	Course name: MATH204 Numerical Methods			**Department:** MSE,EE				Semester 4
	Methods of Education							Credit (ECTS)
	Lecture	Recitation/ (Etud)	Lab	Project/Field Study	Homework	Other	Total	5
	42	0	0	0	0	108	150	
Language	English							
Compulsory/Elective	Compulsory							
Prerequisites	Calculus I-II, Linear Algebra I-II							

Course Contents

Weeks	Subjects
1	Error analysis in numerical computations ▪ Computer number systems ▪ Floating point arithmetic conversion from base 10 to base 2 ▪ Floating point systems and round-off errors
2	Errors: Rounding/Chopping Errors , Truncation Errors
3	Root Finding/Solutions of Equations (Chapter 3 of the textbook) : Iterative methods • bisection method • fixed point iteration
4	Root Finding/Solutions of Equations (Chapter 3 of the textbook) : Iterative methods • secant method • Newton's method
5	Matrix Algebra and Linear System of Equations • Elementary Row(Column) Operations, Echelon Matrices, Row-Reduced Echelon Matrices • Gauss elimination • Gauss-Jordan Elimination • LU factorization and forward substitution • Crout factorization
6	Matrix Algebra and Linear System of Equations • Elementary Row(Column) Operations, Echelon Matrices, Row-Reduced Echelon Matrices • Gauss elimination • Gauss-Jordan Elimination • LU factorization and forward substitution • Crout factorization
7	Interpolation • Lagrange Interpolation • Newton's Divided Differences
8	Interpolation • Lagrange Interpolation Newton's Divided Differences REVIEW
9	**Midterm**
10	Curve Fitting • Linear Least Squares • Nonlinear Least Squares

	11 — Numerical Differentiation Finite Differences • Forward Difference • Central Difference
	12 — Numerical Integration • Trapezoid Rule • Composite Trapezoid Rule • Simpson's Rule • Composite Simpson's Rule
	13 — Numerical Integration • Gaussian-Quadrature
	14 — MATLAB/OCTAVE Applications of Numerical Methods
	15 — MATLAB/OCTAVE Applications of Numerical Methods REVIEW
Course Objectives	Representation of numbers on a computer, introduction to error analysis, numerical solutions of equations of one variable, interpolation, numerical differentiation, numerical integration, curve fitting, numerical solution of linear equations. ○ This course is an introduction to numerical analysis. ○ The primary objective is to develop numerical solution algorithms to solve mathematical problems which generally do not have analytical solutions. ○ This course helps students to understand mathematical theory of algorithms, detecting and controlling errors in scientific computing.
Learning Outcomes and Competences	By the end of this course, a student will be able to: **1.** predict, detect, understand and control errors when approximating solutions to problems using numerical algorithms with computers **2.** understand convergence, accuracy and stability of numerical algorithms **3.** obtain solution algorithms numerically for linear system of equations **4.** obtain solution algorithms numerically for nonlinear system of equations **5.** solve nonlinear equations numerically **6.** apply the basic iterative methods
Textbook and /or References	Kaynak(İngilizce) LAB, Wiley, 201 **1.** **Textbook:** Abdelwahab Kharab, Ronald B. Guenther , An Introduction to Numerical Methods, A MATLAB Approach, , CRC Press. **2.** Richard L. Burden and J. Douglas Faires, Numerical Analysis, 2011, 9th Edition, (available in AYBU library on the shelve QA297 B84 2011) **3.** Abdelwahab Kharab, Ronald B. Guenther , An Introduction to Numerical Methods, A MATLAB Approach, , CRC Press. **4.** A. Gilat, V. Subramaniam, Numerical Methods for Engineers and Scientists: An introduction with applications using MATLAB, Wiley, 201 **5.** E. Ward Cheney, David R. Kincaid, Numerical Mathematics and Computing,1999, Brooks/Cole Publishing Company, 4th Edition. **6.** G.M.Philips, P.J. Taylor, Theory and Applications of Numerical Analysis, 1996, Elsevier, 2nd edition.

Assessment Methods and Criteria

In-Term Studies	Quantity	Percentage%
Mid-terms	1	40
Quizes	0	0
Assignments	4	0
Attendance	0	0
Practice	0	0
Project	0	0

	Final Examination		1	60
	Total		**6**	**100**
ECTS Allocated Based on Student Workload	**Activities**	**Quantity**	**Duration**	**Total Work Load**
	Course Duration	14	3	42
	Hours for off-the-c.r.study	14	4	56
	Assignments	0	0	0
	Mid-terms	1	20	20
	Project	0	0	0
	Final Examination	1	32	32
	Total	**30**	**59**	**150**
Instructors				