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	**PM 300**				
ECTS Credits	**6.00**				
SWL (hr/sem)	**150**				
Module Level		**3**	**Semester of Deliver**		**5**
Administering Department		**PM**	**College**	**TEMO**	
Module Leader	**Dr. Haitham M. Wadullah**		**e-mail**	**Dr.haitham@ntu.edu.iq**	
Module Leader's Acad. Title		**Prof.**	**Module Leader's Qualification**		**Ph.D.**
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		**01/6/2023**	**Version Number**		

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**NO**	**Semester**	
Co-requisites module	**NO**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. Develop a solid foundation in mathematical concepts and techniques used in engineering analysis. 2. Understand the principles and applications of numerical methods for solving engineering problems. 3. Gain proficiency in using software tools and programming languages for numerical analysis. 4. Acquire the skills to analyze and interpret numerical results to make informed engineering decisions. 5. Apply mathematical modeling techniques to solve real-world engineering problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The intended subject specific learning outcomes. On successfully completing the module students will be able to: 1. Acquire a comprehensive understanding of the fundamental principles and concepts underlying a broad range of basic methods used in engineering analysis. 2. Demonstrate proficiency in applying a variety of established techniques and effectively utilizing computational tools to solve engineering problems. 3. Apply the acquired knowledge and skills in basic numerical approximation to address complex problems in diverse contexts, demonstrating the ability to critically assess and select appropriate tools and techniques. 4. Effectively employ MATLAB commands and functions to implement and execute engineering analysis tasks, demonstrating competence in utilizing computational tools for problem-solving.
Indicative Contents المحتويات الإرشادية	Part A Introduction, Mathematical Analysis, Function Analysis and Complex Function Analysis **[20 hr.]** Mathematical Modeling, Logistic Regression Analysis, Probability and Statistics Analysis and Advanced Probability and Statistics Analysis **[20 hr.]** Revision problem classes and quiz [3 hrs] Part B Linear and Nonlinear Regression Analysis, Optimization Analysis and Optimal Control and Nonlinear Optimization Analysis **[20 hr.]**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	1. Establish a solid foundation: Start by thoroughly understanding the fundamental concepts and principles of engineering analysis. This includes grasping the mathematical techniques and numerical methods commonly used in the field. 2. Practice problem-solving: Engineering analysis involves solving complex problems. Regularly practice solving a variety of problems to enhance your problem-solving skills and develop a deeper understanding of the subject matter. 3. Utilize resources: Take advantage of textbooks, online resources, and reference materials specific to engineering analysis. These resources can provide additional explanations, examples, and practice problems to reinforce your understanding.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (hr/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**4**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (hr/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**6**
Total SWL (h/sem)	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	2	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	
Week	**Material Covered**
Week 1	Introduction to Engineering Analysis; Fundamental concepts in engineering analysis Tools and techniques of engineering analysis
Week 2	Mathematical Analysis; Differential equations and their applications in engineering, Differentiation and integration
Week 3	Function Analysis; Algebraic and transcendental functions, Trigonometric and exponential functions
Week 4	Complex Function Analysis; Complex numbers and operations, Analysis of complex functions
Week 5	Mathematical Modeling; Mathematical models of growth, Mathematical models of regression
Week 6	Logistic Regression Analysis; Logistic regression analysis, Applications in engineering

Week 7	Probability and Statistics Analysis; Probability and statistics concepts, Data analysis and probability distributions
Week 8	Advanced Probability and Statistics Analysis; Joint and conditional probability analysis, Advanced statistics analysis and non-normal distributions
Week 9	Linear Regression Analysis; Simple linear regression analysis, Multiple linear regression analysis
Week 10	Nonlinear Regression Analysis; Nonlinear regression analysis, Applications in engineering
Week 11	Optimization Analysis and Optimal Control; Optimization analysis and optimal control problems, Applications in engineering
Week 12	Nonlinear Optimization Analysis; Nonlinear optimization analysis, Applications in engineering
Week 13	Review 1
	Quiz
Week 14	Review 2
Week 15	Review 3
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Engineering Analysis and MATLAB.
Week 2	Lab 2: Numerical Methods for Root Finding
Week 3	Lab 3: Interpolation and Curve Fitting
Week 4	Lab 4: Numerical Integration
Week 5	Lab 5: Numerical Solutions of Ordinary Differential Equations (ODEs)

Week 6	Lab 6: Systems of Linear Equations
Week 7	Lab 7: Partial Differential Equations (PDEs)

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. "Numerical Methods for Engineers" by Steven C. Chapra and Raymond P. Canale 2. "Numerical Analysis" by Timothy Sauer 3. "Numerical Methods in Engineering with MATLAB" by Jaan Kiusalaas	**No**
Recommended Texts	1. "Applied Numerical Methods with MATLAB for Engineers and Scientists" by Steven C. Chapra 2. "Numerical Methods: Design, Analysis, and Computer Implementation of Algorithms" by Anne Greenbaum and Timothy P. Chartier	**No**
Websites	3. (https://www.mathworks.com/) 4. (http://www.numericalmethods.eng.usf.edu/) 5. (https://www.engineering.com/)	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group	**A** - Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors

(50 - 100)	**C** - Good	جيد	70 – 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 – 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	45 – 49	More work required but credit awarded
	F – Fail	راسب	0 – 44	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

Module 1

Code	Course/Module Title	ECTS	Semester
PM 300	Engineering Analysis	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/ sem)**
2	2	63	87
Description			

Engineering Analysis is a field of study that focuses on the application of mathematical and computational methods to solve complex engineering problems. It involves the use of various mathematical techniques, numerical methods, and computer simulations to analyze and interpret data, make informed decisions, and optimize engineering designs and processes.

In Engineering Analysis, students learn fundamental principles and concepts of mathematics, including calculus, linear algebra, and differential equations. They develop skills in using numerical methods, such as interpolation, numerical integration, and numerical solution of differential equations, to solve engineering problems.

Students also gain proficiency in using computational tools and software, such as MATLAB, to perform mathematical modeling, data analysis, and simulations. They learn to analyze and interpret the results obtained from numerical calculations and simulations, and apply these findings to real-world engineering applications.

Engineering Analysis plays a crucial role in various engineering disciplines, including mechanical engineering, civil engineering, electrical engineering, and aerospace engineering. It provides engineers with the tools and techniques to analyze and optimize designs, predict system behavior, and make informed engineering decisions.

By studying Engineering Analysis, students develop critical thinking skills, problem-solving abilities, and a strong foundation in mathematical and computational methods, which are essential for success in the field of engineering.