Course Name : Numerical Analysis

Course Code	Course Type	Regular Semester	Lecture (hours/week)	Seminar (hours/week)	Lab. (hours/week)	Credits	ECTS
CMP 120	B	Spring	3.00	1.00	0.00	3.50	5.00

Lecturer	Sofokli Garo, PhD
Assistant	
Course language	Albanian
Course level	Bachelor
Description	Binary Numbers. Error analysis. Solving systems of linear equations: Gaussian Elimination, modification of Gaussian Elimination and L-U transformation. Solving non-linear equations and systems: Bisection, Newton, Secant methods and fixed point iteration. Interpolation : Lagrange approximation, Newton's polynomials and approximation of polynomials. Curve matching. Numerical differentiations; numerical integrations. Numerical optimizations. Numerical solutions of initial value and peak value problems.: Euler, Heun, Taylor, Runge-Kutta methods.
Objectives	Binary Numbers. Error analysis. Solving systems of linear equations: Gaussian Elimination, modification of Gaussian Elimination and L-U transformation. Solving non-linear equations and systems: Bisection, Newton, Secant methods and fixed point iteration. Interpolation : Lagrange approximation, Newton's polynomials and approximation of polynomials. Curve matching. Numerical differentiations; numerical integrations. Numerical optimizations. Numerical solutions of initial value and peak value problems.: Euler, Heun, Taylor, Runge-Kutta methods.
Core Concepts	

Course Outline

Week	Topic
1	Binary Numbers
2	Error Analysis
3	Solving equations x = g(x). Bracketing methods, Newton's method, Secant method, and Fixed-point iteration methods
4	Aitken's process and Steffensen's and Muller's methods
5	Iteration for non-linear systems
6	Iteration for non-linear systems
7	Newton's method for non-linear systems
8	Midterm Exam
9	Solving non-linear equation systems. Gaussian elimination and L-U decomposition
10	Solving linear equation systems. Modifications of the Gaussian elimination method
11	Visualization of Matrices
12	Newton Polynomials and Polynomial Approximation
13	Numerical Integration. Trapezoidal and Simpson's methods
14	Numerical Differentiation and Integration. Euler's Method
15	Numerical Optimization

16	Final Exam

Prerequisites	The student must attend the course at a minimum rate of 75%.
Literature	• John H.Mathews, Numerical Methods using Matlab, Prentice-Hall International, 2004 • Analize Numerike, Prof. Dr. Fatmir Hoxha
References	• Numerical Methods with C++ Programming. NITA H. SHAH PHI Learning Pvt. Ltd., 2008

Course Outcome

1	Understanding the difference between solving problems by hand and using a computer
2	Understanding the solutions of numerical methods and having a clear structure of an algorithm

Course Evaluation

In-term Studies	Quantity	Percentage
Midterms	1	30
Quizzes	0	0
Projects	0	0
Term Projects	0	0
Laboratory	0	0
Class Participation	1	20
Total in-term evaluation percent		**50**
Final exam percent		**50**
Total		**100**

ECTS Workload (Based on Student Workload)

Activities	Quantity	Duration (hours)	Total (hours)
Course duration (Including the exam week: 16x Total hours of the course)	16	4	64
Study hours outside the classroom (Preparation, Practice, etc.)	14	4	56
Duties	0	0	0
Midterms	1	5	5
Final Exam	1	0	0
Other	0	0	0
Total Work Load			**125**
Total Work Load / 25 (hours)			**5.00**
ECTS			**5.00**