Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	College Technology Erbil	
Department	Automotive Technology Engenerring	
Module Name	Engenerring and Numerical Analysis	
Module Code	Eng505	
Degree	Technical Diploma / Bachelor / High Diploma Master PhD	
Semester	Five	
Qualification	Automotive Technology Engenerring	
Scientific Title	Assistant Professor	
ECTS (Credits)	PhD	
Module type	Prerequisite / Core Assist.	
Weekly hours	4	
Weekly hours (Theory)	(2)hr Class	(12)Total hrs Workload
Weekly hours (Practical)	(1)hr Class	(12)Total hrs Workload
Number of Weeks	12	
Lecturer (Theory)	Dr. Talhat Ismael Hassan	
E-Mail & Mobile NO.	07504701532	
Lecturer (Practical)	Dr. Talhat Ismael Hassan	
E-Mail & Mobile NO.	talhat.hassan@epu.edu.iq	
Websites		

Course Book

Course Description	In life there is no certainty about what will happen in the future but decisions still have to be taken. Therefore, decision processes must be able to deal with the problems of uncertainty. Uncertainty creates risk and this risk must be analysed. Then Numerical methods for solving many problems in our life has important role in applied scinces. In many situations large amounts of numerical data is available which requires numerical techniques for analysis. There fore numerical methods currently plays an important role in the development of so many other sciences such as. Engineering, medicine, Agriculture, commerce, economy, social sciences, practical sciences (mathematics, physics and chemistry). Also, The application of numerical methods is very extensive and is used in all branches of Science and Technology, Industry, Business, Finance, Economics, Sociology, Psychology, Education, Medicine etc. The concept of numerical with the common people consists of numbers tables and data for describing a phenomenon such as Engenering, mathematical and physics problems status in a place which is an initial understanding but the scientific understanding for numerical alaysis consists of data collection arrangement analysis interpretation and inference.
Course objectives	The course objective of this course for the student is to know the subject of Numerical analysis. In addition, they able to understand and get benefit for all of the methods, also to know the concept and basic of the numerical methods to be able to apply these concepts to solve application problems and examples which they make in apply science like mathematic physics, engineering, network and computer science. Identifying the student with the importance of numerical and the stages of numerical method and learning Absolute error, iterations, convergence of methods, Newton Raphson method, solving linear

<table>
<tr><td></td><td>system, solving non linear system, numerical differentiation, application of numerical analysis. Numerical integration.</td></tr>
<tr><td>Student's obligation</td><td>1)Student readiness is very important to learn and get a note about the lesson because you are amenable to the lesson.
2) Be in the Hall or lab before starting time of the lecture
3) Listen to the lecture and write a note
4) If you don’t understand please ask?
5) Is not allowed to use a mobile phone in the classroom during the time of lecture until the teacher goes out of the classroom, If you use it, therefore you face legal punishment.</td></tr>
<tr><td>Required Learning Materials</td><td>White board and Data show to view the headlines, definitions and tables.</td></tr>
<tr><td>Evaluation</td><td>
<table>
<tr><th colspan="2">Task</th><th>Weight (Marks)</th><th>Due Week</th><th>Relevant Learning Outcome</th></tr>
<tr><td colspan="2">Paper Review</td><td>0</td><td></td><td></td></tr>
<tr><td rowspan="6">Assignments</td><td>Homework</td><td>3</td><td></td><td></td></tr>
<tr><td>Class Activity</td><td>3</td><td></td><td></td></tr>
<tr><td>Report</td><td>1</td><td></td><td></td></tr>
<tr><td>Seminar</td><td>1</td><td></td><td></td></tr>
<tr><td>Essay</td><td>0</td><td></td><td></td></tr>
<tr><td>Project</td><td>0</td><td></td><td></td></tr>
<tr><td colspan="2">Quiz</td><td>5%</td><td></td><td></td></tr>
<tr><td colspan="2">Lab.</td><td>15%</td><td></td><td></td></tr>
<tr><td colspan="2">Midterm Exam</td><td>20%</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>60%</td><td></td><td></td></tr>
<tr><td colspan="2">Total</td><td>100%</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Specific learning outcome:</td><td>1- white bourd.
2- Data show
3- Discussion on subjects.</td></tr>
<tr><td>Course References:</td><td>[1] Kincaid, D. and Cheney, W. (1999) ″Numerical Mathematics and Computing, Fourth edition″, Brooks/Cole Publishing Company.
[2] Kincaid, D. and Cheney, W. (2004) ″Numerical Analysis: mathematics of Scientific computing, third edition″, Brooks/Cole Publishing Company.</td></tr>
</table>

	[3] John H.and Kurits D., (1999) Numerical Methods using Matlab , third edition. [4] I. Kamal Al-Deen, (1985) Introduction to Numerical analysis" third edition. [5] Steven T. Karris (2007) " Numerical analysis using Matlab" third edition. B– Magazines and review (internet): Using internet to get more information about the subjects.

Course topics (Theory)	Week	Learning Outcome
1- some basic about Numerical analysis.	1	
2- solution of non-linear functions by programming method.	2	
3- Graphical method.	3	
4- Bisection method and numerical examples.	4	
5- Newton Raphson method and numerical examples.	5	
6- fixed iteration method and numerical examples.	6	
7- Solving the linear system equation and non-linear system.	7	
8- iterative method and numerical examples.	8	
9- Jacobean method and numerical examples.	9	
10- Gauss sidle method and numerical examples	10	
11- Numerical Integration Trapezoidal method and numerical examples.	11	
12- Simpson method 1/3 operator and numerical examples.	12	
Practical Topics (Totorial)	**Week**	**Learning Outcome**
Solving examples on programming method.	1	
Solving examples on graphical method.	2	
Solving examples on NRM..	3	

Solving examples on fixed point method.	4	
Solving examples on linear system method.	5	
Solving examples for non linear system method.	6	
Solving examples on itaretive method.	7	
Solving examples on Jacobian method.	8	
Solving examples for Gauss sidle method.	9	
Solving examples on integrations.	10	
Solving examples on Trapizodal method..	11	
Solving examples on Simpson method.	12	

Quasion example design

Q1-Define Numerical analysis and what are numerical methods for solving nonlinear equation ?

Q2/ Which of the following iteration form should be used for calculating $\frac{1}{a}$ where $a \succ 0$

1) $x_{i+1} = x_i(3 - 3ax_i + a^2x_i^2)$ 2) $x_{i+1} = x_i(2 - ax_i)$

Q3) Let $f(x) = 3^{-x}$ find approximate root of f(x) where error =0.001 by using Newton Raphson method with initial solution $x_0 = 0.5$.

Q4/ By using modified N.R.M. find approximate solution of a system

$$y^2 - \sqrt{2x} - 2 = 0$$

$$xy^2 - \sqrt{xy} - 3x = 0$$

with initial solution $(1.3, 2.5)$. Stop iteration after three steps. (10 marks)

Q5 / Can we use Fixed point iteration method for find numerical solution of a system

$$3x + y^2 = 0$$
$$4y + x^2 = 0$$

with initial approximate solution $(0.2, -0.3)$, error 0.01? Explain you answer.

20. Extra notes:

I have no notification about my subject Numerical analysis.

External Evaluation

The course book of numerical analysis is completely related to syllabus of subjects, the preactical syllabus satisfy the goal of numerical analysis subjects.

The pratical course is completely defined the theoretical and practical lectures. Dr. Basim Mohammed Fadhil Lecturer of automobile Engenerring department.