

	Course name: MATH 216 Differential Equations II		Department: Mathematics				Semester																														
							4																														
	Methods of Education						Credit (ECTS)																														
Lecture	Recitation/ (Etud)	Lab	Exams	Homework	Other	Total	4																														
42	0	0	32	0	56	130																															
Language	English																																				
Compulsory/Elective	Compulsory																																				
Prerequisites	Calculus I and II																																				
Course Contents	<table border="1"> <thead> <tr> <th>Weeks</th> <th>Subjects</th> </tr> </thead> <tbody> <tr> <td>1</td> <td> <ul style="list-style-type: none"> ▪ Linear ODEs (Ordinary Differential Equations) with variable coefficients ▪ Sturm-Liouville system </td> </tr> <tr> <td>2</td> <td>Higher order nonlinear differential equations</td> </tr> <tr> <td>3</td> <td>Autonomous systems and their stability and phase plane portraits</td> </tr> <tr> <td>4</td> <td>Linear and almost linear systems and their stability and phase plane portraits</td> </tr> <tr> <td>5</td> <td> <ul style="list-style-type: none"> ▪ Laplace transforms ▪ Inverse Laplace transforms ▪ Convolution theory </td> </tr> <tr> <td>6</td> <td> <ul style="list-style-type: none"> ▪ Derivatives, integrals and products of Laplace transforms ▪ Transforms of step functions, periodic functions and dirac delta function </td> </tr> <tr> <td>7</td> <td>Solution of Initial Value Problems (IVPs) described by linear ODEs/system of linear ODEs with constant coefficients by using Laplace transforms</td> </tr> <tr> <td>8</td> <td>Fourier Series</td> </tr> <tr> <td>9</td> <td>Fourier Series</td> </tr> <tr> <td>10</td> <td>Fourier Series and its applications</td> </tr> <tr> <td>11</td> <td>Introduction to Partial Differential Equations (PDEs), Boundary Value Problems (BVPs)</td> </tr> <tr> <td>12</td> <td>Separation of variables for classical PDEs (Heat, Wave and Laplace equations)</td> </tr> <tr> <td>13</td> <td>Separation of variables for classical PDEs (Heat, Wave and Laplace equations)</td> </tr> <tr> <td>14</td> <td>Review</td> </tr> </tbody> </table>							Weeks	Subjects	1	<ul style="list-style-type: none"> ▪ Linear ODEs (Ordinary Differential Equations) with variable coefficients ▪ Sturm-Liouville system 	2	Higher order nonlinear differential equations	3	Autonomous systems and their stability and phase plane portraits	4	Linear and almost linear systems and their stability and phase plane portraits	5	<ul style="list-style-type: none"> ▪ Laplace transforms ▪ Inverse Laplace transforms ▪ Convolution theory 	6	<ul style="list-style-type: none"> ▪ Derivatives, integrals and products of Laplace transforms ▪ Transforms of step functions, periodic functions and dirac delta function 	7	Solution of Initial Value Problems (IVPs) described by linear ODEs/system of linear ODEs with constant coefficients by using Laplace transforms	8	Fourier Series	9	Fourier Series	10	Fourier Series and its applications	11	Introduction to Partial Differential Equations (PDEs), Boundary Value Problems (BVPs)	12	Separation of variables for classical PDEs (Heat, Wave and Laplace equations)	13	Separation of variables for classical PDEs (Heat, Wave and Laplace equations)	14	Review
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Course Objectives	This course focuses on the solutions of nonlinear ODEs and gives an introduction to the solution techniques of some classical PDEs and their applications in science and engineering																																				
Learning Outcomes and Competences	<p>By the end of this course, a student will be able to:</p> <ol style="list-style-type: none"> 1. solve higher order nonlinear differential equations 2. solve nonlinear autonomous systems 3. use Laplace transform for the solution of a wide range of ODEs and the systems formed by ODEs 4. solve the linear ODEs/system of ODEs with various right side functions including zero, constants, exponentials, sinusoids, step functions, impulses, and superpositions of these functions 5. use Fourier series to solve all forenamed differential equations of MATH 215 and MATH 216. 6. Solve classical PDEs by using separation of variables 																																				
Textbook and /or References	<ol style="list-style-type: none"> 1. Fundamentals of Differential Equations and Boundary Value Problems by Nagle, Saff and Snider, Pearson, Addison Wesley 2. Introduction to Ordinary Differential Equations by Shepley L. Ross. Fourth Edition, John Wiley and Sons 																																				

Assessment Methods and Criteria	In-Term Studies		Quantity	Percentage%
	Mid-terms		1	40
	Quizes		0	0
	Assignments		0	0
	Attendance		0	0
	Practice		0	0
	Project		0	0
	Final Examination		1	60
Total		2	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	3	42
	Assignments	7	4	28
	Mid-terms	1	14	14
	Project	0	0	0
	Final Examination	1	24	24
Total		37	48	150
Instructors				