com/category/remote-sensing/
	  GIS and remote sensing blog with how-to guides, news and resources.
	- NASA Remote Sensing Tutorials: https://train.org/nasatutorial/satimage/satimage.html
	  Step-by-step guides from NASA on analyzing satellite imagery.
	
	• Journal databases:
	
	- MDPI Remote Sensing: https://www.mdpi.com/journal/remotesensing
	  Open access journal with current research in remote sensing and GIS.
	- IEEE Geoscience and Remote Sensing: https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=368
	  Peer-reviewed journal publishing advances in the field.

<table>
<tr><td align="center">Grading Scheme
مخطط الدرجات</td></tr>
</table>

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.