

FIZ 362E – MATHEMATICAL METHODS IN PHYSICS -II COURSE SYLLABUS - SPRING 2021

Instructor: Dr. Meltem Güngörmez

Course Days : Thursday 15:30-17:30, Zoom

Friday 15:00-18:00, Zoom

e-mail : gungorm@itu.edu.tr

Course Outline:

Hypergeometric Differential Equation's Solution and Hypergeometric Function
Writing the Legendre Differential Equation in terms of the Hypergeometric Equation
Confluent-Hypergeometric Differential Equation Solution and Confluent-Hyp. Function
Demonstration of differential equations such as Legendre, Laguerre, Hermite, Bessel, Chebyshev, Gegenbauer as a special form of Hypergeometric or Confluent-Hypergeometric equations
Analysis of the Laplace Equation by Separation Method
Analysis of the Schrodinger equation with continuous potential examples
Analysis of Helmholtz, wave and diffusion equations
Introduction to group theory in physics, finite groups, cyclic groups, symmetric groups and Pauli exclusion principle
Definition of Lie Groups, Isometry group definition, Various examples $SO(2)$, $SO(3)$, $SU(2)$, $SU(1,1)$
Definition of Lie Algebras, definition of finite and infinite dimensional representations $SO(3)$ and Angular Momentum algebra, Examination of $SU(2)$ and Pauli Spin Matrices
Poincare Group, Definition of Mass and Spin as Casimir operators.
How we look at the interaction through Lie algebras
Green Function method in Sturm-Liouville type equations

References:

Mathematical Methods For Physicists, G.Arken

Classical Electrodynamics, J.D.Jackson

Mathematics For Physicists, P.Dennery And A.Krzywicki

Quantum Mechanics Non-Relativistic Theory, Third Edition:L.D.Landau,Liftshiltz 1976

Grading :

Midterm	(35%)	(1)
Quizes	(15%)	(7)
Homeworks	(10%)	(6)
Final	(40%)	(1)