Jordan University of Science and Technology
Faculty of Science & Arts
Physics Department

PHY301 Mathematical Physics (2) - JNQF Level: 7
Second Semester 2024-2025

Course Catalog

3 Credit Hours. Second order differential equation, Frobenious method, Dirac delta function. Gamma and Beta functions, generalized factorials, Euler constant and Weistrass formula. Sturm-Liouville problem, Bessel inequality, Gram-Schmidt orthonormalization, Hermitian operators. Bessel functions, Neuman functions, Hankel functions, spherical Bessel functions. Legendre functions, Rodrigues formula, generating function, spherical harmonic, addition theorem.

Teaching Method: On Campus

Text Book	
Title	Special Functions for Scientists and Engineers
Author(s)	Nabil L. Laham & Asad K. Abdalla
Edition	3rd Edition
Short Name	1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
2	Mathematical methods in the physical science	Mary L. Boas.	2nd Edition	

Class Schedule & Room

Section 1:
 Lecture Time: Sun, Tue, Thu : 15:00 - 16:00
 Room: PH2102

Prerequisites		
Line Number	**Course Name**	**Prerequisite Type**
922512	PHY251 Modern Physics	Prerequisite / Pass

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Week 1	Frobenious method of solving 2nd ODE	**Ch2** From **1**
Week 2	Dirac delta function	**Ch2** From **1**
Week 3	Gamma functions	**Ch3** From **1**
Week 4	Beta Functions	**Ch3** From **1**
Week 5	Sturm-Liouville problem	**Ch4** From **1**
Week 6	Bessel equation and Bessel function, Bessel function as an integral formula	**Ch5** From **1**
Week 7	Neuman functions and Wronskian	**Ch5** From **1**
Week 8	Spherical Bessel function, Application of Bessel functions to heat equation	**Ch5** From **1**
Week 9	Legendre equation and Legendre functions	**Ch6** From **1**
Week 10	Generating function and Rodregues formula	**Ch6** From **1**
Week 11	Associated Legendre polynomials	**Ch6** From **1**
Week 12	Spherical harmonics, Applications to heat equation	**Ch6** From **1**
Week 13	Addition theorm	**Ch6** From **1**
Week 14	Other special functions	**Ch7** From **1**

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
To solve 2nd order differential equations, and ability to handle Dirac delta function. [3SLO1(K1S1)] [1L7K1, 1L7S1]	34%	
Understanding the properties of Hermitian operators, and how to build an orthonormal set [3SLO1(K1S1)] [1L7K1, 1L7S1]	33%	
Learn how to solve Laplace's equation in cylindrical and in spherical coordinates using Bessel and Legendre functions [3SLO1(K1S1)] [1L7K1, 1L7S1]	33%	

Relationship to Program Student Outcomes (Out of 100%)					
SLO1(K1S1)	SLO2(S23C1)	SLO3(C24)	SLO4(C3)	SLO5(C4)	SLO6(S2C3)
100					

Relationship to NQF Outcomes (Out of 100%)	
L7K1	L7S1
50	50

Evaluation	
Assessment Tool	**Weight**
First Exam	20%
Second Exam	20%
HW	20%
Final Exam	40%

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