	Course name: MATH 429 Numerical Solutions of Ordinary Differential Equations (ODEs)	**Department:** Mathematics	Semester
			7

Methods of Education	Credit (ECTS)

Lecture	Recitation/ (Etud)	Lab	Exams	Homework/ Quiz	Other	Total	**6**
42	0	0	42	40	56	180	

Language	English
Compulsory/Elective	Departmental Elective
Prerequisites	None

Course Contents		

Weeks	Subjects
1	Single-step methods: Euler's method
2	Truncation error , convergence and order of convergence of Euler method
3	Higher order Taylor methods
4	Runge Kutta methods and their applications
5	Multistep methods and their stability, explicit and implicit methods
6	Linear multistep methods: Predictor-corrector methods, Extrapolation methods
7	Linear multistep methods: Predictor-corrector methods, Extrapolation methods
8	Stiff differential equations
9	Stiff differential equations
10	Stability and convergence
11	Implicit Runge-Kutta method
12	Two-point boundary value problems
13	Finite difference method for linear boundary value problems
14	Finite difference method for non-linear boundary value problems: shooting methods

Course Objectives	▪ This course provides a broad-ranging introduction to the entire subject of numerical methods for ordinary differential equations.

Learning Outcomes and Competences	By the end of this course, a student will be able to: 1. use Euler's methods for ODEs 2. understand stability and convergence of one step methods 3. solve ODEs by using Runge Kutta methods 4. learn multi-step methods and applications 5. give solution of linear/nonlinear boundary value problems

Textbook and /or References	1. Numerical Solution of Ordinary Differential Equations, Kendall E. Atkinson Weimin Han, David Stewart. John Wiley Science, 2009 (available online at AYBU Library) 2. Numerical Methods for Ordinary Differential Equations, John C. Butcher, 2016, John Wiley Science (available online at AYBU Library)-Chapters 2-4.

Assessment Methods and Criteria	**In-Term Studies**	**Quantity**	**Percentage%**
	Mid-terms	1	30
	Quizes	0	0
	Assignments	4	20
	Attendance	0	0
	Practice	0	0
	Project	0	0
	Final Examination	1	50
	Total	**6**	**100**

	Activities	Quantity	Duration	Total Work Load
ECTS Allocated Based on Student Workload	Course Duration	14	3	42
	Hours for off-the-	14	4	56
	Assignments	4	10	40
	Mid-terms	1	14	14
	Project	0	0	0
	Final Examination	1	28	28
	Total	**34**	**59**	**180**
Instructors				

Activities	Quantity	Duration	Total Work Load
Course Duration	14	3	42
Hours for off-the-	14	4	56
Assignments	4	10	40
Mid-terms	1	14	14
Project	0	0	0
Final Examination	1	28	28