Dept. Of mathematics

Level Two (UGII)

Semester One

Ministry of Higher Education and Scientific Research
University of Baghdad
College of Science
Department of Mathematics

Module Description Form

نموذج وصف الوحدة الدراسية

Module Information معلومات الوحدة الدراسية			
Module Title	Advanced Calculus		**Delivery Methods**
Delivery Methods	Core Learning Activity		☑ **Theory** ☐ **Lecture** ☐ **Laboratory** ☑ **Tutorial**
Module Code	MAT2119		
ECTS Credits	8		
Total Study Workload (Hours/Semester)	200		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	1
Personnel and Administration			
Module Leader	Dr Liqaa Jameel Khaleel	**College**	Science
Academic Title	Lecturer (PhD)	**Email**	liqaa.khaled@sc.uobaghdad.edu.iq
Module Tutor	Dr Farah Alaa Adnan	**Email**	farah.alaa@sc.uobaghdad.edu.iq
Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules

Prerequisite Modules	MAT1215	**Semester**	2
Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content **أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي**	
Module Objectives **أهداف الوحدة الدراسية**	**1.** Deepen Calculus Knowledge: Build a solid understanding of key calculus concepts. **2.** Enhance Analytical Skills: Prepare students to tackle analytical problems in theory and practice. **3.** Prepare for Advanced Studies: Equip students for mathematics and sciences studies focusing on calculus. **4.** Real-World Applications: Use advanced calculus techniques to solve practical problems.
Module Learning Outcomes **مخرجات التعلم للوحدة**	**1.** Function Analysis: Examine properties such as continuity and differentiability in different situations. **2.** Advanced Techniques: Apply methods like improper integrals and substitutions effectively. **3.** Differential Equations: Solve ordinary and partial differential equations with confidence. **4.** Employ Theorems: Utilize important calculus theorems, including Taylor's theorem and the divergence theorem. **5.** Model Problems: Convert real-world issues into calculus models for viable solutions.
Indicative Content **المحتوى الإرشادي**	**1.** Fundamental Review: Review limits, derivatives, integrals, and crucial theorems. **2.** Multivariable Calculus: Investigate differentiation and integration in multiple variables. **3.** Vector Calculus: Analyze vector fields and integrals, focusing on curl and divergence. **4.** Integration Techniques: Learn about integration by parts, trigonometric integrals, substitutions, and numerical methods. **5.** Differential Equations: Study first and second-order differential equations and their applications in science. **6.** Sequences/Series: Explore convergence, power series, and Fourier series. **7.** Fundamental Analysis: Rigorously study convergence, limits, and continuity. **8.** Applications: Apply calculus methods to solve challenges in various fields.

Learning and Teaching Strategies **استراتيجيات التعلم والتدريس**	
Strategies	**1.** Lectures on Effective Time Management • Conduct structured sessions emphasizing time management's critical role in academic and professional settings. These sessions will explore proven strategies for enhancing personal productivity, including task prioritization, overcoming procrastination, and using practical time-tracking tools. **2.** Collaborative Group Work • Implement group-based assignments to strengthen teamwork, communication, and collective problem-solving abilities. By promoting peer collaboration, the program enhances understanding and cultivates a shared commitment to achieving educational objectives. **3.** Integration of Accessible Online Resources • Leverage user-friendly digital platforms and online courses to support ongoing skill development and reinforce course content. Provide access to a wide range of learning materials, ensuring flexible, independent learning and continuous engagement beyond the traditional classroom environment.

Student Workload (SWL) الحمل الدراسي للطلاب لمدة 15 أسبوعًا			
Structured SWL (hours/semester) الحمل الدراسي المنتظم للطالب خلال الفصل	122	**Structured Study Workload (hours/week)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (hours/semester) الحمل الدراسي غير المنتظم للطالب خلال الفصل	78	**Unstructured Study Workload (hours/week)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	9.1
Total SWL (hours/semester) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم الوحدة الدراسية					
		Time/Number	**Weight (Marks)**	**Weekly Due**	**Relevant Learning Outcomes**
Assessment Methods include	**Quizzes**	4	16%	5, 10	4
	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___
	Reports	2	8%	___	2
Summative Assessments	**Midterm Examination**	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours
Total Assessment		100%			

Weekly Syllabus Delivery Plan منهج أسبوعي لخطة التسليم	
Week	**Material Covered**
Week 1	Three-Dimensional Coordinate Systems • An introduction to three-dimensional coordinate systems, emphasizing definitions and fundamental properties.

Week 2	Line Equations • Studying line equations in both two and three dimensions.
Week 3	Vector Operations (Part I) • An introduction to vectors and the dot product, with applications in geometry and physics.
Week 4	Vector Operations (Part II) • In-depth cross-product exploration, focusing on its practical applications in engineering and spatial analysis.
Week 5	Equations of Planes • Deriving and explaining plane equations in three-dimensional space.
Week 6	Quadrilateral Surfaces • Analyzing quadrilateral surfaces in three-dimensional modelling.
Week 7	Midterm Examination • Evaluation of essential concepts from Weeks 1-6 to improve understanding.
Week 8	Functions of Multiple Variables (Part I) • Introducing functions with multiple variables through practical examples.
Week 9	Functions of Multiple Variables (Part II) • Exploring vector-valued functions in the context of physics and engineering.
Week 10	Multivariable Continuity and Limits • Investigating continuity and limits in functions with several variables.
Week 11	Partial Derivatives and Higher-Order Applications (Part I) • Calculating partial and higher-order derivatives and their basic principles.
Week 12	Advanced Applications of Partial Derivatives (Part II) • Applying partial derivatives for linear approximations and determining tangent planes.
Week 13	Optimization in Multivariable Calculus • Methods for finding and optimizing critical points in multivariable functions.
Week 14	Multiple Integrals • Assessing double and triple integrals, focusing on real-world applications.
Week 15	Final Exam Review • Revisiting course content in preparation for the final exam.
Week 16	Final Examination • A thorough assessment of all topics covered in the course.

Resources for Teaching and Learning **الموارد المخصصة للتدريس والتعلم**		
	Resource Availability	**Library Resource Availability**

Required Texts	*Thomas, G.B., Weir, M.D. and Hass, J., 2010. Thomas' Calculus: Multivariable.* *Mendelson, E., 1997. Schaum's outline of theory and problems of beginning calculus. McGraw-Hill.*	Yes
Recommended Texts	The Central Library, the Science Library, and the Departmental Repository collectively house an extensive selection of essential texts and specialized resources in advanced calculus.	Yes
Websites	– Specialized academic websites. – Virtual library services provide resources that are accessible from international university libraries.	

Grading Scheme

مخطط الدرجات

Assessment Groups and Corresponding Grades	Grade		Marks (%)	Definition
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
	Grade B	Very Good	80–89	Above-Average Performance with Minor Errors
	Grade C	Good	70–79	Acceptable Work with Noticeable Errors
	Grade D	Satisfactory	60–69	Satisfactory – Fair Performance with Significant Shortcomings
	Grade E	Sufficient	50–59	Meets Minimum Requirements
Fail Group (0–49)	**Grade FX**	Fail	45–49	Additional Work Required; Credit Awarded
	Grade F	Fail	0–44	Substantial Improvement Needed

Important Note on Grade Rounding: In line with our commitment to fair academic assessment, all decimal grades will be rounded to the nearest whole number. For example, a grade of 54.5 will be rounded to 55, whereas 54.4 will be rounded to 54. Any modifications to the grades initially assigned by evaluators will strictly follow this automated rounding process.

Ministry of Higher Education and Scientific Research
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Department of Mathematics

Module Description Form

نموذج وصف الوحدة الدراسية

Module Information معلومات الوحدة الدراسية			
Module Title	English Language 2		**Delivery Methods**
Delivery Methods	Supplement		☑ **Theory** ☐ **Lecture** ☐ **Laboratory** ☐ **Tutorial**
Module Code	UOB206		
ECTS Credits	2		
Total Study Workload (Hours/Semester)	50		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	1
Personnel and Administration			
Module Leader	Dr Seemaa Abdul Sattar	**College**	Science
Academic Title	Lecturer (PhD)	**Email**	seemaa.a@sc.uobaghdad.edu
Module Tutor		**Email**	
Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules

Prerequisite Modules	UOB102	**Semester**	1
Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content **أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي**	
Module Objectives **أهداف الوحدة الدراسية**	**1.** Enhance Communication Skills: Improve writing and speaking skills for academic and professional environments in science. **2.** Strengthen Research Writing: Teach how to write clear and persuasive research papers and presentations. **3.** Improve Reading and Listening: Foster critical engagement with complex mathematical and scientific texts. **4.** Cultural Awareness: Enhance understanding of cultural differences in academic English.
Module Learning Outcomes **مخرجات التعلم للوحدة**	**1.** Communicate in Academic Contexts: Clearly express complex mathematical ideas in written and spoken English. **2.** Write Structured Research Papers: Create research papers and proposals that align with academic standards. **3.** Analyze Scholarly Texts: Critically evaluate and summarize information from academic articles. **4.** Present Findings Effectively: Use academic English to present complex topics to various audiences. **5.** Navigate Professional Environments: Utilize English skills effectively in diverse professional settings.
Indicative Content **المحتوى الإرشادي**	**1.** Academic Writing Techniques: Learn how to structure arguments, maintain coherence, and use specific scientific terminology. **2.** Public Speaking Skills: Acquire effective presentation techniques, including visual aids. **3.** Critical Analysis Skills: Develop essential reading and listening strategies in academic contexts. **4.** Research and Citation: Understand best practices for conducting research, citing sources, and avoiding plagiarism. **5.** Professional Communication Skills: Learn the language for professional networking, including proper email etiquette. **6.** Workshops and Peer Review: Engage in workshops to practice writing and presentation skills with peer feedback.

Learning and Teaching Strategies **استراتيجيات التعلم والتدريس**	
Strategies	**4.** Lectures on Effective Time Management • Conduct structured sessions emphasizing time management's critical role in academic and professional settings. These sessions will explore proven strategies for enhancing personal productivity, including task prioritization, overcoming procrastination, and using practical time-tracking tools. **5.** Collaborative Group Work • Implement group-based assignments to strengthen teamwork, communication, and collective problem-solving abilities. By promoting peer collaboration, the program enhances understanding and cultivates a shared commitment to achieving educational objectives. **6.** Integration of Accessible Online Resources

	• Leverage user-friendly digital platforms and online courses to support ongoing skill development and reinforce course content. Provide access to a wide range of learning materials, ensuring flexible, independent learning and continuous engagement beyond the traditional classroom environment.

Student Workload (SWL) **الحمل الدراسي للطلاب لمدة 15 أسبوعًا**			
Structured SWL (hours/semester) **الحمل الدراسي المنتظم للطالب خلال الفصل**	33	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (hours/semester) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	17	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (hours/semester) **الحمل الدراسي الكلي للطالب خلال الفصل**	50		

Module Evaluation **تقييم الوحدة الدراسية**					
		Time/Number	**Weight (Marks)**	**Weekly Due**	**Relevant Learning Outcomes**
Assessment Methods include	**Quizzes**	4	16%	5, 10	4
	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___
	Reports	2	8%	___	2
Summative Assessments	**Midterm Examination**	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours
Total Assessment		100%			

Weekly Syllabus Delivery Plan **منهج أسبوعي لخطة التسليم**

Week	Material Covered
Week 1	Cross-Cultural Communication • Working with individuals from diverse backgrounds to promote cultural awareness and exchange.
Week 2	Vocabulary Enhancement • Expanding vocabulary to enhance clarity and expression in communication.
Week 3	Global Geography Overview • Discussing key global locations to improve geographical knowledge.
Week 4	Reading Techniques for Articles • Analyze and develop effective reading strategies for engaging with magazines.
Week 5	Tech Innovations in Communication • Exploring modern technologies in speech communication and their practical applications.
Week 6	Conference Writing Styles • Identifying suitable writing styles for presentations and academic purposes.
Week 7	Midterm Evaluation • Reviewing the material covered in the first six weeks of the course.
Week 8	Science and Society Intersections • Investigating how scientific phenomena relate to everyday life.
Week 9	Characteristics of Academic Writing • Understanding essential elements and structures of precise academic writing.
Week 10	Pollution Text Analysis • Applying reading techniques to evaluate texts about pollution, focusing on their features and implications.
Week 11	Grammar Focus—Tenses • Reviewing and practising the rules of present and past tenses in various contexts.
Week 12	IT in Scientific Contexts • Examining the scientific aspects of information technology and its impact on innovation.
Week 13	Scientific Breakthroughs • Identifying the characteristics of significant scientific and technological advancements.
Week 14	Properties of Matter • Learning about the processes and qualities defining matter conceptually and practically.
Week 15	Tourism and Travel Insights • Examining the environmental, economic, and social factors affecting global tourism.
Week 16	Final Assessment • Conducting a thorough evaluation of all course material, emphasizing memory.

Resources for Teaching and Learning

المواردالمخصصة للتدريس والتعلم		
	Resource Availability	**Library Resource Availability**
Required Texts	*Philpot, S. and Curnick, L., 2007. New headway academic skills 3 reading and writing: teacher's book. Oxford: Oxford University Press.*	Yes
Recommended Texts	The central library, science library, and departmental resources offer a comprehensive collection of essential English literature and distinctive materials.	Yes
Websites	– Specialized academic websites. – Virtual library services provide resources that are accessible from international university libraries.	

Grading Scheme **مخطط الدرجات**				
Assessment Groups and Corresponding Grades	**Grade**		**Marks (%)**	**Definition**
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
	Grade B	Very Good	80–89	Above-Average Performance with Minor Errors
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	Grade F	Fail	0–44	Substantial Improvement Needed
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Module Description Form

نموذج وصف الوحدة الدراسية

Module Information معلومات الوحدة الدراسية			
Module Title	**Graph Theory**		**Delivery Methods**
Delivery Methods	Elective Learning Activity		☑ **Theory** ☐ **Lecture** ☐ **Laboratory** ☑ **Tutorial**
Module Code	MAT21012		
ECTS Credits	4		
Total Study Workload (Hours/Semester)	100		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	1
Personnel and Administration			
Module Leader	Dr Asawer Duraid Hamdi	**College**	Science
Academic Title	Assistant Professor (PhD)	**Email**	asawer.d@sc.uobaghdad.edu.iq
Module Tutor	Dr Zaman Adel Rashid	**Email**	zaman.adel@sc.uobaghdad.edu.iq
Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules			
Prerequisite Modules	None	**Semester**	___

Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content **أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي**	
Module Objectives **أهداف الوحدة الدراسية**	**1.** Understand Graph Theory: Learn basic concepts, definitions, and theorems. **2.** Improve Problem-Solving Skills: Acquire techniques for tackling problems in graph theory and discrete mathematics. **3.** Explore Real-World Applications: Learn how graph theory is used in computer science, engineering, and the social sciences. **4.** Prepare for Advanced Studies: Build a foundation for further algorithms and network analysis studies.
Module Learning Outcomes **مخرجات التعلم للوحدة**	**1.** Identify Core Principles: Students should recognise and use key concepts and terminology, such as graphs, paths, trees, and connectivity. **2.** Apply Key Theorems: Utilise significant results like Euler's theorems, Hamiltonian paths, and graph colouring. **3.** Solve Graph Problems: Analyse and address complex graph challenges using theoretical methods. **4.** Model Real-World Scenarios: Represent practical situations as graph problems and analyse them using appropriate algorithms. **5.** Engage in Research: Participate in research activities, including formulating problems and presenting results.
Indicative Content **المحتوى الإرشادي**	**1.** Overview of Graphs: This section introduces different types of graphs, including directed, undirected, weighted, and bipartite graphs. **2.** Understanding Connectivity: Learn about connectivity, components, cut vertices, and the connectivity of directed graphs. **3.** Exploring Paths and Trees: Study paths, cycles, trees, and the conditions required for Eulerian and Hamiltonian paths. **4.** Planarity and Colouring Techniques: Investigate planar graphs, graph embeddings, and algorithms for graph colouring. **5.** Network Flow Concepts: Understand topics like the max-flow min-cut theorem and algorithms for bipartite matching. **6.** Introduction to Advanced Topics: Get acquainted with spectral graph theory and its applications.

Learning and Teaching Strategies **استراتيجيات التعلم والتدريس**	
Strategies	**7.** Lectures on Effective Time Management • Conduct structured sessions emphasising time management's critical role in academic and professional settings. These sessions will explore proven strategies for enhancing personal productivity, including task prioritisation, overcoming procrastination, and using practical time-tracking tools. **8.** Collaborative Group Work • Implement group-based assignments to strengthen teamwork, communication, and collective problem-solving abilities. By promoting peer collaboration, the program enhances understanding and cultivates a shared commitment to achieving educational objectives. **9.** Integration of Accessible Online Resources • Leverage user-friendly digital platforms and online courses to support ongoing skill development and reinforce course content. Provide access to a wide range of learning materials, ensuring flexible, independent learning and continuous engagement beyond the traditional classroom environment.

Student Workload (SWL) الحمل الدراسي للطلاب لمدة 15 أسبوعًا			
Structured SWL (hours/semester) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured Study Workload (hours/week)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (hours/semester) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured Study Workload (hours/week)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
Total SWL (hours/semester) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم الوحدة الدراسية					
		Time/Number	**Weight (Marks)**	**Weekly Due**	**Relevant Learning Outcomes**
Assessment Methods include	**Quizzes**	4	16%	5, 10	4
	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___
	Reports	2	8%	___	2
Summative Assessments	**Midterm Examination**	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours
Total Assessment		100%			

Weekly Syllabus Delivery Plan منهج أسبوعي لخطة التسليم	
Week	**Material Covered**
Week 1	Introduction to Graphs

	• Introduction to the fundamental concepts of graph theory, including order, size, and simplicity. • Differences between directed and undirected graphs.
Week 2	Understanding Adjacency and Vertex Degrees • Examples of adjacent vertices in graphs. • Importance of vertex degrees in analysis.
Week 3	Fundamental Theorems in Graph Theory • Key theorems that support advanced applications of graph theory. • Framework for upcoming topics.
Week 4	Degree Sequences and Graph Complements • The significance of degree sequences in graph analysis. • Examination of graphs and their complements, focusing on their properties.
Week 5	Advanced Graph Operations • Exploration of graph composition and advanced operations. • Real-world applications of combined graph structures.
Week 6	Paths, Connectivity, and Walks • Key definitions and theorems regarding paths in connected graphs. • Comparison between open and closed walks, with an emphasis on cycles.
Week 7	Midterm Examination • Evaluation of the material covered in Weeks 1-6.
Week 8	Isomorphism and Self-Complementary Graphs (Part I) • Introduction to the definitions and theorems of graph isomorphism. • Overview of self-complementary graphs with examples.
Week 9	Isomorphism and Self-Complementary Graphs (Part II) • In-depth examination of isomorphism in equivalent graph structures. • More examples and insights on self-complementary graphs.
Week 10	Important Graph Matrices • Overview of adjacency, path, and incidence matrices. • Discussion of their definitions, properties, and practical applications.
Week 11	Bipartite Graphs • Analysis of bipartite graphs, including definitions, theorems, and examples. • Exploration of graph completion concepts and their implications.
Week 12	Loops, Circuits, and Circuit Matrices • Clarification of definitions and theorems related to loops and circuits. • Applications to graph traversals and shortest-path problems.
Week 13	Tree Theories and Eulerian Concepts (Part I) • Examination of tree theorems and their importance. • Review of Eulerian paths, circuits, and structures.
Week 14	Tree Theories and Eulerian Concepts (Part II) • Discussion of the practical applications of tree and Eulerian theories. • Consolidation of Eulerian concepts with examples.

Week 15	Comprehensive Review • A session dedicated to integrating all topics covered in the course.
Week 16	Final Examination • A comprehensive assessment covering all course material, demonstrating a complete understanding of graph theory.

Resources for Teaching and Learning **الموارد المخصصة للتدريس والتعلم**		
	Resource Availability	**Library Resource Availability**
Required Texts	*West, D.B., 2001. Introduction to graph theory (Vol. 2). Upper Saddle River: Prentice hall.* *Harary, F., 2018. Graph theory (on Demand Printing of 02787). CRC Press.*	Yes
Recommended Texts	The central, science, and departmental libraries provide a comprehensive collection of essential scholarly texts and exclusive resources on graph theory.	Yes
Websites	– Specialised academic websites. – Virtual library services provide resources that are accessible from international university libraries.	

Grading Scheme **مخطط الدرجات**				
Assessment Groups and Corresponding Grades	**Grade**		**Marks (%)**	**Definition**
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
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Fail Group (0–49)	**Grade FX**	Fail	45–49	Additional Work Required; Credit Awarded
	Grade F	Fail	0–44	Substantial Improvement Needed

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College of Science
Department of Mathematics

Module Description Form

نموذج وصف الوحدة الدراسية

Module Information معلومات الوحدة الدراسية			
Module Title	**Linear Algebra 1**		**Delivery Methods**
Delivery Methods	Core Learning Activity		☑ **Theory** ☐ **Lecture** ☐ **Laboratory** ☑ **Tutorial**
Module Code	MAT21110		
ECTS Credits	8		
Total Study Workload (Hours/Semester)	200		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	1
Personnel and Administration			
Module Leader	Dr Hiba Abdullah Ibrahim	**College**	Science
Academic Title	Assistant Professor (PhD)	**Email**	hiba.ibrahim@sc.uobaghdad.edu.iq
Module Tutor	Dr Hiba Abdulla Ahmed	**Email**	hiba.ahmed@sc.uobaghdad.edu.iq
Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules			
Prerequisite Modules	MAT1103	Semester	1

Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content **أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي**	
Module Objectives **أهداف الوحدة الدراسية**	**1.** Fundamental Concepts: This section introduces the basics of linear algebra, including vectors, matrices, and their transformations. **2.** Practical Skills: Students should be able to solve linear equations, perform matrix operations, and calculate determinants. **3.** Theoretical Knowledge: Deepen understanding of vector spaces, linear independence, bases, and dimensions. **4.** Real-World Applications: Show how to apply linear algebra in fields such as physics, engineering, computer science, and economics.
Module Learning Outcomes **مخرجات التعلم للوحدة**	**1.** Solve Linear Systems: Using Gaussian elimination and matrix inversion methods to resolve linear equations. **2.** Understand Vector Spaces: Define key concepts, including vector spaces, subspaces, bases, dimensions, and linear independence. **3.** Perform Matrix Operations: Carry out addition, multiplication, finding inverses, and understanding their applications. **4.** Eigenvalues and Eigenvectors: Calculate these values and apply them in stability, Markov chains, and transformations. **5.** Apply Theoretical Concepts: Demonstrate how linear algebra is used in graphics, optimization, and data analysis.
Indicative Content **المحتوى الإرشادي**	**1.** Matrices and Vectors: Cover definitions, properties, types, operations, and determinants. **2.** Linear Equations: Discuss methods for solving, such as row reduction, and the nature of solutions. **3.** Vector Spaces: Define basis, dimension, null space, column space, and row space. **4.** Linear Transformations: Introduce the basics, matrix representation, and basis changes. **5.** Orthogonality: Explore projections, the Gram-Schmidt process, and the least squares method. **6.** Eigenvalues: Learn calculation techniques and the importance of diagonalization. **7.** Applications of Linear Algebra: Investigate real-life applications in network theory, algorithms, and physics.

Learning and Teaching Strategies **استراتيجيات التعلم والتدريس**	
Strategies	**10.** Lectures on Effective Time Management • Conduct structured sessions emphasizing time management's critical role in academic and professional settings. These sessions will explore proven strategies for enhancing personal productivity, including task prioritization, overcoming procrastination, and using practical time-tracking tools. **11.** Collaborative Group Work • Implement group-based assignments to strengthen teamwork, communication, and collective problem-solving abilities. By promoting peer collaboration, the program enhances understanding and cultivates a shared commitment to achieving educational objectives. **12.** Integration of Accessible Online Resources • Leverage user-friendly digital platforms and online courses to support ongoing skill development and reinforce course content. Provide access to a wide range of learning materials, ensuring flexible, independent learning and continuous engagement beyond the traditional classroom environment.

Student Workload (SWL) الحمل الدراسي للطلاب لمدة 15 أسبوعًا			
Structured SWL (hours/semester) **الحمل الدراسي المنتظم للطالب خلال الفصل**	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (hours/semester) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	137	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	9.1
Total SWL (hours/semester) **الحمل الدراسي الكلي للطالب خلال الفصل**	200		

Module Evaluation تقييم الوحدة الدراسية					
		Time/Number	**Weight (Marks)**	**Weekly Due**	**Relevant Learning Outcomes**
Assessment Methods include	**Quizzes**	4	16%	5, 10	4
	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___
	Reports	2	8%	___	2
Summative Assessments	**Midterm Examination**	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours
Total Assessment		100%			

Weekly Syllabus Delivery Plan منهج أسبوعي لخطة التسليم	
Week	**Material Covered**
Week 1	Vector Properties in 2D and 3D • Overview of vector definitions, properties, and operations in two-dimensional (2D) and three-dimensional (3D) spaces.

Week 2	Dot Products • Explanation of dot products: what they are, their properties, and their practical applications.
Week 3	Cauchy–Schwarz Inequality • Detailed look at the Cauchy–Schwarz inequality, including a proof and its uses in vector spaces.
Week 4	Cross Products • Exploration of cross products: their definitions, geometric interpretations, algebraic properties, and applications.
Week 5	Vector Space and Subspace Definitions • Introduction to vector spaces and subspaces, along with essential definitions and examples.
Week 6	Linear Combination • Explanation of linear combinations, covering definitions, relevant theorems, and examples of their applications.
Week 7	Midterm Examination • Assessment of the material covered in Weeks 1 to 6.
Week 8	Span • Review the definitions and theories concerning the span of a set of vectors.
Week 9	Linear Independence • Review of the definitions and theories related to linear independence.
Week 10	Basis • Exploration of bases in vector spaces, including definitions, theorems, and illustrative examples.
Week 11	Dimensions • Discussion on the concept of dimensions and their practical importance.
Week 12	The Rank of a Matrix • Investigating the definitions and theorems related to matrix rank enhances the understanding of established concepts.
Week 13	Row (Column) Rank • Examining definitions, theorems, and examples related to row and column spaces.
Week 14	Homogeneous Systems • Overview of homogeneous systems, including definitions, examples, and methods for finding solutions.
Week 15	Applications of Rank to AX=b • Introduction to nonhomogeneous systems, highlighting core theorems and practical examples.
Week 16	Final Examination • Comprehensive assessment of all topics covered throughout the course.

Resources for Teaching and Learning **الموارد المخصصة للتدريس والتعلم**		
	Resource Availability	**Library Resource Availability**

Required Texts	*Leon, S.J., 2014. Linear algebra with applications (Vol. 9). Upper Saddle River, NJ: Pearson.*	Yes
Recommended Texts	The central library, the science library, and the respective departments house the most critical texts and distinctive resources for studying linear algebra.	Yes
Websites	– Specialized academic websites. – Virtual library services provide resources that are accessible from international university libraries.	

Grading Scheme

مخطط الدرجات

Assessment Groups and Corresponding Grades	Grade		Marks (%)	Definition
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
	Grade B	Very Good	80–89	Above-Average Performance with Minor Errors
	Grade C	Good	70–79	Acceptable Work with Noticeable Errors
	Grade D	Satisfactory	60–69	Satisfactory – Fair Performance with Significant Shortcomings
	Grade E	Sufficient	50–59	Meets Minimum Requirements
Fail Group (0–49)	**Grade FX**	Fail	45–49	Additional Work Required; Credit Awarded
	Grade F	Fail	0–44	Substantial Improvement Needed

Important Note on Grade Rounding: In line with our commitment to fair academic assessment, all decimal grades will be rounded to the nearest whole number. For example, a grade of 54.5 will be rounded to 55, whereas 54.4 will be rounded to 54. Any modifications to the grades initially assigned by evaluators will strictly follow this automated rounding process.

Ministry of Higher Education and Scientific Research
University of Baghdad
College of Science
Department of Mathematics

Module Description Form

نموذج وصف الوحدة الدراسية

Module Information معلومات الوحدة الدراسية			
Module Title	**Probability and Statistics**		**Delivery Methods**
Delivery Methods	Core Learning Activity		☑ **Theory** ☐ **Lecture** ☐ **Laboratory** ☑ **Tutorial**
Module Code	MAT21111		
ECTS Credits	6		
Total Study Workload (Hours/Semester)	150		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	1
Personnel and Administration			
Module Leader	Dr Rehab Noori Shalan	**College**	Science
Academic Title	Assistant Professor (PhD)	**Email**	rehab.shallan@sc.uobaghdad.edu.iq
Module Tutor	Dr Alaa Waleed Salih	**Email**	alaa.w@sc.uobaghdad.edu.iq
Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules

Prerequisite Modules	MAT21111 MAT1215	**Semester**	1
Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content **أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي**	
Module Objectives **أهداف الوحدة الدراسية**	**1.** Understanding Probability: This section introduces fundamental concepts, including laws, random variables, and distributions. **2.** Developing Statistical Analysis Skills: Teach students techniques such as hypothesis testing, estimation, and regression analysis. **3.** Enhancing Problem-Solving Skills: This course strengthens the ability to apply probability and statistics to solve real-world problems. **4.** Preparing for Advanced Studies: Equip students for higher-level statistics and data analysis courses.
Module Learning Outcomes **مخرجات التعلم للوحدة**	**1.** Apply Probability Theory: Understand and use basic principles and distributions of probability. **2.** Perform Data Analysis: Use statistical methods to analyze data, including estimation and hypothesis testing. **3.** Utilize Regression Techniques: Use linear regression and correlation to examine relationships between variables. **4.** Model Random Variables: Apply discrete and continuous random variables to model various processes. **5.** Interpret Statistical Results: Assess statistical findings using analysis software.
Indicative Content **المحتوى الإرشادي**	**1.** Introduction to Probability: Learn the basic rules of probability, conditional probability, Bayes' theorem, and various distributions. **2.** Random Variables: Understand definitions, expected value, variance, moment-generating functions, and essential distributions. **3.** Sampling Distributions: Explore sampling concepts and the central limit theorem related to estimation. **4.** Estimation and Hypothesis Testing: Investigate estimation methods, hypothesis testing, types of errors, and the power of tests. **5.** Linear Regression and Correlation: Study simple linear regression, the least squares method, and correlation measures. **6.** Analysis of Variance (ANOVA): Learn techniques for comparing variances among different groups, including one-way and two-way ANOVA. **7.** Non-parametric Tests: Introduce methods for analyzing data that do not conform to normal distribution. **8.** Use of Statistical Software: Participants will participate in practical sessions to analyze data and interpret results using statistical software, such as R or SPSS.

Learning and Teaching Strategies **استراتيجيات التعلم والتدريس**	
Strategies	**13.** Lectures on Effective Time Management

	• Conduct structured sessions emphasizing time management's critical role in academic and professional settings. These sessions will explore proven strategies for enhancing personal productivity, including task prioritization, overcoming procrastination, and using practical time-tracking tools. **14.** Collaborative Group Work • Implement group-based assignments to strengthen teamwork, communication, and collective problem-solving abilities. By promoting peer collaboration, the program enhances understanding and cultivates a shared commitment to achieving educational objectives. **15.** Integration of Accessible Online Resources • Leverage user-friendly digital platforms and online courses to support ongoing skill development and reinforce course content. Provide access to a wide range of learning materials, ensuring flexible, independent learning and continuous engagement beyond the traditional classroom environment.

Student Workload (SWL) **الحمل الدراسي للطلاب لمدة 15 أسبوعًا**			
Structured SWL (hours/semester) **الحمل الدراسي المنتظم للطالب خلال الفصل**	63	**Structured Study Workload (hours/week)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	4.2
Unstructured SWL (hours/semester) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	87	**Unstructured Study Workload (hours/week)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	5.8
Total SWL (hours/semester) **الحمل الدراسي الكلي للطالب خلال الفصل**	150		

Module Evaluation **تقييم الوحدة الدراسية**					
		Time/Number	**Weight (Marks)**	**Weekly Due**	**Relevant Learning Outcomes**
Assessment Methods include	**Quizzes**	4	16%	5, 10	4
	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___
	Reports	2	8%	___	2
Summative Assessments	**Midterm Examination**	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours

Total Assessment	100%		

Weekly Syllabus Delivery Plan **منهج أسبوعي لخطة التسليم**	
Week	**Material Covered**
Week 1	Introduction to Descriptive Statistics • Discusses essential concepts related to advanced research and data analysis.
Week 2	Definitions and Theorems • Introduction to key definitions and theorems that clarify fundamental statistical ideas.
Week 3	Summation Notation • Examine the properties of summation notation and its use in finance and engineering for calculating totals and averages.
Week 4	Grouped and Ungrouped Data • Comparison of the properties and examples of grouped versus ungrouped data, including data representation techniques.
Week 5	Measures of Concentration • Overview of measures that show concentration and indicators of central tendency, which help interpret statistical distributions.
Week 6	Distribution Frequency Tables • Instructions on creating and interpreting frequency tables, highlighting their significance in analyzing concentration measures.
Week 7	Midterm Examination • An assessment covering Weeks 1-6 material to evaluate understanding of foundational concepts.
Week 8	Geometric Mean, Mode, and Median • Techniques for calculating and interpreting these statistical measures, along with practical examples for data analysis.
Week 9	Standard Deviation and Mean • Examine how to calculate and understand standard deviation and mean, illustrated with real-world examples.
Week 10	Introduction to Variance and Moments • Overview of methods used to measure variability, focusing on variance and moments.
Week 11	Advanced Approaches to Variance and Moments • In-depth exploration of variance and moments with techniques for assessing variability, supported by examples.
Week 12	Foundations of Probability Theory • Introduction to essential probability concepts, providing a framework for understanding probability spaces.
Week 13	Probability Measures and Bounds • Detailed analysis of the properties of probability measures and their implications for statistical analysis.

Week 14	Finite Sets, Conditional Probability, and Disjoint Events • Explored their relationships by investigating conditional probability and disjoint events within finite sets.
Week 15	Consolidation Week • Comprehensive review and reinforcement of course materials and essential concepts.
Week 16	Final Examination • Cumulative evaluation of the course content, demonstrating a complete understanding of statistical principles.

Resources for Teaching and Learning

الموارد المخصصة للتدريس والتعلم

	Resource Availability	Library Resource Availability
Required Texts	*Heumann, C. and Shalabh, M.S., 2016. Introduction to statistics and data analysis. Springer.*	Yes
Recommended Texts	The Central Library, the Science Library, and the department's collection offer an extensive range of essential books and specialized resources in mathematical statistics.	Yes
Websites	– Specialized academic websites. – Virtual library services provide resources that are accessible from international university libraries.	

Grading Scheme

مخطط الدرجات

Assessment Groups and Corresponding Grades	Grade		Marks (%)	Definition
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
	Grade B	Very Good	80–89	Above-Average Performance with Minor Errors
	Grade C	Good	70–79	Acceptable Work with Noticeable Errors
	Grade D	Satisfactory	60–69	Satisfactory – Fair Performance with Significant Shortcomings
	Grade E	Sufficient	50–59	Meets Minimum Requirements
Fail Group (0–49)	**Grade FX**	Fail	45–49	Additional Work Required; Credit Awarded
	Grade F	Fail	0–44	Substantial Improvement Needed

Important Note on Grade Rounding: In line with our commitment to fair academic assessment, all decimal grades will be rounded to the nearest whole number. For example, a grade of 54.5 will be rounded to 55, whereas 54.4 will be rounded to 54. Any modifications to the grades initially assigned by evaluators will strictly follow this automated rounding process.

Ministry of Higher Education and Scientific Research
University of Baghdad
College of Science
Department of Mathematics

Module Description Form

نموذج وصف الوحدة الدراسية

Module Information معلومات الوحدة الدراسية			
Module Title	**The Crimes of the Ba'ath Regime in Iraq**		**Delivery Methods**
Delivery Methods	Support or Related Learning Activity		☑ **Theory** ☐ **Lecture** ☐ **Laboratory** ☐ **Tutorial**
Module Code	UOB208		
ECTS Credits	2		
Total Study Workload (Hours/Semester)	50		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	1
Personnel and Administration			
Module Leader	Dr Anwar Ismael Khalil	**College**	Science
Academic Title	Lecturer (PhD)	**Email**	ansam.faik@sc.uobaghdad.edu.iq
Module Tutor		**Email**	

Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules			
Prerequisite Modules	None	**Semester**	___
Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content **أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي**	
Module Objectives **أهداف الوحدة الدراسية**	**1.** Understand Historical Context: Explore how the Ba'ath Regime rose to power and governed Iraq. **2.** Analyze Human Rights Violations: Examine the human rights abuses, genocides, and wars during the regime's rule. **3.** Develop Analytical Skills: Use statistics to interpret conflict and human rights data. **4.** Foster Critical Thinking: Reflect on how political decisions impact society and international relations.
Module Learning Outcomes **مخرجات التعلم للوحدة**	**1.** Detail the Ba'ath Party's History: Describe the origins, ideologies, and key figures of the Ba'ath Party. **2.** Identify and Discuss Major Crimes: Recognize significant crimes committed by the regime, such as the Anfal Campaign and the use of chemical weapons. **3.** Apply Statistical Analysis: Analyze statistics on casualties and displacements. **4.** Critically Evaluate Sources: Assess the reliability and bias of various sources concerning the regime's influence. **5.** Communicate Findings Effectively: Present findings clearly, using empirical evidence and analysis.
Indicative Content **المحتوى الإرشادي**	**1.** Historical Overview of Iraq's Ba'ath Party: Examine the political climate during the Ba'ath Party's rule. **2.** Key Events and Figures: Review essential events, including Saddam Hussein's ascent, the Iran-Iraq War, and sectarian violence. **3.** Human Rights Violations: Investigate abuses such as ethnic cleansing, torture, and executions. **4.** Data on Human Rights Violations: Familiarize yourself with data sets for analyzing conflict-related abuses. **5.** Case Studies: Investigate specific events like the Halabja attack and the Al-Anfal Campaign. **6.** Interdisciplinary Approaches: Employ statistical methods to grasp the extent of human rights violations. **7.** Ethical Considerations: Discuss the moral responsibilities of studying human rights and advocacy.

Learning and Teaching Strategies **استراتيجيات التعلم والتدريس**	
Strategies	**16.** Lectures on Effective Time Management

	• Conduct structured sessions emphasizing time management's critical role in academic and professional settings. These sessions will explore proven strategies for enhancing personal productivity, including task prioritization, overcoming procrastination, and using practical time-tracking tools. **17.** Collaborative Group Work • Implement group-based assignments to strengthen teamwork, communication, and collective problem-solving abilities. By promoting peer collaboration, the program enhances understanding and cultivates a shared commitment to achieving educational objectives. **18.** Integration of Accessible Online Resources • Leverage user-friendly digital platforms and online courses to support ongoing skill development and reinforce course content. Provide access to a wide range of learning materials, ensuring flexible, independent learning and continuous engagement beyond the traditional classroom environment.

Student Workload (SWL) **الحمل الدراسي للطلاب لمدة 15 أسبوعًا**			
Structured SWL (hours/semester) **الحمل الدراسي المنتظم للطالب خلال الفصل**	33	**Structured Study Workload (hours/week)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	2.2
Unstructured SWL (hours/semester) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	17	**Unstructured Study Workload (hours/week)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	1.3
Total SWL (hours/semester) **الحمل الدراسي الكلي للطالب خلال الفصل**	50		

Module Evaluation **تقييم الوحدة الدراسية**					
		Time/Number	**Weight (Marks)**	**Weekly Due**	**Relevant Learning Outcomes**
Assessment Methods include	**Quizzes**	4	16%	5, 10	4
	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___
	Reports	2	8%	___	2
Summative Assessments	**Midterm Examination**	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours

Total Assessment	100%		

Weekly Syllabus Delivery Plan **منهج أسبوعي نظري لخطة التسليم**	
Week	**Material Covered**
Week 1	Understanding Crime in Language • Examine how crime is defined and interpreted in language.
Week 2	Crime Through Different Disciplines • Analyze how sociology, psychology, and other fields define crime.
Week 3	Crimes Committed by the Previous Government • Investigate and classify offences associated with the former government.
Week 4	The Supreme Criminal Court's Legal Structure • Study the functions and regulations of the Supreme Criminal Court.
Week 5	Significant Rulings of the Supreme Criminal Court • Evaluate the significance of key court decisions made by the Supreme Criminal Court.
Week 6	Understanding Psychological Crimes • Investigate the types and social effects of psychological crimes.
Week 7	Midterm Evaluation Assess your grasp of the course material from the first half.
Week 8	Policies of the Baath Regime • Analyze the policies introduced by the Baath regime.
Week 9	Effects of Psychological Crimes on Society • Discuss how psychological crimes affect society.
Week 10	Defining Social Crimes • Clarify what constitutes social crimes and how they are viewed.
Week 11	The Regime's Approach to Militarization and Religion • Examine the regime's policies regarding militarization and religion.
Week 12	Violations of Domestic Laws • Investigate instances of national law breaches by the former regime.
Week 13	Violations of International Law • Explore breaches of international law by the previous government.
Week 14	Political Death Penalties • Study the issuance and consequences of death sentences for political reasons.
Week 15	Analyzing Prison Locations

	• Examine the locations and conditions of prisons during the previous regime.
Week 16	Final Examination

Resources for Teaching and Learning **الموارد المخصصة للتدريس والتعلم**		
	Resource Availability	**Library Resource Availability**
Required Texts	*Ismail, B.J. and al-Badawi, A.A.H., 2023. Conflicts in Iraq and its Accumulated Disputes:(Coups and Wars). Migration Letters, 20(S4), pp.1005-1021.*	Yes
Recommended Texts	The central library, the science library, and the relevant department are key locations for accessing vital literature and distinctive resources about crimes perpetrated by the Ba'ath regime.	Yes
Websites	– Specialized academic websites. – Virtual library services provide resources that are accessible from international university libraries.	

Grading Scheme **مخطط الدرجات**				
Assessment Groups and Corresponding Grades	**Grade**		**Marks (%)**	**Definition**
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
	Grade B	Very Good	80–89	Above-Average Performance with Minor Errors
	Grade C	Good	70–79	Acceptable Work with Noticeable Errors
	Grade D	Satisfactory	60–69	Satisfactory – Fair Performance with Significant Shortcomings
	Grade E	Sufficient	50–59	Meets Minimum Requirements
Fail Group (0–49)	**Grade FX**	Fail	45–49	Additional Work Required; Credit Awarded
	Grade F	Fail	0–44	Substantial Improvement Needed
Important Note on Grade Rounding: In line with our commitment to fair academic assessment, all decimal grades will be rounded to the nearest whole number. For example, a grade of 54.5 will be rounded to 55, whereas 54.4 will be rounded to 54. Any modifications to the grades initially assigned by evaluators will strictly follow this automated rounding process.				

Dept. Of mathematics

Level Two (UGII)

Semester Two

Ministry of Higher Education and Scientific Research
University of Baghdad
College of Science
Department of Mathematics

Module Description Form

نموذج وصف الوحدة الدراسية

Module Information معلومات الوحدة الدراسية			
Module Title	**Operation Research**		**Delivery Methods**
Delivery Methods	Core Learning Activity		☑ **Theory** ☐ **Lecture** ☐ **Laboratory** ☑ **Tutorial**
Module Code	MAT22117		
ECTS Credits	4		
Total Study Workload (Hours/Semester)	100		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	2
Personnel and Administration			
Module Leader	Dr Iraq Tareq Abbas	**College**	Science
Academic Title	Assistant Professor (PhD)	**Email**	iraqtariq73@gmail.com
Module Tutor	Dr Farah Alaa Adnan	**Email**	farah.alaa@sc.uobaghdad.edu.iq
Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules

Prerequisite Modules	MAT1103	**Semester**	1
Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content **أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي**	
Module Objectives **أهداف الوحدة الدراسية**	**1.** Introduce Operations Research Concepts: This section aims to help students understand fundamental operations research (OR) concepts essential for decision-making. **2.** Develop Analytical Skills: Provide students with the tools to model and solve optimization problems effectively. **3.** Apply OR Techniques: Students should be able to implement OR methods in logistics, finance, and healthcare. **4.** Prepare for Advanced Studies: Lay the groundwork for further studies and careers in optimization and resource management.
Module Learning Outcomes **مخرجات التعلم للوحدة**	**1.** Model Optimization Problems: Based on real-world situations, create models for linear, integer, and nonlinear programming challenges. **2.** Use OR Methodologies: Solve problems by applying linear programming, network analysis, and simulation techniques. **3.** Analyze Results: Assess the solutions obtained from operations research and understand their implications for decision-making. **4.** Employ Software Tools: For optimization tasks, use OR software like LINDO, CPLEX, and MATLAB. **5.** Communicate Solutions: Present findings to various audiences using effective visualization methods.
Indicative Content **المحتوى الإرشادي**	**1.** Introduction to Operations Research: An overview of the history, scope, and applications of OR in various industries. **2.** Linear Programming (LP): Learning to formulate problems, solve them graphically, use the simplex method, and perform sensitivity analysis. **3.** Integer Programming: Understanding binary models, branch and bound techniques, and their applications in scheduling. **4.** Network Models: This course explores the shortest path, maximum flow, minimum spanning tree, and project management. **5.** Nonlinear Programming: Techniques for optimizing convex and non-convex problems. **6.** Queueing Theory: Introduction to basic models and their applications in analyzing services. **7.** Simulation: Utilizing Monte Carlo and discrete-event simulation methods for decision-making. **8.** Decision Analysis: Tools and techniques for risk analysis and decision-making in uncertain situations.

Learning and Teaching Strategies **استراتيجيات التعلم والتدريس**	
Strategies	**19.** Lectures on Effective Time Management • Conduct structured sessions emphasizing time management's critical role in academic and professional settings. These sessions will explore proven strategies for enhancing personal productivity, including task prioritization, overcoming procrastination, and using practical time-tracking tools. **20.** Collaborative Group Work

	• Implement group-based assignments to strengthen teamwork, communication, and collective problem-solving abilities. By promoting peer collaboration, the program enhances understanding and cultivates a shared commitment to achieving educational objectives. **21.** Integration of Accessible Online Resources • Leverage user-friendly digital platforms and online courses to support ongoing skill development and reinforce course content. Provide access to a wide range of learning materials, ensuring flexible, independent learning and continuous engagement beyond the traditional classroom environment.

Student Workload (SWL) **الحمل الدراسي للطلاب لمدة 15 أسبوعًا**			
Structured SWL (hours/semester) **الحمل الدراسي المنتظم للطالب خلال الفصل**	48	**Structured Study Workload (hours/week)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	3.2
Unstructured SWL (hours/semester) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	52	**Unstructured Study Workload (hours/week)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	3.5
Total SWL (hours/semester) **الحمل الدراسي الكلي للطالب خلال الفصل**	100		

Module Evaluation **تقييم الوحدة الدراسية**					
		Time/Number	**Weight (Marks)**	**Weekly Due**	**Relevant Learning Outcomes**
Assessment Methods include	**Quizzes**	4	16%	5, 10	4
	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___
	Reports	2	8%	___	2
Summative Assessments	**Midterm Examination**	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours
Total Assessment		100%			

Weekly Syllabus Delivery Plan منهج أسبوعي لخطة التسليم	
Week	**Material Covered**
Week 1	Introduction to Operations Research and Its Applications • Learn the basic principles of operations research and its use in various industries.
Week 2	Using the Linear Programming (LP) Model • Introduce the LP model with real-world examples that illustrate its practical applications.
Week 3	Creating an LP Model • Provide a step-by-step guide for developing linear programming models supported by case studies.
Week 4	Applications of the LP Model • Discuss contexts where LP models are used, focusing on constraints and objective functions to determine optimal solutions.
Week 5	Graphical LP Solutions • Explore the graphical method for solving LP problems, highlighting situations where it is particularly beneficial.
Week 6	Solving Maximization Problems • Investigate techniques for addressing maximization challenges, including examples demonstrating the model's importance.
Week 7	Midterm Examination • Evaluate the key concepts and methods covered in Weeks 1–6.
Week 8	Significant Cases and Applications • Examine complex LP cases, discussing their strategic importance and tailored solutions.
Week 9	Slack, Surplus, and Unrestricted Variables • Explain the roles of slack, surplus, and unrestricted variables in LP formulations.
Week 10	Standard Form LPs and Practical Applications • Detail how to convert LP problems to standard form and analyze the real-world advantages of this approach.
Week 11	Finding Feasible Solutions • Use definitions and case studies to identify feasible and optimal solutions in LP.
Week 12	The Simplex Method • Please provide an overview of the simplex algorithm, demonstrating its effectiveness in solving LP problems.
Week 13	The Big M-Method • Explain the Big M-method for LP problems that involve artificial variables supported by relevant case studies.
Week 14	The Two-Phase Method • Describe the two-phase method for LP problems with artificial variables, including practical examples.
Week 15	Duality in Linear Programming

	• Explore the duality principles in LP, including theoretical insights and examples of primal-dual relationships.
Week 16	Final Examination • This final assessment evaluates the comprehensive knowledge and skills acquired throughout the course.

Resources for Teaching and Learning **الموارد المخصصة للتدريس والتعلم**		
	Resource Availability	**Library Resource Availability**
Required Texts	*Gupta, P.K. and Hira, D.S., 2022. Introduction to Operations Research. S. Chand Publishing.* *Taha, H.A. and Taha, H.A., 2003. Operations research: an introduction (Vol. 7). Upper Saddle River, NJ: Prentice hall.*	Yes
Recommended Texts	The Central Library, the Science Library, and the Department provide extensive academic books and specialized research resources to support advanced scholarly inquiry.	Yes
Websites	– Specialized academic websites. – Virtual library services provide resources that are accessible from international university libraries.	

Grading Scheme **مخطط الدرجات**				
Assessment Groups and Corresponding Grades	**Grade**		**Marks (%)**	**Definition**
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
	Grade B	Very Good	80–89	Above-Average Performance with Minor Errors
	Grade C	Good	70–79	Acceptable Work with Noticeable Errors
	Grade D	Satisfactory	60–69	Satisfactory – Fair Performance with Significant Shortcomings
	Grade E	Sufficient	50–59	Meets Minimum Requirements
Fail Group (0–49)	**Grade FX**	Fail	45–49	Additional Work Required; Credit Awarded
	Grade F	Fail	0–44	Substantial Improvement Needed

Important Note on Grade Rounding: In line with our commitment to fair academic assessment, all decimal grades will be rounded to the nearest whole number. For example, a grade of 54.5 will be rounded to 55, whereas 54.4 will be rounded to 54. Any modifications to the grades initially assigned by evaluators will strictly follow this automated rounding process.

Ministry of Higher Education and Scientific Research
University of Baghdad
College of Science
Department of Mathematics

Module Description Form

نموذج وصف الوحدة الدراسية

Module Information معلومات الوحدة الدراسية			
Module Title	**Number theory**		**Delivery Methods**
Delivery Methods	Core Learning Activity		☑ **Theory** ☐ **Lecture** ☐ **Laboratory** ☑ **Tutorial**
Module Code	MAT22018		
ECTS Credits	3		
Total Study Workload (Hours/Semester)	75		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	2
Personnel and Administration			
Module Leader	Dr Asawer Duraid Hamdi	**College**	Science
Academic Title	Assistant Professor (PhD)	**Email**	asawer.d@sc.uobaghdad.edu.iq
Module Tutor	Dr Seemaa Abdulsattar Mohammed	**Email**	Seemaa.a@sc.uobaghdad.edu.iq

Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules			
Prerequisite Modules	None	**Semester**	___
Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content **أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي**	
Module Objectives **أهداف الوحدة الدراسية**	**1.** Understand Number Theory: Learn key concepts and theorems in number theory and their significance. **2.** Improve Analytical Skills: Develop critical thinking about numbers, focusing on divisibility and prime numbers. **3.** Apply Concepts: Utilize number theory in cryptography and computer science fields. **4.** Prepare for Advanced Studies: Build a foundation for future studies in pure mathematics and its applications.
Module Learning Outcomes **مخرجات التعلم للوحدة**	**1.** Understand Integer Properties: Grasp the basics of divisibility, prime numbers, and the Euclidean algorithm. **2.** Solve Congruences: Tackle and apply linear and polynomial congruences in coding theory. **3.** Use Key Theorems: Implement essential theorems like Fermat's and Euler's in real-world scenarios. **4.** Know Cryptographic Applications: Recognize how number theory underpins modern systems like RSA. **5.** Conduct Proofs: Formulate and prove conjectures related to number theory.
Indicative Content **المحتوى الإرشادي**	**1.** Divisibility and Primes: Fundamentals of divisibility, properties of primes, and techniques for identifying prime numbers. **2.** Congruences: An introduction to congruences and their use in checksums. **3.** Number Theoretic Functions: Overview of functions like the Euler phi function and their importance. **4.** Diophantine Equations: Methods for solving equations that involve integers. **5.** Quadratic Residues: Examination of quadratic residues and the Law of Quadratic Reciprocity. **6.** Continued Fractions: Using continued fractions to solve Pell's equations. **7.** Cryptography: Investigation of number theory applications in public key systems such as RSA. **8.** Advanced Topics: A brief introduction to algebraic number theory and p-adic numbers for interested learners.

Learning and Teaching Strategies **استراتيجيات التعلم والتدريس**	
Strategies	**22.** Lectures on Effective Time Management

	• Conduct structured sessions emphasizing time management's critical role in academic and professional settings. These sessions will explore proven strategies for enhancing personal productivity, including task prioritization, overcoming procrastination, and using practical time-tracking tools. **23.** Collaborative Group Work • Implement group-based assignments to strengthen teamwork, communication, and collective problem-solving abilities. By promoting peer collaboration, the program enhances understanding and cultivates a shared commitment to achieving educational objectives. **24.** Integration of Accessible Online Resources • Leverage user-friendly digital platforms and online courses to support ongoing skill development and reinforce course content. Provide access to a wide range of learning materials, ensuring flexible, independent learning and continuous engagement beyond the traditional classroom environment.

Student Workload (SWL) **الحمل الدراسي للطلاب لمدة 15 أسبوعًا**			
Structured SWL (hours/semester) **الحمل الدراسي المنتظم للطالب خلال الفصل**	33	**Structured Study Workload (hours/week)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	2.2
Unstructured SWL (hours/semester) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	42	**Unstructured Study Workload (hours/week)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	2.8
Total SWL (hours/semester) **الحمل الدراسي الكلي للطالب خلال الفصل**	75		

Module Evaluation **تقييم الوحدة الدراسية**					
		Time/Number	**Weight (Marks)**	**Weekly Due**	**Relevant Learning Outcomes**
Assessment Methods include	**Quizzes**	4	16%	5, 10	4
	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___
	Reports	2	8%	___	2
Summative Assessments	**Midterm Examination**	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours

Total Assessment	100%		

Weekly Syllabus Delivery Plan **منهج أسبوعي لخطة التسليم**	
Week	**Material Covered**
Week 1	Integer Numbers and Ordering Principles • Define the properties of integers, emphasizing the differences between partially and well-ordered sets.
Week 2	Mathematical Induction • Explore the basics of mathematical induction, highlighting key theorems and examples and focusing on the second principle.
Week 3	Bessel Rule and Binomial Theorem • Investigate the Bessel Rule and the Binomial Theorem, assessing their applications in engineering, physics, and computer science.
Week 4	Division Algorithm and Fibonacci Numbers • Examine the division algorithm and least common multiples (LCMs) and discuss the importance of Fibonacci numbers in nature and technology.
Week 5	Euclidean Algorithm • Clarify the Euclidean Algorithm by providing theoretical insights, examples, and its relevance to problem-solving.
Week 6	Back-Substitution and “Blank Shipping” Techniques • Review the back-substitution and “Blank Shipping” methods as systematic approaches to problem-solving.
Week 7	Midterm Examination • Take an assessment covering Weeks 1 to 6 material to strengthen your understanding and analytical skills.
Week 8	Diophantine Equations • Introduce techniques for solving Diophantine equations through brute force, modular arithmetic, and continued fractions.
Week 9	Fundamental Theory of Arithmetic • Review arithmetic properties and how they apply in diverse problem-solving situations.
Week 10	Eratosthenes’ Lemma and Euclid’s Prime Theory • Study the principles of prime numbers through Eratosthenes’ Lemma and the work of Euclid.
Week 11	Fermat’s Method • Present Fermat’s method and its significance in number theory and prime number proofs.
Week 12	Congruences • Part I: Introduce congruence theory by examining congruent numbers and the fundamental theorems that underpin the subject.
Week 13	• Part II: Delve into Euler’s theorem within congruence relationships, elaborating on its proofs and applications.

Week 14	• Part III: Explore Fermat's theorem and discuss its significance in the broader landscape of number theory.
Week 15	• Part IV: Analyze the Chinese Remainder Theorem as a capstone to the series on congruences, emphasizing effective strategies for solving simultaneous congruences.
Week 16	Final Examination • Administer a thorough assessment of all course materials, requiring a comprehensive understanding of graph theory concepts and their applications.

Resources for Teaching and Learning **الموارد المخصصة للتدريس والتعلم**		
	Resource Availability	**Library Resource Availability**
Required Texts	*Tattersall, J.J., 1999. Elementary number theory in nine chapters. Cambridge University Press.* *Hua, L.K., 2012. Introduction to number theory. Springer Science & Business Media.*	Yes
Recommended Texts	The Central Library, the Science Library, and the departmental repository maintain extensive collections of foundational texts and specialized academic resources in the field of number theory.	Yes
Websites	– Specialized academic websites. – Virtual library services provide resources that are accessible from international university libraries.	

Grading Scheme **مخطط الدرجات**				
Assessment Groups and Corresponding Grades	**Grade**		**Marks (%)**	**Definition**
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
	Grade B	Very Good	80–89	Above-Average Performance with Minor Errors
	Grade C	Good	70–79	Acceptable Work with Noticeable Errors
	Grade D	Satisfactory	60–69	Satisfactory – Fair Performance with Significant Shortcomings
	Grade E	Sufficient	50–59	Meets Minimum Requirements
Fail Group (0–49)	**Grade FX**	Fail	45–49	Additional Work Required; Credit Awarded

	Grade F	Fail	0–44	Substantial Improvement Needed

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Module Description Form

نموذج وصف الوحدة الدراسية

Module Information **معلومات الوحدة الدراسية**			
Module Title	Methods of Solution for Ordinary Differential Equation		**Delivery Methods**
Delivery Methods	Core Learning Activity		☑ **Theory** ☐ **Lecture** ☐ **Laboratory** ☑ **Tutorial**
Module Code	MAT22115		
ECTS Credits	6		
Total Study Workload (Hours/Semester)	150		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	2
Personnel and Administration			
Module Leader	Dr Liqaa Jameel Khaleel	**College**	Science
Academic Title	Lecturer (PhD)	**Email**	liqaa.khaled@sc.uobaghdad.edu.iq

Module Tutor	Dr Alaa Waleed Salih	**Email**	alaa.w@sc.uobaghdad.edu.iq
Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules			
Prerequisite Modules	MAT1215	**Semester**	2
Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content **أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي**	
Module Objectives **أهداف الوحدة الدراسية**	**1.** Understand ODEs: Help students learn about the types, orders, and importance of ordinary differential equations (ODEs). **2.** Develop Solution Skills: Teach analytical and numerical methods for solving linear and nonlinear ODEs. **3.** Apply Methods: Encourage applying theoretical approaches to solve real-world problems in different fields. **4.** Enhance Problem-Solving: Strengthen problem-solving skills through practice and project applications.
Module Learning Outcomes **مخرجات التعلم للوحدة**	**1.** Classify First-Order ODEs: Identify and solve first-order ODEs, including separable and exact ones. **2.** Solve Higher-Order Linear ODEs: To solve higher-order linear ODEs, use techniques such as characteristic equations and undetermined coefficients. **3.** Use Numerical Methods: Apply methods such as Euler's to solve ODEs without theoretical solutions. **4.** Model with ODEs: Use ODEs to model various phenomena and analyze these models to make predictions. **5.** Communication Solutions: Present results using appropriate mathematical terminology and visual tools.
Indicative Content **المحتوى الإرشادي**	**1.** Introduction to ODEs: An overview of definitions, classifications, orders, and their importance in science. **2.** First-Order ODEs: Study methods for solving first-order ODEs, including separable and homogeneous equations. **3.** Linear ODEs: Learn about second and higher-order linear ODEs and methods involving characteristic roots. **4.** Series Solutions: Investigate power series and special functions as solutions to differential equations. **5.** Laplace Transforms: Utilize Laplace transforms to solve linear ODEs and incredibly initial value problems. **6.** Numerical Methods: Introduce techniques like Euler's and Runge-Kutta methods for solving ODEs. **7.** Applications: Examine real-world uses of ODEs in areas such as population modelling and electrical circuits.

	8. Advanced Topics: Brief discussion on nonlinear ODEs, stability analysis, and phase plane analysis.

Learning and Teaching Strategies **استراتيجيات التعلم والتدريس**	
Strategies	**25.** Lectures on Effective Time Management • Conduct structured sessions emphasizing time management's critical role in academic and professional settings. These sessions will explore proven strategies for enhancing personal productivity, including task prioritization, overcoming procrastination, and using practical time-tracking tools. **26.** Collaborative Group Work • Implement group-based assignments to strengthen teamwork, communication, and collective problem-solving abilities. By promoting peer collaboration, the program enhances understanding and cultivates a shared commitment to achieving educational objectives. **27.** Integration of Accessible Online Resources • Leverage user-friendly digital platforms and online courses to support ongoing skill development and reinforce course content. Provide access to a wide range of learning materials, ensuring flexible, independent learning and continuous engagement beyond the traditional classroom environment.

Student Workload (SWL) **الحمل الدراسي للطلاب لمدة 15 أسبوعًا**			
Structured SWL (hours/semester) **الحمل الدراسي المنتظم للطالب خلال الفصل**	63	**Structured Study Workload (hours/week)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	4.2
Unstructured SWL (hours/semester) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	87	**Unstructured Study Workload (hours/week)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	5.8
Total SWL (hours/semester) **الحمل الدراسي الكلي للطالب خلال الفصل**	150		

Module Evaluation **تقييم الوحدة الدراسية**					
		Time/Number	**Weight (Marks)**	**Weekly Due**	**Relevant Learning Outcomes**
Assessment Methods include	**Quizzes**	4	16%	5, 10	4
	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___

	Reports	2	8%	___	2
Summative Assessments	**Midterm Examination**	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours
Total Assessment		100%			

Weekly Syllabus Delivery Plan **منهج أسبوعي لخطة التسليم**	
Week	**Material Covered**
Week 1	Introduction to First-Order Differential Equations • Part I: Linear Equations
Week 2	• Part II: Separable Equations
Week 3	• Part III: Exact Differential Equations and Integration Methods
Week 4	• Part IV: Integrating Factors for Solving First-Order Equations
Week 5	• Part V: Homogeneous Equations
Week 6	Practical Applications of First-Order Differential Equations • Detailed Examples Showcasing Various Types of First-Order Differential Equations
Week 7	Midterm Examination • Thorough Assessment of Material Covered in Weeks 1–6
Week 8	Reduction of Order • Deriving First-Order Equations from Second-Order Equations Using Reduction of Order
Week 9	Higher-Order Linear Systems with Constant Coefficients • Overview of Characteristics and Solution Approaches for Higher-Order Linear Equations with Constant Coefficients
Week 10	Advanced Examples of Higher-Order Linear Equations • Part I: Applications in Complex, Real-World Situations
Week 11	• Part II: Method of Undetermined Coefficients
Week 12	• Part III: Variation of Parameters
Week 13	Series Solutions of Second-Order Linear Equations • Part I: Building Series Solutions Near Ordinary Points
Week 14	• Part II: Analyzing and Addressing Regular Singular Points

Week 15	Comprehensive Challenges and Examples • Reinforcing Series Solution Techniques for Second-Order Linear Equations
Week 16	Final Examination • A Comprehensive Assessment Designed to Evaluate the Knowledge and Skills Gained Throughout the Course

Resources for Teaching and Learning **الموارد المخصصة للتدريس والتعلم**		
	Resource Availability	**Library Resource Availability**
Required Texts	*Alexander, R., 1990. Solving ordinary differential equations i: No stiff problems (e. hairer, sp norsett, and g. Wanner). Siam Review, 32(3), p.485.* *Zill, D.G., 1993. A first course in differential equations (pp. 310-311). Bostonn MA: PWS-Kent.*	Yes
Recommended Texts	The Central Library, the Science Library, and the departmental repository offer indispensable collections and specialized resources that facilitate the analysis and resolution of ordinary differential equations.	Yes
Websites	– Specialized academic websites. – Virtual library services provide resources that are accessible from international university libraries.	

Grading Scheme **مخطط الدرجات**				
Assessment Groups and Corresponding Grades	**Grade**		**Marks (%)**	**Definition**
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
	Grade B	Very Good	80–89	Above-Average Performance with Minor Errors
	Grade C	Good	70–79	Acceptable Work with Noticeable Errors
	Grade D	Satisfactory	60–69	Satisfactory – Fair Performance with Significant Shortcomings

	Grade E	Sufficient	50–59	Meets Minimum Requirements
Fail Group (0–49)	**Grade FX**	Fail	45–49	Additional Work Required; Credit Awarded
	Grade F	Fail	0–44	Substantial Improvement Needed

Important Note on Grade Rounding: In line with our commitment to fair academic assessment, all decimal grades will be rounded to the nearest whole number. For example, a grade of 54.5 will be rounded to 55, whereas 54.4 will be rounded to 54. Any modifications to the grades initially assigned by evaluators will strictly follow this automated rounding process.

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Module Description Form

نموذج وصف الوحدة الدراسية

Module Information **معلومات الوحدة الدراسية**			
Module Title	Mathematical Statistics 1		**Delivery Methods**
Delivery Methods	Core Learning Activities		☑ **Theory** ☐ **Lecture** ☐ **Laboratory** ☑ **Tutorial**
Module Code	MAT22116		
ECTS Credits	4		
Total Study Workload (Hours/Semester)	100		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	2
Personnel and Administration			

Module Leader	Dr Rehab Noori Shalan	**College**	Science
Academic Title	Assistant Professor (PhD)	**Email**	rehab.shallan@sc.uobaghdad.edu.iq
Module Tutor	Dr Rana Adnan Mohammed	**Email**	rana.a@sc.uobaghdad.edu.iq
Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules			
Prerequisite Modules	MAT21111 MAT1215	**Semester**	1
Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content **أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي**	
Module Objectives **أهداف الوحدة الدراسية**	1. Introduce Probability Theory: Teach students the key probability theory concepts for statistical analysis. 2. Develop an Understanding of Theoretical Statistics: Ensure students thoroughly comprehend statistical inference, estimation, and hypothesis testing. 3. Enhance Quantitative Reasoning: Improve students' problem-solving skills by applying statistical methods. 4. Prepare for Advanced Studies: Build a strong foundation for students who want to explore more complex statistical theories and techniques.
Module Learning Outcomes **مخرجات التعلم للوحدة**	1. Understand and Apply Probability Concepts: Define and apply basic probability rules, random variables, and distributions effectively. 2. Conduct Statistical Inference: Execute point and interval estimations and perform hypothesis tests accurately. 3. Model with Random Variables: Use discrete and continuous random variables to model real-world situations. 4. Use Probability Distributions: Apply major probability distributions (including standard, binomial, Poisson, and exponential) in different contexts. 5. Interpret Statistical Results: Analyze and interpret what statistical findings mean in real-life applications.
Indicative Content **المحتوى الإرشادي**	1. Probability Foundations: Understand the essential principles, combinatorial analysis, axioms, conditional probability, and Bayes' theorem. 2. Random Variables and Distributions: Learn about discrete and continuous random variables, their standard distributions, and their applications. 3. Expectation and Variance: Calculate and understand the expectation, variance, moments, and moment-generating functions. 4. Joint Distributions: Study marginal and conditional distributions, as well as concepts of covariance, correlation, and independence.

	5. Limit Theorems: Explore the central limit theorem, the laws of large numbers, and their statistical applications. **6.** Statistical Inference: Gain knowledge of point estimation, confidence intervals, and the processes involved in hypothesis testing. **7.** Applications in Data Analysis: Work on real case studies using statistical software to reinforce the concepts taught.

Learning and Teaching Strategies **استراتيجيات التعلم والتدريس**	
Strategies	**28.** Lectures on Effective Time Management • Conduct structured sessions emphasizing time management's critical role in academic and professional settings. These sessions will explore proven strategies for enhancing personal productivity, including task prioritization, overcoming procrastination, and using practical time-tracking tools. **29.** Collaborative Group Work • Implement group-based assignments to strengthen teamwork, communication, and collective problem-solving abilities. By promoting peer collaboration, the program enhances understanding and cultivates a shared commitment to achieving educational objectives. **30.** Integration of Accessible Online Resources • Leverage user-friendly digital platforms and online courses to support ongoing skill development and reinforce course content. Provide access to a wide range of learning materials, ensuring flexible, independent learning and continuous engagement beyond the traditional classroom environment.

Student Workload (SWL) **الحمل الدراسي للطلاب لمدة 15 أسبوعًا**			
Structured SWL (hours/semester) **الحمل الدراسي المنتظم للطالب خلال الفصل**	48	**Structured Study Workload (hours/week)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	3.2
Unstructured SWL (hours/semester) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	52	**Unstructured Study Workload (hours/week)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	3.5
Total SWL (hours/semester) **الحمل الدراسي الكلي للطالب خلال الفصل**	100		

Module Evaluation **تقييم الوحدة الدراسية**					
		Time/Number	**Weight (Marks)**	**Weekly Due**	**Relevant Learning Outcomes**
Assessment Methods include	**Quizzes**	4	16%	5, 10	4

	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___
	Reports	2	8%	___	2
Summative Assessments	**Midterm Examination**	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours
Total Assessment		100%			

Weekly Syllabus Delivery Plan **منهج أسبوعي لخطة التسليم**	
Week	**Material Covered**
Week 1	Probability Distributions and Random Variables • Provide an overview of the basic principles, key theorems, and definitions related to probability distributions and random variables, along with examples.
Week 2	Cumulative Distribution Function (Part I) • Introduction to the cumulative distribution function (CDF) for discrete and continuous variables, emphasizing its properties and applications.
Week 3	Cumulative Distribution Function (Part II) • Continued exploration of CDF properties, examining advanced theoretical elements for both types of distributions, supplemented by examples and exercises.
Week 4	Mathematical Expectations and Moments • Discussion on the relationship between distribution functions and probability density functions. Introduction to moments and their practical applications.
Week 5	Mathematical Expectations • In-depth study of expected values, variances, and moments, with definitions and examples to highlight their significance.
Week 6	Advanced Analysis of Distribution Functions • Examine how distribution functions are related to median moments and their connections to characteristic functions.
Week 7	Midterm Examination and Review • The midterm exam assesses understanding and skills, followed by a review session to reinforce knowledge.
Week 8	Discrete Distributions (Part I) • Analysis of critical discrete distributions, such as Uniform and Binomial, covering their essential characteristics.
Week 9	Discrete Distributions (Part II)

	• Detailed investigation of additional discrete distributions, including Negative Binomial and Poisson, focusing on applications and problem-solving.
Week 10	Continuous Distributions • Study of moments for standard continuous distributions, including practical examples such as uniform distribution.
Week 11	Gamma Function and Its Distribution • Exploration of the Gamma function, its significance in continuous distribution theory, and the properties of the Gamma distribution.
Week 12	Integration of Density Functions and Marginal Distributions • Study the integration of probability density functions and the importance of marginal distributions in statistical analysis.
Week 13	Real-World Applications • Apply theoretical concepts through case studies and examples to ensure engagement with core ideas.
Week 14	Conditional Distributions, Covariance, and Correlation • Examining conditional distributions and their role in calculating covariance and correlation between random variables, helping to understand their relationships.
Week 15	Final Review and Examination Preparation • Comprehensive review of all course materials and guided sessions to prepare for the final exam.
Week 16	Final Examination • A summative assessment evaluates knowledge and skills acquired throughout the course, concluding with feedback and guidance for future study or application.

Resources for Teaching and Learning **الموارد المخصصة للتدريس والتعلم**		
	Resource Availability	**Library Resource Availability**
Required Texts	*Heumann, C. and Shalabh, M.S., 2016. Introduction to statistics and data analysis. Springer.*	Yes
Recommended Texts	The Central Library, the Science Library, and the department's collection offer an extensive range of essential books and specialized resources in mathematical statistics.	Yes
Websites	– Specialized academic websites. – Virtual library services provide resources that are accessible from international university libraries.	

Grading Scheme **مخطط الدرجات**

Assessment Groups and Corresponding Grades	Grade		Marks (%)	Definition
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
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Fail Group (0–49)	**Grade FX**	Fail	45–49	Additional Work Required; Credit Awarded
	Grade F	Fail	0–44	Substantial Improvement Needed

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Ministry of Higher Education and Scientific Research
University of Baghdad
College of Science
Department of Mathematics

Module Description Form

نموذج وصف الوحدة الدراسية

Module Information **معلومات الوحدة الدراسية**			
Module Title	**Linear Algebra 2**		**Delivery Methods**
Delivery Methods	Elective Learning Activity		☑ **Theory** ☐ **Lecture** ☐ **Laboratory** ☑ **Tutorial**
Module Code	MAT22114		
ECTS Credits	8		
Total Study Workload (Hours/Semester)	200		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	2
Personnel and Administration			
Module Leader	Dr Hiba Abdullah Ibrahim	**College**	Science
Academic Title	Assistant Professor (PhD)	**Email**	hiba.ibrahim@sc.uobaghdad.edu.iq
Module Tutor	Dr Hiba Abdulla Ahmed	**Email**	hiba.ahmed@sc.uobaghdad.edu.iq
Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules			
Prerequisite Modules	MAT21110	**Semester**	1

Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content **أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي**	
Module Objectives **أهداف الوحدة الدراسية**	**1.** Enhance Theoretical Knowledge: Build on the concepts from Linear Algebra 1 to explore more advanced and theoretical ideas. **2.** Improve Computational Abilities: Develop skills for handling complex matrices and vector spaces. **3.** Examine Advanced Applications: Use linear algebra in data science, quantum mechanics, and optimization. **4.** Career Preparation: Equip students for research roles and careers in industries that rely on analyzing high-dimensional data.
Module Learning Outcomes **مخرجات التعلم للوحدة**	**1.** Comprehend Advanced Topics: Understand and apply concepts like Jordan forms and spectral decomposition. **2.** Connect Abstract Algebra and Linear Concepts: Apply techniques from abstract algebra in linear algebra contexts. **3.** Solve Complex Eigenproblems: Determine eigenvalues and eigenvectors for complex matrices and use them in dynamical systems. **4.** Conduct Mathematical Proofs: Formulate and prove theorems in linear algebra, showing a deep understanding of the material. **5.** Apply Linear Algebra in Other Areas: Use linear algebra techniques in cryptography and machine learning.
Indicative Content **المحتوى الإرشادي**	**1.** Matrix Theory: Study matrix functions, generalized inverses, and perturbation theory. **2.** Spectral Theory: Explore spectral and singular value decompositions and their practical uses. **3.** Jordan Form: Learn techniques for finding Jordan forms and their application in solving differential equations. **4.** Inner Product Spaces: Investigate concepts of orthogonality and their applications in Fourier analysis. **5.** Quadratic Forms: Examine quadratic forms and related optimization problems. **6.** Applications of Abstract Algebra: Study field extensions and how they relate to linear algebra. **7.** Real-World Applications: Focus on computational techniques relevant across fields such as physics and economics.

Learning and Teaching Strategies **استراتيجيات التعلم والتدريس**	
Strategies	**31.** Lectures on Effective Time Management • Conduct structured sessions emphasizing time management's critical role in academic and professional settings. These sessions will explore proven strategies for enhancing personal productivity, including task prioritization, overcoming procrastination, and using practical time-tracking tools. **32.** Collaborative Group Work • Implement group-based assignments to strengthen teamwork, communication, and collective problem-solving abilities. By promoting peer collaboration, the program enhances understanding and cultivates a shared commitment to achieving educational objectives. **33.** Integration of Accessible Online Resources • Leverage user-friendly digital platforms and online courses to support ongoing skill development and reinforce course content. Provide access to a wide range of learning materials, ensuring flexible, independent learning and continuous engagement beyond the traditional classroom environment.

Student Workload (SWL) الحمل الدراسي للطلاب لمدة 15 أسبوعًا			
Structured SWL (hours/semester) **الحمل الدراسي المنتظم للطالب خلال الفصل**	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (hours/semester) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	137	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	9.1
Total SWL (hours/semester) **الحمل الدراسي الكلي للطالب خلال الفصل**	200		

Module Evaluation تقييم الوحدة الدراسية					
		Time/Number	**Weight (Marks)**	**Weekly Due**	**Relevant Learning Outcomes**
Assessment Methods include	**Quizzes**	4	16%	5, 10	4
	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___
	Reports	2	8%	___	2
Summative Assessments	**Midterm Examination**	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours
Total Assessment		100%			

Weekly Syllabus Delivery Plan منهج أسبوعي لخطة التسليم	
Week	**Material Covered**
Week 1	Linear Transformation

	• This section provides a clear overview of linear transformations, including their definitions, practical examples, and their significance in vector spaces.
Week 2	Kernel of a Linear Transformation • This part explores the kernel of a linear transformation, detailing its definition, properties, and applications.
Week 3	Range of Linear Transformation • Here, we examine the range of linear transformations, covering definitions, properties, and practical applications.
Week 4	Matrix of a Linear Transformation • An overview of the matrix representation of a linear transformation, with definitions and examples to illustrate the concept.
Week 5	Orthogonality and Orthonormality • An introduction to orthogonality, orthonormal bases, definitions, and key theorems.
Week 6	Gram-Schmidt Process • A detailed analysis of the Gram-Schmidt Process, featuring a formal statement and examples of its application.
Week 7	Midterm Examination • This evaluation covers Weeks 1–6 material to assess students' understanding and progress.
Week 8	Introduction to Eigenvalues and Eigenvectors
Week 9	Characteristic Polynomial • An exploration of the characteristic polynomial, combining theoretical insights with practical applications.
Week 10	Similar Matrices • This section discusses matrix similarity, with examples illustrating its importance in linear algebra.
Week 11	Diagonalization (part I) • An introduction to matrix diagonalization, featuring basic examples and foundational theory.
Week 12	Diagonalization (part II) • Further exploration of diagonalization theorems, enhanced with practical examples.
Week 13	Diagonalizing Symmetric Matrices • A presentation on the definitions and properties related to the diagonalization of symmetric matrices.
Week 14	Lines and Planes • An overview of lines and planes in R^2 and R^3, emphasizing definitions and illustrative examples.
Week 15	Quadratic Forms • A summary of quadratic forms, highlighting key definitions and examples.
Week 16	Final Examination • A comprehensive assessment covering all the topics discussed throughout the course.

Resources for Teaching and Learning

الموارد المخصصة للتدريس والتعلم

	Resource Availability	Library Resource Availability
Required Texts	*Leon, S.J., 2014. Linear algebra with applications (Vol. 9). Upper Saddle River, NJ: Pearson.*	Yes
Recommended Texts	The central library, the science library, and the respective departments house the most critical texts and distinctive resources for studying linear algebra.	Yes
Websites	– Specialized academic websites. – Virtual library services provide resources that are accessible from international university libraries.	

Grading Scheme

مخطط الدرجات

Assessment Groups and Corresponding Grades	Grade		Marks (%)	Definition
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
	Grade B	Very Good	80–89	Above-Average Performance with Minor Errors
	Grade C	Good	70–79	Acceptable Work with Noticeable Errors
	Grade D	Satisfactory	60–69	Satisfactory – Fair Performance with Significant Shortcomings
	Grade E	Sufficient	50–59	Meets Minimum Requirements
Fail Group (0–49)	**Grade FX**	Fail	45–49	Additional Work Required; Credit Awarded
	Grade F	Fail	0–44	Substantial Improvement Needed

Important Note on Grade Rounding: In line with our commitment to fair academic assessment, all decimal grades will be rounded to the nearest whole number. For example, a grade of 54.5 will be rounded to 55, whereas 54.4 will be rounded to 54. Any modifications to the grades initially assigned by evaluators will strictly follow this automated rounding process.

Ministry of Higher Education and Scientific Research
University of Baghdad
College of Science
Department of Mathematics

Module Description Form

نموذج وصف الوحدة الدراسية

Module Information معلومات الوحدة الدراسية			
Module Title	**Computer Skills 2**		**Delivery Methods**
Delivery Methods	Basic Learning Activities		☑ **Theory** ☐ **Lecture** ☑ **Laboratory** ☐ **Tutorial**
Module Code	UOB207		
ECTS Credits	3		
Total Study Workload (Hours/Semester)	75		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	2
Personnel and Administration			
Module Leader	Dr Saad Mohammed Ali	**College**	Science
Academic Title	Assistant Professor (PhD)	**Email**	saad.m@sc.uobaghdad.edu.iq
Module Tutor		**Email**	
Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules			
Prerequisite Modules	UOB103	**Semester**	1

Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content **أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي**	
Module Objectives **أهداف الوحدة الدراسية**	**1.** Enhance Programming Skills: Improve programming skills in languages used for mathematical computations. **2.** Integrate Software Tools: Teach students to use specialized software to model and solve mathematical problems effectively. **3.** Foster Computational Thinking: Develop algorithmic thinking and apply computational methods to complex math challenges. **4.** Prepare for Research and Industry: Equip students with the computational skills needed for roles in research and industry.
Module Learning Outcomes **مخرجات التعلم للوحدة**	**1.** Master Advanced Programming Concepts: Demonstrate proficiency in advanced programming techniques using Python, C++, MATLAB, or R. **2.** Utilize Mathematical Software: Effectively use MATLAB, Mathematica, and C++ for simulations, visualizations, and data analysis. **3.** Develop and Analyze Algorithms: Create, implement, and evaluate algorithms for various mathematical problems. **4.** Collaborate on Software Projects: Work collaboratively on software development projects using tools for version control and integrated development environments (IDEs). **5.** Apply Skills to Real-World Problems: Use computational methods to address real-world issues, bridging the gap between theory and practical application.
Indicative Content **المحتوى الإرشادي**	**1.** Advanced Programming Techniques: This course covers object-oriented programming, data structures, recursion, and threading, focused on mathematical tasks. **2.** Mathematical Software Proficiency: Intensive training in Mathematica, MATLAB, C++ and other tools for diverse mathematical applications. **3.** Algorithm Development: Examination of algorithms' efficiency and complexity in mathematical contexts. **4.** Scientific Computing: Introduction to numerical methods for solving differential equations and optimization problems. **5.** Data Analysis and Visualization: Skills for data management, statistical analysis, and visualization using advanced tools. **6.** Project Management in Software Development: Emphasis on version control (e.g., Git), debugging, testing, and documentation practices. **7.** Applications in Research and Industry: Case studies showcasing computational skills applied in research, finance, and technology.

Learning and Teaching Strategies **استراتيجيات التعلم والتدريس**	
Strategies	**34.** Lectures on Effective Time Management • Conduct structured sessions emphasizing time management's critical role in academic and professional settings. These sessions will explore proven strategies for enhancing personal productivity, including task prioritization, overcoming procrastination, and using practical time-tracking tools. **35.** Collaborative Group Work

	• Implement group-based assignments to strengthen teamwork, communication, and collective problem-solving abilities. By promoting peer collaboration, the program enhances understanding and cultivates a shared commitment to achieving educational objectives. **36.** Integration of Accessible Online Resources • Leverage user-friendly digital platforms and online courses to support ongoing skill development and reinforce course content. Provide access to a wide range of learning materials, ensuring flexible, independent learning and continuous engagement beyond the traditional classroom environment.

Student Workload (SWL) **الحمل الدراسي للطلاب لمدة 15 أسبوعًا**			
Structured SWL (hours/semester) **الحمل الدراسي المنتظم للطالب خلال الفصل**	49	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (hours/semester) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	26	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.7
Total SWL (hours/semester) **الحمل الدراسي الكلي للطالب خلال الفصل**	75		

Module Evaluation **تقييم الوحدة الدراسية**					
		Time/Number	**Weight (Marks)**	**Weekly Due**	**Relevant Learning Outcomes**
Assessment Methods include	**Quizzes**	4	16%	5, 10	4
	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___
	Reports	2	8%	___	2
Summative Assessments	**Midterm Examination**	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours
Total Assessment		100%			

Weekly Syllabus Delivery Plan منهج أسبوعي لخطة التسليم	
Week	**Material Covered**
Week 1	Fundamentals of OOP • Mastering Object-Oriented Programming (OOP) concepts is essential for software development.
Week 2	Introduction to C++ • An overview of the C++ programming environment, including its syntax, data types, and the fundamental structure of programs.
Week 3	Integer Variables • How to declare, manipulate, and utilize integer variables in C++ programs.
Week 4	Character Variables • An in-depth exploration of character types, including how to read, write, and manipulate character data.
Week 5	Floating-Point Types and Strings • How to implement floating-point numbers, string constants, and best practices for managing numerical and text data.
Week 6	Arithmetic Operators and Type Conversion • Carrying out arithmetic operations while comprehending type conversion and casting in C++.
Week 7	Midterm Evaluation • Assessment covering the material from Weeks 1 to 6.
Week 8	Relational Operators and Increment/Decrement • Utilizing relational operators for comparisons and incrementing and decrementing values in C++.
Week 9	Loops with Multiple Statements • Effectively managing loops that contain multiple statements to control the flow of the program.
Week 10	Advanced Statements • Creating intricate program logic involving interconnected statements.
Week 11	Nested Loops and Library Functions • Employing nested loops for problem-solving and utilizing standard library functions to enhance efficiency.
Week 12	Functionality in C++ • Defining and calling functions, understanding how to pass parameters, and applying modular design principles.
Week 13	Structuring C++ Applications • Organizing complete C++ applications for clarity in function definitions and overall structure.
Week 14	Function Return Values • Designing functions that provide return values alongside best practices and examples of error handling.
Week 15	Importance of Arrays

	• An introduction to declaring and operating on arrays for effective data management.
Week 16	Final Examination • A comprehensive assessment that evaluates your understanding and application of the course concepts.

Weekly Syllabus Delivery Plan **منهج أسبوعي عملي لخطة التسليم**	
Week	**Material Covered**
Week 1	Fundamentals of Object-Oriented Programming (OOP) • Overview of OOP concepts: Encapsulation, Inheritance, Polymorphism, and Abstraction. • Introduction to C++ classes and objects. • Creating a simple class with attributes and methods.
Week 2	Introduction to C++ Programming - Development Environment • Setting up a C++ compiler and Integrated Development Environment (IDE), such as Code: Blocks, Dev-C++, or Visual Studio. • Writing and compiling a basic C++ program (Hello, World!). • Understanding the structure and syntax of a C++ program.
Week 3	Handling Integer Variables • Declaring and initializing integer variables. • Performing arithmetic operations on integers. • Exercises for manipulating integer values.
Week 4	Character Variables in C++ • Declaring character (char) variables. • Using `cin` and `cout` for character input and output. • Exercises focused on handling character data.
Week 5	Floating-Point and String Data Types • Working with float and double variables for decimal numbers. • Managing strings using character arrays and the string class. • Exercises for manipulating floating-point numbers and strings.
Week 6	Arithmetic Operators and Type Conversion • Utilizing arithmetic operators: +, -, *, /, and %. • Understanding type conversion (casting). • Exercises involving arithmetic calculations.
Week 7	Midterm Examination • Assessment of practical skills developed during Weeks 1–6.
Week 8	Relational Operators, Increment, and Decrement • Using relational operators (==,!=, <, >, <=, >=). • Understanding the increment (++) and decrement (--) operations. • Programs that involve comparisons and increments.
Week 9	Loops with Multiple Statements • Implementing loops: for, while, and do-while.

	• Writing loops that contain multiple statements. • Exercises focused on controlling loops.
Week 10	Advanced Statements in C++ • Creating decision structures using if-else and switch-case statements. • Working with nested conditionals and loops. • Exercises that apply advanced logic.
Week 11	Nested Loops and Standard Library Functions • Implementing nested loops to create patterns and process data. • Introduction to standard library functions in C++. • Projects that incorporate loops and built-in functions.
Week 12	Functionality in C++ • Writing functions, including declaration, definition, and calling. • Learning how to pass parameters by value and by reference. • Exercises focused on modular design.
Week 13	Structuring C++ Applications • Organizing C++ projects that consist of multiple files. • Utilizing structs and numbers for effective data management. • Creating structured programs.
Week 14	Function Return Values • Understanding the significance of return values in functions. • Functions that return various data types. • Exercises related to return values.
Week 15	Practical Review & Problem-Solving • Reviewing key concepts and completing lab exercises. • Solving programming problems collaboratively. • Debugging and optimizing code. • Conducting Q&A sessions and preparing for exams.
Week 16	Final Examination • A thorough assessment covering all topics addressed throughout the course.

Resources for Teaching and Learning **الموارد المخصصة للتدريس والتعلم**		
	Resource Availability	**Library Resource Availability**
Required Texts	*Patt, Y.N. and Patel, S.J., 2020. Introduction to Computing Systems; Bits & Gates to C++ and Beyond.* *Perry, J.E. and Levin, H.D., 1996. An introduction to object-oriented design in C++. (No Title).*	Yes

Recommended Texts	The central library, science library, and departmental repository contain the most critical texts and distinctive resources on computer skills.	Yes
Websites	– Specialized academic websites. – Virtual library services provide resources that are accessible from international university libraries.	

Grading Scheme **مخطط الدرجات**				
Assessment Groups and Corresponding Grades	**Grade**		**Marks (%)**	**Definition**
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
	Grade B	Very Good	80–89	Above-Average Performance with Minor Errors
	Grade C	Good	70–79	Acceptable Work with Noticeable Errors
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	Grade E	Sufficient	50–59	Meets Minimum Requirements
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	Grade F	Fail	0–44	Substantial Improvement Needed
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Ministry of Higher Education and Scientific Research
University of Baghdad
College of Science
Department of Mathematics

Module Description Form

نموذج وصف الوحدة الدراسية

Module Information معلومات الوحدة الدراسية			
Module Title	Arabic Language 2		**Delivery Methods**
Delivery Methods	Suplement		☑ **Theory** ☐ **Lecture** ☐ **Laboratory** ☐ **Tutorial**
Module Code	UOB101		
ECTS Credits	2		
Total Study Workload (Hours/Semester)	50		
Module Level	2	**Approval Date by the Scientific Committee**	
Department	Mathematics	**Semester of Delivery**	2
Personnel and Administration			
Module Leader	Dr Leqaa Faleh Owdaa	**College**	Science
Academic Title	Lecturer (PhD)	**Email**	leqaa.falih@ircoedu.uobaghdad.edu.iq
Module Tutor		**Email**	
Peer Reviewer		**Additional Email Addresses**	
Administration Date	1/10/2024	**Version Number**	1

Relationship with Other Modules			
Prerequisite Modules	UOB101	**Semester**	1
Co-requisite Module	None	**Semester**	___

Module Objectives, Module Learning Outcomes, and Indicative Content أهداف الوحدة الدراسية ونتائج التعلم والمحتوى الإرشادي	
Module Objectives **أهداف الوحدة الدراسية**	1. تطوير الكفاءة اللغوية: البناء على المهارات الأساسية في اللغة العربية المكتسبة في العربية 1 لتطوير كفاءة أعلى في القراءة والكتابة والاستماع والتحدث. 2. تعزيز فهم البُنى اللغوية المعقدة: تقديم بنى نحوية أكثر تعقيدًا لتحسين قدرات الطلاب على الفهم والتعبير. 3. تنمية التقدير الثقافي والأدبي: تعميق الفهم للثقافة العربية من خلال دراسة أدبها ووسائل إعلامها وفنونها. 4. تطوير مهارات اللغة التطبيقية: تشجيع التطبيق العملي للغة العربية في سياقات أكاديمية ومهنية ويومية.
Module Learning Outcomes **مخرجات التعلم للوحدة**	1. التواصل في مواقف أكثر تعقيدًا: الانخراط في محادثات تشمل مجموعة أوسع من الموضوعات، والتعبير عن الآراء وصياغة الحجج باللغة العربية. 2. قراءة وفهم النصوص المتقدمة: قراءة نصوص أكثر تعقيدًا، بما في ذلك الأدب والكتابات الفنية ذات الصلة بمجال دراستهم، مع تحسين الفهم. 3. الكتابة بوضوح وهيكلية محسنة: إنتاج نصوص مكتوبة مُنظمة جيدًا تظهر إتقانًا أعمق للقواعد والمفردات. 4. تقدير وتحليل المحتوى الثقافي: تحليل والتفاعل النقدي مع المنتجات الثقافية العربية، مثل الشعر والنثر والأفلام، مع فهم سياقاتها التاريخية والثقافية. 5. استخدام اللغة العربية في البحث الأكاديمي: تطبيق مهارات اللغة العربية لإجراء البحوث، كتابة التقارير، وعرض النتائج حول الموضوعات المتعلقة بالاهتمامات الأكاديمية والمهنية.
Indicative Content **المحتوى الإرشادي**	1. القواعد والتراكيب النحوية المتوسطة: دراسة معمقة لأشكال الأفعال والأزمنة، حالات الاسم، واستخدام الجزيئات في البنى النحوية المختلفة. 2. توسيع المفردات والتعبيرات الاصطلاحية: تعلم المفردات المحددة للقطاع، خاصة في العلوم والتكنولوجيا، إلى جانب التعبيرات الاصطلاحية المستخدمة في التواصل اليومي. 3. فهم القراءة: التركيز على قراءة وتحليل النصوص المعاصرة والكلاسيكية، بما في ذلك المقالات الإخبارية، المقالات، ومقتطفات من الأعمال العربية الكبرى. 4. مهارات الكتابة المتقدمة: تعليمات في كتابة المقالات، التقارير، والأوراق البحثية بالعربية، مع التركيز على الحجة الواضحة والهيكل المتماسك. 5. الممارسة في الاستماع والتحدث: تمارين استماع متقدمة باستخدام وسائل الإعلام مثل البودكاست، المقابلات، والمحاضرات، إلى جانب الممارسة المكثفة في مهارات التحدث والعرض. 6. الدراسات الثقافية: دراسة الثقافة العربية من خلال أدبها، سينمائها، موسيقاها، وفنونها البصرية، استكشاف مواضيع مثل الهوية، التقاليد، والحداثة. 7. تطبيقات اللغة العملية: فرص لاستخدام اللغة العربية في سيناريوهات العالم الواقعي، مثل محاكاة المفاوضات، المناقشات العلمية، والتبادلات الثقافية.

Learning and Teaching Strategies استراتيجيات التعلم والتدريس	
Strategies	1. محاضرات حول إدارة الوقت بفعالية • إجراء جلسات منظمة تؤكد على الدور الحاسم لإدارة الوقت في البيئات الأكاديمية والمهنية. ستستكشف هذه الجلسات الاستراتيجيات المثبتة لتعزيز الإنتاجية الشخصية، بما في ذلك تحديد أولويات المهام، التغلب على التسويف، واستخدام أدوات تتبع الوقت العملية. 2. العمل الجماعي التعاوني • تنفيذ واجبات قائمة على العمل الجماعي لتعزيز مهارات العمل الجماعي والتواصل والقدرة على حل المشكلات بشكل جماعي. من خلال تشجيع التعاون بين الأقران، يعزز البرنامج الفهم وينمي التزامًا مشتركًا بتحقيق الأهداف التعليمية. 3. دمج الموارد الإلكترونية المتاحة

	• استغلال المنصات الرقمية سهلة الاستخدام والدورات عبر الإنترنت لدعم تطوير المهارات المستمر وتعزيز محتوى الدورة. توفير الوصول إلى مجموعة واسعة من المواد التعليمية، مما يضمن التعلم المستقل المرن والتفاعل المستمر خارج بيئة الفصل التقليدي.

Student Workload (SWL) الحمل الدراسي للطلاب لمدة 15 أسبوعًا			
Structured SWL (hours/semester) الحمل الدراسي المنتظم للطالب خلال الفصل	33	Structured Study Workload (hours/week) الحمل الدراسي المنتظم للطالب أسبوعيا	2.0
Unstructured SWL (hours/semester) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	Unstructured Study Workload (hours/week) الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.3
Total SWL (hours/semester) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم الوحدة الدراسية					
		Time/Number	Weight (Marks)	Weekly Due	Relevant Learning Outcomes
Assessment Methods include	Quizzes	4	16%	5, 10	4
	Assignments	4	16%	3, 14	4
	Projects/Laboratories	___	___	___	___
	Reports	2	8%	___	2
Summative Assessments	Midterm Examination	2 hours	10%	7	2 hours
	Final Examination	3 hours	50%	17	3 hours
Total Assessment		100%			

Weekly Syllabus Delivery Plan منهج أسبوعي نظري لخطة التسليم	
Week	Material Covered

Week 1	مقدمة وتقييم المستوى • مقدمة عن أهداف ومحتوى الدورة. • تقييم مستوى الطلاب لتحديد نقاط القوة والضعف.
Week 2	القواعد - المستوى المتوسط • تعريف بالأفعال في الزمن الماضي والمضارع. • تمارين عملية على تصريف الأفعال.
Week 3	الأسماء والصفات • دراسة الإعراب وأنواع الجمل. • تمارين على الأسماء والصفات واستخدامها في الجمل.
Week 4	المفردات والتعبيرات • توسيع المفردات ذات الصلة بالعلوم والتكنولوجيا. • تعلم التعبيرات الاصطلاحية وكيفية استخدامها.
Week 5	قراءة وفهم النصوص • قراءة وتحليل نصوص معاصرة وكلاسيكية.
Week 6	مهارات الكتابة المتقدمة • تعلم كتابة البحوث والتقارير. • ورشة عمل على كتابة مقال قصير.
Week 7	الامتحان النصفي • امتحان شامل يغطي المادة من الأسابيع 1-6.
Week 8	الاستماع والتحدث • تدريبات مكثفة على الاستماع والمحادثة باستخدام وسائل إعلام متنوعة.
Week 9	دراسات ثقافية • دراسة الأدب العربي وأبرز المؤلفين. • تحليل فيلم عربي ومناقشته.
Week 10	التطبيقات العملية للغة • محاكاة لمواقف واقعية وتمارين على التفاوض والنقاش.
Week 11	المراجعة والتقييم • مراجعة النقاط الرئيسية وإجراء تقييم للمهارات المكتسبة.
Week 12 **Week 13** **Week 14**	مشروع الفصل • تخطيط وتنفيذ مشروع بحثي أو تطبيقي يستخدم اللغة العربية، يتبعه عرض النتائج.
Week 15	مراجعة • جلسة مراجعة نهائية لتعزيز المعرفة والاستعداد للامتحان الشامل النهائي، مع إعادة زيارة الهياكل النحوية الرئيسية والدقائق اللغوية المغطاة خلال الدورة.
Week 16	الامتحان الشامل النهائي

Resources for Teaching and Learning

الموارد المخصصة للتدريس والتعلم		
	Resource Availability	**Library Resource Availability**
Required Texts	*جامع الدروس العربية وشرح ابن عقيل*	Yes
Recommended Texts	تحتوي المكتبة المركزية ومكتبة العلوم ومستودع الأقسام على نصوص بالغة الأهمية وموارد فريدة عن اللغة العربية.	Yes
Websites	- مواقع إلكترونية أكاديمية متخصصة. - توفر خدمات المكتبات الافتراضية مصادر يمكن الوصول إليها من مكتبات الجامعات العالمية.	

Grading Scheme **مخطط الدرجات**				
Assessment Groups and Corresponding Grades	**Grade**		**Marks (%)**	**Definition**
Success Group (50–100)	**Grade A**	Excellent	90–100	Outstanding Performance
	Grade B	Very Good	80–89	Above-Average Performance with Minor Errors
	Grade C	Good	70–79	Acceptable Work with Noticeable Errors
	Grade D	Satisfactory	60–69	Satisfactory – Fair Performance with Significant Shortcomings
	Grade E	Sufficient	50–59	Meets Minimum Requirements
Fail Group (0–49)	**Grade FX**	Fail	45–49	Additional Work Required; Credit Awarded
	Grade F	Fail	0–44	Substantial Improvement Needed

Important Note on Grade Rounding: In line with our commitment to fair academic assessment, all decimal grades will be rounded to the nearest whole number. For example, a grade of 54.5 will be rounded to 55, whereas 54.4 will be rounded to 54. Any modifications to the grades initially assigned by evaluators will strictly follow this automated rounding process.