

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Engineering and Numerical Analysis		Module Delivery	
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	ATU12052			
ECTS Credits	8			
SWL (hr/sem)	200			
Module Level	1	Semester of Delivery		1
Administering Department	ATU12	College	PMETC	
Module Leader	Ahmed Hammodi Ali		e-mail	ahmed.hammodi.ali@gmail.com
Module Leader's Acad. Title	Assist.Professor		Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/06/2023		Version Number	1.0

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

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	Developing problem-solving skills and understanding the right basics of Engineering and Numerical analysis 2. Calculating the main variables in Engineering and Numerical analysis 3. Calculate some case studies that face the student in a practical way.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The student will be able to understand and distinguish many things about the subject of geometric and numerical analyses 2. understanding Laplace Transformations and how to derive, integrate and inverse it 3. Knowing some special functions such as the gamma, beta and Bessel functions 4. Learn about the Fourier series and how to deal with it and its applications 5. Solving differential equations of the second order, both homogeneous and non-homogeneous 6. calculate the numerical solution of differential equations of the first and second order, using different methods 7. calculate the numerical solution of some of difficult integrals using trapezoidal, Simpson and Romberg methods 8. Calculating the missing points and making special equations for the curves using the Curve fitting methods 9. Numerical interpolation calculation 10. Knowledge of the multiple roots of nonlinear equations
Indicative Contents المحتويات الإرشادية	<u>Part A – Engineering Analysis</u> Gamma and Beta function , Bessel function , Laplace transformation , Applications of Laplace Transformation, inverse of Laplace, Complex functions and variables, solution of complex functions in special cases, Fourier series, Power series , definition of second order differential equations, types of second order differential equations, solution of second order differential equations by three different ways(undetermined coefficient , variation and Reduction of Order method. [15 hrs] <u>Part B- Numerical Analysis</u> Definition of First order differential equations, solution of 1 st order differential equation by (Euler , Modified Euler and Runge-Kutta method), solution of 1 st ordinary equation numerically by (Jacobi and Gauss-Seidel method), Definition of interpolation, types of interpolation (Newton – divided and Lagrange Formula), definition of Curve fitting , solution of second order differential equations, Numerical integration(Trapezoidal, one-third Simpson's rule, three-eighth Simpson's rule and Romberg theorem, solution of non-linear equation (Bi-section, Newton-Raphson and Iterative method) . [15 hrs]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	
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	The main goal is to adopt a comprehensive vision to find a solid ground for students in order to make them prepared to know how to deal with the various problems that may occur during their work and the most successful ways to address them.
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Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	109	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	91	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #7, #8
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #11
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	Gamma and Beta functions
Week 2	Bessel Function
Week 3	Laplace transformation
Week 4	Inverse of Laplace transformation
Week 5	Special cases of Laplace transformations(Derivative and Integral)

Week 6	Applications of Laplace transformation
Week 7	Convolution
Week 8	Fourier Series and Applications
Week 9	Complex functions and variables
Week 10	Some applications of Complex functions
Week 11	Second order differential equations
Week 12	Homogenous and non-homogenous 2 nd differential Eqs. (types of roots)
Week 13	Undetermined Coefficients
Week 14	Variation Method
Week 15	Reduction of Order Method
Week 16	Review before the semester exam

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Book by George B. Thomas, Giordano, and Maurice D. Weir	yes
Recommended Texts		No
Websites	https://www.google.com/search?gs_ssp=eJzj4tVP1zc0TCovKK5MKcw2YPTiT07MSS7NKS1WKMnlz00sBgCwpgtG&q=calculus+thomas&oq=calculus&ags=chrome.2.69i57j0i10i433i512j46i10i340i512l4j0i	

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.				