

	<b>Course name:</b> MATH 311 Numerical Analysis I		<b>Department:</b> Mathematics				Semester <b>5</b>
	Methods of Education						Credit (ECTS)
	Lecture	Recitation/ (Etud)	Lab	Exams	Homework /Quiz	Other	Total
42	0	0	36	40	62	180	<b>6</b>
Language	English						
Compulsory/Elective	Compulsory						
Prerequisites	None						
Course Contents	<b>Weeks</b>	<b>Subjects</b>					
	<b>1</b>	Error analysis in numerical computations <ul style="list-style-type: none"> <li>▪ Computer number systems</li> <li>▪ Floating point arithmetic conversion from base 10 to base 2</li> <li>▪ Floating point systems and round-off errors</li> </ul>					
	<b>2</b>	Linear system of equations: Direct methods; <ul style="list-style-type: none"> <li>▪ Gauss elimination with backward substitution</li> <li>▪ Pivoting strategies</li> </ul>					
	<b>3</b>	Linear system of equations: Direct methods; <ul style="list-style-type: none"> <li>▪ LU factorization and forward substitution</li> <li>▪ Crout factorization</li> </ul>					
	<b>4</b>	Numerical factorizations: Jacobi and Gauss-Seidel methods and their convergence analysis					
	<b>5</b>	Eigenvalue problems, Power method, orthogonal factorization					
	<b>6</b>	Eigenvalue problems, Power method, orthogonal factorization					
	<b>7</b>	Least square problems					
	<b>8</b>	Least square problems					
	<b>9</b>	Solutions of nonlinear equations in one variable					
	<b>10</b>	Locating roots of equations					
	<b>11</b>	Fixed point iteration technique					
	<b>12</b>	Bisection method					
	<b>13</b>	Newton-Raphson method					
	<b>14</b>	Regula-Falsi and Secant methods					
Course Objectives	<ul style="list-style-type: none"> <li>▪ This course is an introduction to numerical analysis.</li> <li>▪ The primary objective is to develop numerical solution algorithms to solve mathematical problems which generally do not have analytical solutions.</li> <li>▪ This course helps students to understand mathematical theory of algorithms, detecting and controlling errors in scientific computing.</li> </ul>						
Learning Outcomes and Competences	By the end of this course, a student will be able to: <ol style="list-style-type: none"> <li>1. predict, detect, understand and control errors when approximating solutions to problems using numerical algorithms with computers</li> <li>2. understand convergence, accuracy and stability of numerical algorithms</li> <li>3. obtain solution algorithms numerically for linear system of equations</li> <li>4. obtain solution algorithms numerically for nonlinear system of equations</li> <li>5. solve nonlinear equations numerically</li> <li>6. apply the basic iterative methods(fixed point, bisection, Regula-Falsi,Newton-Raphson etc. ) for the solution of nonlinear equations in one variable</li> </ol>						
Textbook and /or References							

	<ol style="list-style-type: none"> <li>1. Richard L. Burden and J. Douglas Faires, Numerical Analysis, 2011, 9th Edition, (available in AYBU library on the shelf QA297 B84 2011)</li> <li>2. E. Ward Cheney, David R. Kincaid, Numerical Mathematics and Computing, 1999, Brooks/Cole Publishing Company, 4th Edition.</li> <li>3. G.M. Philips, P.J. Taylor, Theory and Applications of Numerical Analysis, 1996, Elsevier, 2nd edition.</li> </ol>			
Assessment Methods and Criteria	<b>In-Term Studies</b>	<b>Quantity</b>	<b>Percentage%</b>	
	Mid-terms	1	30	
	Quizzes	0	0	
	Assignments	4	20	
	Attendance	0	0	
	Practice	0	0	
	Project	0	0	
	Final Examination	1	50	
	<b>Total</b>	<b>6</b>	<b>100</b>	
ECTS Allocated Based on Student Workload	<b>Activities</b>	<b>Quantity</b>	<b>Duration</b>	<b>Total Work Load</b>
	Course Duration	14	4	56
	Hours for off-the-c.r.study	14	4	56
	Assignments	4	8	32
	Mid-terms	1	12	12
	Project	0	0	0
	Final Examination	1	24	24
	<b>Total</b>	<b>34</b>	<b>52</b>	<b>180</b>
Instructors				