MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Engineering Analysis			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ATU11501**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	UGIII		**Semester of Delivery**	1	
Administering Department			**College**	NETC	
Module Leader	Asaad. S. Daghal		**e-mail**	ad466kent@atu.edu.iq	
Module Leader's Acad. Title	Assist. Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name	Nasir Hussein Selman		**e-mail**	Coj.nas@atu.edu.iq	
Scientific Committee Approval Date	01/05/2025		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. **Comprehensive Understanding:** Develop a holistic understanding of complex analysis, Laplace transforms, and partial differential equations. 2. **Problem-Solving Skills:** Enhance analytical and problem-solving skills through the application of theoretical concepts to practical scenarios. 3. **Interdisciplinary Connections:** Foster the ability to connect mathematical theories to applications in science, engineering, and technology.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1. Z-Transform** Understanding and Application, Properties and Pairs, Inverse Z-Transform, Discrete-Time System Analysis. **2. Laplace Transform** Definition and Basic Functions, Inverse Transform, Differential Equations, Transform Properties: **3. Partial Differential Equations** Fundamental Concepts, Separation of Variables, D'Alembert's Solution **4. Complex Analytic Functions** Complex Functions and Properties, Analyticity and Cauchy-Riemann Equations, Laplace's Equation and Rational Functions. **5. Complex Integrals** Line Integrals in the Complex Plane, Properties of Complex Line Integrals, Cauchy's Integral Formula.

	6. Special Functions Gamma and Beta Functions, Applications of Special Functions.
Indicative Contents المحتويات الإرشادية	**1. Z-Transform** **2. Laplace Transform** **3. Partial Differential Equations** **4. Complex Analytic Functions** **5. Complex Integrals** **6. Special Functions**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**1. Lectures:** Introduce key concepts using structured presentations and visual aids. **2. Interactive Tutorials:** Conduct problem-solving sessions and encourage peer collaboration. **3. Hands-On Exercises:** Utilize mathematical software for computational tasks. **4. Case Studies:** Discuss real-world applications and invite industry speakers. **5. Assignments and Projects:** Assign individual problems and facilitate group projects. **6. Discussion Forums:** Use online platforms for peer interaction and guide discussions. **7. Assessment Methods:** Implement formative quizzes and summative exams. **8. Self-Directed Learning:** Provide recommended readings and encourage study groups. **9. Feedback Mechanisms:** Offer regular feedback on assignments and encourage reflective practices for improvement.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Z-Transform: Basics of Z-Transform; Definition and significance of the Z-transform; Overview of discrete-time signals and systems; Properties: linearity, time shifting, and region of convergence (ROC)
Week 2	Key Techniques and Applications: Z-Transform Pairs and Inversion; Common Z-transform pairs; Techniques for finding the inverse Z-transform (power series and partial fractions); Z-transform of common signals (step, impulse, exponential)
Week 3	**System Analysis and Applications**: Analysis of discreet-time systems using Z-transform; Frequency response and stability analysis
Week 4	Laplace transformation: - definition of Laplace transform; Laplace transform of some elementary function
Week 5	Linearity, time shifting, and initial/final value theorems
Week 6	unit step function; ramp function; impulse function.

Week 7	Inverse of Laplace transforms; Laplace transform of derivative and transformation of ordinary differential equations
Week 8	partial fractions: solution of differential equation by using Laplace transform
Week 9	Partial differential equations: - basic concepts; separation of variables; D'Alembert's solution of wave equation.
Week 10	**Mid -Term Exam**
Week 11	Complex analytic functions: - complex function; limit; derivative;
Week 12	Analytic function; Cauchy-Rieman equations;
Week 13	Laplace's equation; rational function; root.
Week 14	Complex Integrals: - Line integral in the complex plane; basic properties of the complex line integral; Cauchy's integral formula; the derivatives of an analytic function
Week 15	**Special functions: - Gamma function; Beta function**
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Advanced Engineering Mathematics" by Erwin Kreyszig	Yes
Recommended Texts	Engineering Mathematics" by K.A. Stroud and Dexter J. Booth	No
Websites	https://www.lboro.ac.uk/departments/mlsc/student-resources/helm-workbooks/	

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

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