

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
PHYSICS DEPARTMENT
METHODS OF THEORETICAL PHYSICS (Phys 210)
Spring (Second Semester) 2021
(Term 202)

Instructor : Thamer Al-Aithan
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Office Hours : Times can be checked at my office and/or website. You can see me by a ppointment, too.

Course Description: ENABLE STUDENTS WITH REQUIRED MATHEMATICAL TOOLS AND SKILLS NEEDED FOR UPPER LEVEL PHYSICS COURSES.

Topics covered include: Vector Calculus, Matrix algebra, Fourier Series and Transforms, Functions of a complex variable; Contour integration and Residue theorem; Orthogonal Polynomials; Partial differential equations; Introduction to tensors.

Course Learning Outcomes: -Learn basic tools & skills in Math at intermediate level
-Use Math tools & Skills to solve simple physics problems

Prerequisites : CO-REQUISITE Math 202

Text : MATHEMATICAL METHODS IN THE PHYSICAL SCIENCES, 3rd Edition 2006, by Mary Boas, Published by John Wiley

References :

- 1- Wong C.W. - Introduction to Mathematical Physics. Methods and Concepts 2nd Ed-Oxford University Press (2013).
- 2- M. P HOBSON, K. F RILEY; 1st edition (January 1, 2005), CAMBRIDGE UNIVERSITY PRESS.
- 3- *TAI L. CHOW* Mathematical Methods for Physicists:A concise introduction, Cambridge University Press; 1st edition (July 1, 2000).

Grading Policy :

Homework+Quizzes	15%
First Major Exam	35%
Final Exam (comperhensive)	50%

Dates	Week No.	Topic	Sec in Textbook	Homework
	1	Review chap 1,2 and 3. INFINITE SERIES, POWER SERIES. COMPLEXNUMBERS. LINEARALGEBRA	Chap 1, 2 and 3 Textbook	Chap#1; Boas-1.2,2.3, 2.9, 4.1, 4.5,5.3,5.5,6.4,6.9,6.19,7.1,10.5,10.7 Chap#2 -5.7,5.21,5.26,5.32,6.2,6.8,7.4,7.5,9.10,9.19, 10.22,10,23,11.11,11.17,12.12,12.15 chap3 ;2.13,2.17,3.9,3.11,3.17,5.3,5.6,5.10,5.21,5.37, 5.39,6.6,6.17,6.21,7.1,7.4,7.13,7.21,7.32,7.35,8.2 ,8.6,8.12,8.17,8.23,9.3,9.19,10.2,10.4,10.5 ,11.19 by hand,11.25 by computer,11.42 ,11.51,11.55,12.14
	2	Linear Vector Spaces, Eigenvalues and Eigenvectors	3.7-3.12	
	3	Vector Differentiation, Fields, Gradient	6.1-6.6	chap#6;;3.1,3.12,4.2,4.9,6.3,6.6,6.9,6.13,6.11,7.6 ,7.15,8.1,8.5,8.11,9.6,9.7,10.2,10.5,11.2,11.3
	4	Line Integrals, Green's Theorem, Divergence, Curl	6.7-6.12	
	5	Fourier series and Fourier Coefficients	7.1-6.6	
	6	Fourier Transforms, Applications	7.7-7.12	chap# 7;;2.10,2.18,3.3,4.4,4.1,5.1,8.15 a) only ,9.5,9.6,11.5,12.3,12.6,12.18,12.24
	7	Analytic Functions, Contour Integrals, Residue Theorem	14.1-14.6	
	8	Applications, Conformal Mappings	14.7-14.10	Chapter 14;;2.23,2.46,3.15,3.18,4.11,5.1,6.2,6.15 ,6.20,7.11,7.3,7.28,9.4
	9	Legendre and Associated Legendre Polynomials	10	
	10	Bessel Functions, Hermite Polynomials	12.11-12.22	Chapter12;;1.,3.3,4.4,5.3,5.9,6.5,7.4,8.2,9.2,10.3 ,10.7,11.10,12.2,16.14,19.2,22.3
	11	Laplace's Equation, Heat Equation	13.1-13.5	
	12	Poisson's Equation, Integral Transforms	13.6-13.10	Chap13; 1.1,2.1
	13	Cartesian Tensors, Pseudo vectors and Pseudo tensors, Applications	10.1-10.7	
	14-15	Selected Topics		