



9. Differential Equations (PH026IU)

Course designation	<i>This course introduces fundamental mathematical methods and analysis in ordinary differential equations and their applications and a short introduction to partial differential equations.</i>
Semester(s) in which the course is taught	1, 2, summer semester
Person responsible for the course	Department of Mathematics
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, assignment.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/3.08 ECTS
Required and recommended prerequisites for joining the course	None



<p>Course learning outcomes</p>	<p>Upon the successful completion of this course students will be able to:</p> <table border="1" data-bbox="544 349 1406 909"> <thead> <tr> <th data-bbox="544 349 756 472">Competency level</th> <th data-bbox="756 349 1406 472">Course learning outcome (CLO)</th> </tr> </thead> <tbody> <tr> <td data-bbox="544 472 756 658">Knowledge</td> <td data-bbox="756 472 1406 658">CLO1. Solve mathematical problems by using first order, second order, numerical methods, series solutions, Laplace transforms and Fourier series.</td> </tr> <tr> <td data-bbox="544 658 756 808">Skill</td> <td data-bbox="756 658 1406 808">CLO2. Apply the techniques, skills, and modern engineering tools to engineering practice</td> </tr> <tr> <td data-bbox="544 808 756 909">Attitude</td> <td data-bbox="756 808 1406 909">CLO3. Confidence when applying differential equations to practical situations.</td> </tr> </tbody> </table>	Competency level	Course learning outcome (CLO)	Knowledge	CLO1. Solve mathematical problems by using first order, second order, numerical methods, series solutions, Laplace transforms and Fourier series.	Skill	CLO2. Apply the techniques, skills, and modern engineering tools to engineering practice	Attitude	CLO3. Confidence when applying differential equations to practical situations.													
Competency level	Course learning outcome (CLO)																					
Knowledge	CLO1. Solve mathematical problems by using first order, second order, numerical methods, series solutions, Laplace transforms and Fourier series.																					
Skill	CLO2. Apply the techniques, skills, and modern engineering tools to engineering practice																					
Attitude	CLO3. Confidence when applying differential equations to practical situations.																					
<p>Content</p>	<p><i>The description of the contents should clearly indicate the weighting of the content and the level.</i></p> <p>Weight: lecture session (2 hours)</p> <p>Teaching levels: I (Introduce); T (Teach); U (Utilize)</p> <table border="1" data-bbox="544 1144 1430 1671"> <thead> <tr> <th data-bbox="544 1144 1198 1223">Topic</th> <th data-bbox="1198 1144 1326 1223">Weight</th> <th data-bbox="1326 1144 1430 1223">Level</th> </tr> </thead> <tbody> <tr> <td data-bbox="544 1223 1198 1290">Chapter 1: Introduction</td> <td data-bbox="1198 1223 1326 1290">1</td> <td data-bbox="1326 1223 1430 1290">I, T,U</td> </tr> <tr> <td data-bbox="544 1290 1198 1357">Chapter 2: First Order Differential Equations</td> <td data-bbox="1198 1290 1326 1357">2</td> <td data-bbox="1326 1290 1430 1357">I, T,U</td> </tr> <tr> <td data-bbox="544 1357 1198 1435">Chapter 3: Second Order Linear Equations</td> <td data-bbox="1198 1357 1326 1435">4</td> <td data-bbox="1326 1357 1430 1435">I, T,U</td> </tr> <tr> <td data-bbox="544 1435 1198 1514">Chapter 4: The Laplace Transform</td> <td data-bbox="1198 1435 1326 1514">3</td> <td data-bbox="1326 1435 1430 1514">I, T,U</td> </tr> <tr> <td data-bbox="544 1514 1198 1581">Chapter 5: Numerical Methods</td> <td data-bbox="1198 1514 1326 1581">3</td> <td data-bbox="1326 1514 1430 1581">I, T,U</td> </tr> <tr> <td data-bbox="544 1581 1198 1671">Chapter 6: Partial Differential Equations and Fourier Series</td> <td data-bbox="1198 1581 1326 1671">2</td> <td data-bbox="1326 1581 1430 1671">I, T,U</td> </tr> </tbody> </table>	Topic	Weight	Level	Chapter 1: Introduction	1	I, T,U	Chapter 2: First Order Differential Equations	2	I, T,U	Chapter 3: Second Order Linear Equations	4	I, T,U	Chapter 4: The Laplace Transform	3	I, T,U	Chapter 5: Numerical Methods	3	I, T,U	Chapter 6: Partial Differential Equations and Fourier Series	2	I, T,U
Topic	Weight	Level																				
Chapter 1: Introduction	1	I, T,U																				
Chapter 2: First Order Differential Equations	2	I, T,U																				
Chapter 3: Second Order Linear Equations	4	I, T,U																				
Chapter 4: The Laplace Transform	3	I, T,U																				
Chapter 5: Numerical Methods	3	I, T,U																				
Chapter 6: Partial Differential Equations and Fourier Series	2	I, T,U																				
<p>Examination forms</p>	<p>Exam</p>																					
<p>Study and examination requirements</p>	<p>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.</p> <p>Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</p>																					



Reading list	[1] Lecture Notes [2] W.E. Boyce, R.C. DiPrima, <i>Elementary Differential Equations and Boundary Value Problems</i> , 8th ed., John Wiley & Sons, 2004
--------------	--