COURSE DESCRIPTIONS

Faculty	**Science and Information Technology**				
Department	**Mathematics**			**NQF level**	
Course Title	**mathematical method**	**Code**	**505252**	**Prerequisite**	**-**
Credit Hours	**3**	**Theory**	**3**	**Practical**	**-**
Course Leader	**Dr.Hamzeh Zureigat**	**email**	**hamzeh.zu@jadara.edu.jo**		
Lecturers	**Dr.Hamzeh Zureigat**	**emails**	**hamzeh.zu @jadara.edu.jo**		
Lecture time	**8:30 -10:00**	**Classroom**	**-**		
Semester	**second semester**	**Production**		**Updated**	
Awards	**-**			**Attendance**	Fulltime

Short Description

- the primary objective of the course is introduce to Fourier series, beta and gamma functions, definition of the Laplace transform, calculating inverse Laplace transforms, Legendre and associated Legendre functions, eigenvalues and Eigen functions, strum- liouville boundary value problems, series solutions near regular singular points (Bessel functions).

Course Objectives

- Periodic functions
- Fourier series
- Fourier sine and cosine series
- Special types functions (Error/ gamma / beta functions)
- Definition of the Laplace Transform.
- Calculating inverse Laplace Transforms
- Laplace Transform Solution of differential equations with polynomial coefficients.
- Legendre and associated Legendre functions
- Eigenvalues and Eigen functions
- Sturm- Liouville Boundary Value problems,
- Bessel functions

Learning Outcomes
A. Knowledge - Theoretical Understanding
a1) Discuss and interpret the foundational ideas of Periodic functions and Fourier series and Fourier sine and cosine. a2) Define and Solve the concepts of Laplace transform and calculating inverse Laplace transforms.
B. Knowledge - Practical Application
a3) Analyze and apply properties of Special types functions and solve the Sturm- Liouville Boundary Value problems solve problems involving Legendre functions and Bessel functions and solve problems involving Bessel functions b1) Evaluate inverse Laplace transforms. Also, solving differential equations with polynomial coefficients involving Laplace transform..
C. Skills - Generic Problem Solving and Analytical Skills
b2) Distinguish and implement techniques for solving special types functions, Legendre equations, Sturm- Liouville Boundary Value problems and Bessel functions
D. Skills - Communication, ICT, and Numeracy
c1) Formulate and solve various types of integral problems and certain applications using special types functions.
E. Competence: Autonomy, Responsibility, and Context
Teaching and Learning Methods
• E-learning. • Distance learning using (Microsoft Teams). • Problem based learning (PBL), • Direct students to self-learning through textbooks, library, e-library, and research papers. • Tutorials and discussion.
Assessment Methods
Lectures, Assignments, Exams, Quizzes, Discussion and Interaction

Course Contents					
W	**Hours**	**CLOs**	**Topics**	**Teaching & Learning Methods**	**Assessment Methods**
1.	**3**	**a1**	Periodic functions	Lecturing, examples, Discussion.	Assignments, Exams, Quizzes, Discussion and Interaction
2.	**3**	**a1, b1**	Fourier series	Lecturing, examples, Discussion.	Assignments, Exams, Quizzes, Discussion and Interaction
3.	**3**	**a2, b1**	Fourier sine and cosine series	Lecturing, examples Discussion.	Assignments, Exams, Quizzes, Discussion and

					Interaction
4.	**3**	**a2, b1, c1.**	Special types functions (Error and gamma functions)	Lecturing, examples Discussion.	Assignments, Exams, Quizzes, Discussion and Interaction
5.	**3**	**a3,c1**	Special types functions (beta functions)	Lecturing, examples Discussion.	Assignments, Exams, Quizzes, Discussion and Interaction
6.	**3**	**a2, b1**	Definition of the Laplace Transform	Lecturing, examples Discussion.	Assignments, Exams, Quizzes, Discussion and Interaction
7.	**3**	**a2, b1**	Calculating inverse Laplace Transforms	Lecturing, oral discussion	Assignments, Exams, Quizzes, Discussion and Interaction
8.	**3**	**a2, b1**, **c1**	Laplace Transform Solution of differential equations with polynomial coefficients	Lecturing, oral discussion	Assignments, Exams, Quizzes, Discussion and Interaction
9.	**3**	**a3**	Legendre functions	Lecturing, examples	Assignments, Exams, Quizzes, Discussion and Interaction
10.	**3**	**a3, b2**	Orthogonally and Normalization of Legendre polynomials	Lecturing, examples	Assignments, Exams, Quizzes, Discussion and Interaction
11.	**3**	**a3**	Legendre and associated Legendre series	Lecturing, examples	Assignments, Exams, Quizzes, Discussion and Interaction
12.	**3**	**a3, b2**	Eigenvalues and Eigen functions	Lecturing, oral discussion	Assignments, Exams, Quizzes, Discussion and Interaction
13.	**3**	**a3, b2**	Sturm- Liouville Boundary	Lecturing, oral discussion	Assignments, Exams,

			Value problems		Quizzes, Discussion and Interaction
14.	**3**	**a3, b2**	Nonhomogeneous Boundary value problems. Kinds of Sturm – Liouville problems.	Lecturing, examples	Assignments, Exams, Quizzes, Discussion and Interaction
15.	**3**	**b2**	Bessel functions	Lecturing, examples	Assignments, Exams, Quizzes, Discussion and Interaction

Infrastructure	
Textbook	Advanced engineering mathematics o'neil 8th edition
References	1. Elementary Differential Equations and Boundary Value Problems, Boyce and Diprima. 9th ed., 2010. (QA371, B77) 2. Mathematical Physic, Butkov. 1968. (QA401, B78) 3. Advanced Engineering Mathematics. O'Neil. 5th ed., 2003. (QA401, O54)
Required reading	
Electronic materials	
Other	

Course Assessment Plan								
Assessment Method		**Grade**		**CLOs**				
			a1	**a2**	**a3**	**b1**	**b2**	**c1**
First (Midterm)		30	5	5	5	10	5	0
Second (if applicable)								
Final Exam		50	8	12	10	8	7	5
Coursework								
Coursework assessment methods	Assignments	10	3	3	3			
	Case study							
	Discussion and interaction							
	Group work activities							
	Lab tests and assignments							
	Presentations							

	Quizzes	10				5	6	
Total		100						

Plagiarism
Plagiarism is claiming that someone else's work is your own. The department has a strict policy regarding plagiarism and, if plagiarism is indeed discovered, this policy will be applied. Note that punishments apply also to anyone assisting another to commit plagiarism (for example by knowingly allowing someone to copy your code). Plagiarism is different from group work in which a number of individuals share ideas on how to carry out the coursework. You are strongly encouraged to work in small groups, and you will certainly not be penalized for doing so. This means that you may work together on the program. What is important is that you have a full understanding of all aspects of the completed program. In order to allow proper assessment that this is indeed the case, you must adhere strictly to the course work requirements as outlined above and detailed in the coursework problem description. These requirements are in place to encourage individual understanding, facilitate individual assessment, and deter plagiarism.

Chair of Mathematics Department: Dr. Belal Batiha

Course Leader: Dr. Hamzeh Zureigat