EASTERN MEDITERRANEAN UNIVERSITY
COURSE OUTLINE TEMPLATE

COURSE CODE	MATH373	COURSE LEVEL	Undergraduate SPRING 2014-2015
COURSE TITLE	Numerical Analysis for Engineers		
COURSE TYPE			
LECTURER(S)	Gr. 1 Asst. Prof. Dr. Mehmet Bozer mehmet.bozer@emu.edu.tr ext.1003 office AS273 Gr. 2 Dr. Övgü Çıdar İyikal ovgu.cidar@emu.edu.tr ext. 2281 office AS118		
CREDIT VALUE	(3,1) 3	ECTS VALUE	6
PREREQUISITES	MATH203 or MATH207		
COREQUISITES			
DURATION OF COURSE	One semester		
WEB LINK			

CATALOGUE DESCRIPTION

Numerical error. Solution of nonlinear equations. Convergence. Solution of linear systems of equations: direct and iterative methods. Interpolation. Curve fitting. Numerical differentiation and integration.

AIMS & OBJECTIVES

This course is an introduction to a broad range of numerical methods for solving mathematical problems that arise in computational science, engineering and mathematics. The goal of this course is to provide you with an understanding of some basic numerical methods so that you are able to choose appropriate techniques for solving problems and are able to interpret the results. To achieve this goal, you will be required to use MATLAB to implement numerical techniques and to study their properties.

GENERAL LEARNING OUTCOMES (COMPETENCES)

On completion of this module, student should be able to:

- **write basic Matlab programs to solve the problems encountered in the course;**
- **know the difference between an approximate and an exact solution of a problem, and the definition of absolute and relative errors;**
- **determine the root(s) of a nonlinear equation using the Bisection method , Regula Falsi method , fixed point iteration method , Newton's method and the Secant method;**
- **state and prove the conditions under which the sequence $x_{n+1} = g(x_n)$ converges to a unique root of the equation x=g(x);**
- **determine the order of an iterative process for computing the root of an equation;**
- **solve nonlinear systems of equations using fixed point and Newton's methods;**
- **Solve simultaneously sets of linear algebraic equations using Gauss Elimination, LU Decomposition, Jacobi , Gauss-Siedel and the SOR methods;**
- **construct an interpolating polynomial using either the Lagrange or Newton formula, and describe their relative advantages and disadvantages;**
- **prove the error formula for Lagrange interpolation;**
- **construct divided difference tables for prescribed data;**
- **solve numerical differentiation problems using suitable numerical differentiation formulas;**
- **derive the trapezoidal and Simpson's rules for approximating an integral;**
- **derive the error term for the trapezoidal and Simpson' rules;**
- **solve Ordinary Differential Equation problems using Euler's, Heun's and Runge Kutta methods**

On successful completion of this course, all students will have developed **their skills in**:

- the mathematical analysis underlying the development of numerical methods
- the implementation of the numerical methods for a variety of multidisciplinary applications
- being able to establish the limitations, advantages, and disadvantages of numerical methods

On successful completion of this course, all students will have developed their appreciation of and respect for **values and attitudes** regarding the issues of:

- The role of numerical methods in relation to enginerring
- Relationship with other members engineering

GRADING CRITERIA

A (excellent)	**A:85-100 , A-:80-84** Excellent understanding of the concepts and the principles as demonstrated by correct and accurate knowledge and application of theory/laws in solving problems. Response to problems is clear, legible, concise and accurate. Excellent performance.
B (good)	**B+: 75-79, B:70-74 , B-: 66-69** Better than average understanding of the concepts and the principles as demonstrated by correct and accurate knowledge and application of theory/laws in solving problems, but doesn't have the depth and outstanding quality of an "A". Response to problems is fairly clear, legible, but occasionally contains some inaccuracies. Performance exceeds the minimum requirements
C (average)	**C+:63-65 , C:59-62 , C-: 56-58** An average understanding of the concepts and the principles as demonstrated by reasonably correct knowledge and application of theory/laws in solving problems, but doesn't have any depth. Response to problems is reasonably clear, legible, but contains inaccuracies. It reveals a sufficient understanding of the material, but lacks depth in understanding and approach/application. Content and form don't go beyond basic expectations and/or display some substantial errors. Acceptable but non-exceptional performance that doesn't go beyond the minimum requirements.
D (barely sufficient)	**D+:53-55 , D:50-52** Minimal knowledge and barely sufficient understanding of the concepts and the principles as demonstrated by approximately correct application of theory/laws in solving problems. Response to problems is not very clear and is barely legible, and contains many inaccuracies. It reveals a minimum (confused) understanding of the material, and lacks depth in understanding and approach/application. Content and form do not adequately meet the basic expectations, and/or display significant errors. Performance demonstrates severe problems in one or more areas.
D- (fail)	**35-49** Unsatisfactory progress in understanding of the concept and principles, unsatisfactory knowledge of the theoretical part of and insufficient skils in solving problems.
F (fail)	Work does not meet the most minimal standards. It reveals no understanding of the material, lack of basic academic skills and knowledge, or completely incomprehensible writing. Performance is not acceptable
NG	May be given the students not attending classes and or examinations

RELATIONSHIP WITH OTHER COURSES
The course draws lots of concepts and theories from the lower level Mathematics courses like Calculus and differential equations.

LEARNING / TEACHING METHOD
This course is composed of lectures, class works, researches and lab applications. The students should participate in 80% of the class work and should settle for all the exams.

ASSIGNMENTS
Assignments for the term includes:
-theoretical applications to methods
-software programs

METHOD OF ASSESSMENT
Course Grade will be computed as follows:
1. Midterm Exam 1 % 25
2. Midterm Exam 2 % 25
3. Final Exam % 40
4. Lab works, Quizes, homeworks and attendance % 10

IMPORTANT NOTICE

- **It is compulsory to show student identification card, in order to be able to attend examinations or quizzes. Those who will not be able to show identification card will not be allowed to attend the examination.**
- **Students are compulsory to attend the examinations in the scheduled room. They will not be allowed to attend the examination in a room which is not scheduled for them.**
- **Students may check their examination papers within a pre-announced period of time. Information about this matter will be given in the instructions of each of the examinations.**
- **Students missing an examination has to provide a valid excuse within three days following the examination they missed.**
- **One general make up examination will be given at the end of the semester after the final examination period. Students attending make up examination will be responsible from all subjects.**

ATTENDANCE
It is a University regulation that unexplained absences of 20% or more from classes will automatically result in an **NG grade**.

TEXTBOOK/S
John H. Mathews: Numerical Methods for Mathematics,
Science and Engineering, Prentice Hall, 1999.

INDICATIVE BASIC READING LIST
NONE

EXTENDED READING LIST
NONE

SEMESTER OFFERRED
2014-2015 Spring Semester

CONTENT & SCHEDULE

WEEK	DATE	TOPICS
1	Mar. 9-13	Roots of Equations,Locating the roots graphically and analytically
2	Mar. 16-20	Bisection Method, False Position Method,Fixed Point Iterative Method
3	Mar. 23-27	Newton's Method, Order of the methods
4	Mar 30-Apr 3	Fixed Point Method, Newton’s Method for nonlinear systems.
5	Apr.6 -10	Iterative Methods for linear systems(Jacobi, Gauss-Seidel)
6	Apr.13 -17	LU Decomposition Method, Cholesky Decomposition Method
7	Apr.20 -23	Lagrange Interpolation Polynomial, Newton polynomials
7-8-9	Apr.24 – May 06	Midterm Examinations
9	May. 7-8	Least Squares, Least Squares Polynomial Fitting
10	May. 11-15	Nonlinear Curve Fitting
11	May. 18-22	Calculus of Finite Differences, Errors and Approximation of Derivatives
12	May. 25-29	Quadrature, Trapezoidal, Simpson's Formulas,
13	June 1-5	Composite Integration Formulas
14	June 8-12	Explicit Methods, Implicit Methods
15	June 15-18	Runge Kutta type implicit methods
16-17	June 22-July 04	Final Examinations

PLAGIARISM
This is intentionally failing to give credit to sources used in writing regardless of whether they are published or unpublished. Plagiarism (which also includes any kind of cheating in exams) is a disciplinary offence and will be dealt with accordingly.)

PLEASE KEEP THIS COURSE SYLLABUS FOR FUTURE REFERENCE AS IT CONTAINS IMPORTANT INFORMATION