Differential Equations

Course Code:

MATH 241

Course Period:

Autumn

Course Type:

Core

Credits:

4

Theoric:

3

Practice:

2

Laboratory Hour:

0

ECTS:

6

Prerequisite Courses:

Calculus II [1]
Course Language:

English

Course Objectives:

The aim of this course is to provide students with an understanding of first order and higher order ordinary differential equations and appropriate methods to solve some of these equations.

Course Content:

First order ODE’s (homogeneous and non-homogeneous, direct integration, integrating factors, substitution). Second order ODE’s (variation of parameters, reduction of order). Laplace transform and its applications. Power series solutions of second order linear differential equations, Frobenius method.

Course Methodology:

1: Lecture, 2: Problem Solving

Course Evaluation Methods:

A: Written examination

Learning Outcomes	**Program Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Solves some of the first and second order ODE’s using appropriate methods.	1	1,2	A
2) Knows Laplace transform and uses it to solve some ODE’s.	1	1,2	A
3) Uses power series to solve some ODE’s.	1	1,2	A

Week	**Topics**	**Study Materials**
1	Introduction (Basic definitions, Classification of DE's), Separable Equations, Homogeneous Equations	(From Textbook) 1.1,1.2,1.3,2.2
2	1st order linear DE's (Method of integrating factors), Bernoulli Equations, Discontinuous Coefficients	2.1,2.4
3	Riccati, Clairaut Equations, Substitution methods	Page 132
4	Exact Equations and integrating factors, Existence-Uniqueness Theorem for 1st order ODE's	2.6,2.8
5	Modeling with first order equations, 2nd order linear homogeneous equations with constant coefficients	2.3,3.1
6	Existence-Uniqueness Theorem for higher order ODE's, Fundamental set of solutions, Linear independence, Wronskian, Abel's Theorem	3.2
7	Complex roots of the characteristic equation, Repeated roots of the characteristic equation, Reduction of order, Homogeneous Cauchy-Euler Equation	3.3,3.4
8	Method of Undetermined Coefficients, Variation of Parameters	3.5,3.6

9	Variation of Parameters (continued), Non-homogeneous Cauchy-Euler Equation	3.5,3.6
10	Laplace Transform (definition, solutions of IVP's)	6.1,6.2
11	Step Functions, DE's with discontinuous forcing functions	6.3,6.4
12	Impulse Functions, The Convolution Integral, Review of Power Series	6.5,6.6,5.1
13	Series Solutions Near an Ordinary Point	5.2,5.3
14	Series Solutions Near a Regular Singular Point	5.4,5.5,5.6

Textbook	W. Boyce and R. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Ed., Wiley (2009)
Additional Resources	

Documents	
Assignments	
Exams	

IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-terms	2	100
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE	1	40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		**100**

No	Program Learning Outcomes	Contribution					
		1	2	3	4	5	
1	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied information in these areas to model and solve engineering problems.					X	

2	Ability to identify, formulate, and solve Electrical and Electronics Engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.						
3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose.						
4	Ability to devise, select, and use modern techniques and tools needed for engineering practice; ability to employ information technologies effectively.						
5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating engineering problems						
6	Ability to access information; For this purpose ability to perform database searching and conduct literature review.						
7	Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually.						
8	Ability to communicate effectively both orally and in writing; knowledge of a minimum of one foreign language.						
9	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself.						
10	Awareness of professional and ethical responsibility.						
11	Information about business life practices such as project management, risk management, and change management; awareness of entrepreneurship, innovation, and sustainable development.						
12	Knowledge about contemporary issues and the global and societal effects of engineering practices on health, environment, and safety; awareness of the legal consequences of engineering solutions.						

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (14x Total course hours)	14	5	70
Hours for off-the-classroom study (Pre-study, practice)	14	4	56

Mid-terms (Including self study)	2	8	16
Final examination (Including self study)	1	12	12
Total Work Load			154
Total Work Load / 25 (h)			6.16
ECTS Credit of the Course			6