

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Advanced Engineering Mathematics		Module Delivery	
Module Type	Basic learning activities		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	CET2201			
ECTS Credits	5			
SWL (hr/sem)	150			
Module Level	2	Semester of Delivery		4
Administering Department	CET	College	EECT	
Module Leader	Hala A. Hashim		e-mail	hala.solomon@gmail.com
Module Leader's Acad. Title	Assistant Lecturer		Module Leader's Qualification	M.Sc.
Module Tutor	Haneen Jawad Abood		e-mail	haneenjawadabood1994@gmail.com
Peer Reviewer Name	Asst. Prof. Alhamzah Taher Mohammed		e-mail	alhamza_tm@mtu.edu.iq
Scientific Committee Approval Date	13/06/2023		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CET2101	Semester	3
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To develop problem solving skills complex analysis. 2. To understand power series. 3. To the way around Fourier series. 4. To get the grip on using Laplace transform. 5. To develop a good understanding of ODEs. 6. This course deals with Advanced Engineering Mathematics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Describe Complex environment. 2. Discuss derivative of Analytic Function. 3. Describe Exponential, Trigonometric and Hyperbolic Functions. 4. Explain Line Integral in the Complex Plane and Cauchy's Integral Formula. 5. Using power Series and how to expand a function 6. Identify elements of Fourier Series. 7. Identify elements of Laplace Transform. 8. Discuss different aspects of First-Order ODEs. 9. Identify Bernoulli Equation and Population Dynamics. 10. Discuss different aspects of Second-Order Linear ODEs. 11. Using Variation of Parameters. 12. Discuss different aspects of Higher Order Linear ODEs. 13. Using Power Series to solve ODE. 14. Explain Fourier Series solution of ODE. 15. Discuss Laplace Transform solution of ODE.
Indicative Contents المحتويات الإرشادية	<u>Part A – Complex Analysis.</u> This part includes Complex Numbers. Polar Form of Complex Numbers. Powers and Roots. Complex variables. Complex Function. Derivative. Analytic Function. Cauchy–Riemann and Laplace's Equation. Exponential, Trigonometric and Hyperbolic Functions. Euler's Formula. Logarithm. Line Integral in the Complex Plane. Cauchy's Integral Formula. Derivatives of Analytic Functions. [12 hrs] + Revision problem classes in weekly tutorials [4 hrs]

	<u>Part B – Preliminaries to Methods of solving ODE.</u> This part includes Power Series. Functions Given by Power Series. Fourier Series. Arbitrary Period. Even and Odd Functions. Fourier Analysis for Periodic Functions. Fourier series Formula of a function. Differentiation and Integration of Fourier Series Laplace Transform. Transforms of Derivatives and Integrals. Table of Laplace Transforms. inverse Laplace transform [9 hrs] + Revision problem classes in weekly tutorials [3 hrs] <u>Part C – ODE.</u> This part includes First-Order ODEs. Separable ODEs. Exact ODEs. Integrating Factors. Linear ODEs. Bernoulli Equation. Population Dynamics. Second-Order Linear ODEs. Homogeneous. Homogeneous with Constant Coefficients. Nonhomogeneous ODEs. Solution by Variation of Parameters. Higher Order Linear ODEs. Homogeneous Linear ODEs. Homogeneous Linear ODEs with Constant Coefficients. Nonhomogeneous Linear ODEs. Power Series solution of ODE. Fourier Series solution of ODE. Laplace Transform solution of ODE. [24 hrs] + Revision problem classes in weekly tutorials [8 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module will primarily focus on encouraging students to participate in the activities, as well as refining and developing their critical thinking skills. This will be achieved through lectures, tutorials, discussions, and grading activities.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	59	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	91	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	6.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1-4, LO #5-9
	Assignments	2	10% (10)	3, 11	LO # 1-10
	Projects / Lab.	N/A			
	Report	N/A			
Summative assessment	Midterm Exam	2 hr	30% (30)	8	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المناهج الاسبوعي النظري

	Material Covered
Week 1	Complex Numbers. Polar Form of Complex Numbers. Powers and Roots. Complex variables.
Week 2	Complex Function. Derivative. Analytic Function. Cauchy–Riemann and Laplace’s Equation.
Week 3	Exponential, Trigonometric and Hyperbolic Functions. Euler’s Formula. Logarithm.
Week 4	Line Integral in the Complex Plane. Cauchy’s Integral Formula. Derivatives of Analytic Functions
Week 5	Power Series. Functions Given by Power Series.
Week 6	Fourier Series. Arbitrary Period. Even and Odd Functions. Fourier Analysis for Periodic Functions. Fourier series Formula of a function. Differentiation and Integration of Fourier Series
Week 7	Laplace Transform. Transforms of Derivatives and Integrals. Table of Laplace Transforms. inverse Laplace transform
Week 8	Midterm + First-Order ODEs. Separable ODEs. Exact ODEs. Integrating Factors.
Week 9	Linear ODEs. Bernoulli Equation. Population Dynamics.
Week 10	Second-Order Linear ODEs. Homogeneous. Homogeneous with Constant Coefficients.
Week 11	Nonhomogeneous ODEs. Solution by Variation of Parameters.
Week 12	Higher Order Linear ODEs. Homogeneous Linear ODEs. Homogeneous Linear ODEs with Constant Coefficients. Nonhomogeneous Linear ODEs.
Week 13	Power Series solution of ODE.
Week 14	Fourier Series solution of ODE.
Week 15	Laplace Transform solution of ODE.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Tutorial)

المنهاج الاسبوعي الاضافي

Material Covered

Each week, a question sheet related to the material presented in the theoretical lecture will be solved and debated.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"Advanced Engineering Mathematics ", Erwin Kreyszig, Wiley, 10th edition (August 16, 2011), ISBN-13: 978-0470458365.	Yes
Recommended Texts	"Differential Equations for Engineers and Scientists", Yunus Cengel, William Palm, McGraw Hill, 1st edition (January 31, 2012), ISBN-13: 978-0073385907.	No
Websites	https://www.coursera.org/learn/differential-equations-engineers	

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.