

PHY7101: METHODS OF MATHEMATICAL PHYSICS 2(2-0)

1. Course Name: Methods of Mathematical Physics

2. Course Code: PHY7101

3. Credit Units: 2

4. Course Description:

This course covers all the mathematics required for the postgraduate courses. All the operators, functions and numerical analysis treated has physics-related examples.

5. Course Objectives:

At the end of the course, the students should be able to:

- Use all types of operators and apply them to finite and infinite dimensional spaces.
- Use functions of complex variable in real situations.
- Apply special functions to physics problems.

6. Course Outline:

Content	Hours
Tensors and Hilbert Space.	5
Operators: Linear and non-linear operators; self-adjoint, unitary and anti-unitary operators; Operators in infinite dimensional spaces; Integral and differential operators; projection operators.	7
Functions of a complex variable: Calculus of residues; branch cuts, Riemann sheets and surfaces; analytic continuation, Dispersion relations; method of steepest descent; the function.	10
Special functions (and asymptotic forms where applicable): Legendre, Bessel, Hermite, Laguerre, Beta, Gamma, Hypergeometric functions.	8
Integral equations and their kernels (Laplace, Euler, Mellin, etc).	5

Selected topics in Numerical methods.	5
Green's functions.	5
Total	45

7. Mode of Delivery:

This course will consist mainly of lecture sessions.

8. References:

1. Boas, M.L.: Mathematical Methods in the Physical Sciences. John Wiley & Sons (1966).
2. Erwin Kreyszig.: Advanced Engineering Mathematics. Wiley International Ltd.