CO-PO attainment
in
CCFUP Programme
in
Outcome Based Education

Department of Physics

Government General Degree College, Kalna-I

Program Outcome (PO)

- ❖PO1: Disciplinary knowledge
- ❖PO2: Communication Skills
- ❖PO3: Critical thinking
- ❖PO4 : Problem solving
- ❖PO5: Self directed learning
- ❖PO6: Research-related skills
- ❖PO7: Scientific reasoning
- ❖PO8: Information/digital literacy
- ❖PO9: Lifelong learning

Program Specific Outcome (PSO): UG Physics

- ❖PSO1: **Foundation for Theoretical Concepts of Physics:** To use theoretical methodologies to explain physical laws around us.
- ❖PSO2: **Foundation for Experimental/Numerical tools of Physics :** The ability to implement/visualize the theoretical knowledge through laboratory based experimental /numerical techniques.
- ❖PSO3: **Foundation for possible further developments** : The ability to grasp the scientific ideas behind different physical laws and connecting them to broad area of real life applications and provide new ideas and innovations towards research.

Course Content

Semester: I

Course code : Major-Physics

Course name: Mathematical Physics-I

Course Code: PHYS1011
(Credits: Theory-03, Practicals-01)

MAJOR-I: F.M.=75 (Theory-40, Practical–20, Internal Assessment–15)

COURSE OBJECTIVE: The aim of this course is to equip the students with mathematical methods that are important prerequisites for physics courses.

Theory: 45 Lectures

Calculus:

Recapitulation: Limits, Continuity, Average and instantaneous quantities, Differentiation. Plotting functions. Intuitive ideas of continuous, differentiable etc. functions and plotting of curves. Approximation: Taylor and binomial series (statements only). (3 Lectures)

First Order and Second Order Differential equations: First Order Differential Equations and Integrating Factor. Homogeneous Equations with constant coefficients. Wronskian and general solution. Statement of the existence and the Uniqueness theorem for Initial Value Problems. Particular Integral. (9 Lectures)

Calculus of functions of more than one variable: Partial derivatives, Exact and inexact differentials. (6 Lectures)

Vector Calculus:

Recapitulation of vectors: Properties of vectors under rotations. Scalar product and its invariance under rotations. Vector product, Scalar triple product and their interpretation in terms of area and volume respectively. Scalar and Vector fields. (5 Lectures)

Vector Differentiation: Directional derivatives and normal derivative. Gradient of a scalar field and its geometrical interpretation. Divergence and curl of a vector field. Del and Laplacian operators. Vector identities. (6 Lectures)

Vector Integration: Ordinary integrals of vectors, Multiple integrals, Jacobian. Notion of an infinitesimal line, surface and volume elements. Line, surface and volume integrals of vector fields. Flux of a vector field, Gauss' divergence theorem. Green's and Stokes Theorems and their applications (no rigorous proofs). (10 Lectures)

Orthogonal Curvilinear Coordinates: Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems. (6 Lectures)

Practical: 30 Lectures

Introduction and Overview: Computer architecture and organization, Memory, Input/Output devices.

Basics of scientific computing: Binary and decimal arithmetic, Floating point numbers, Algorithms, Sequence, Selection and Repetition, Single and double precision arithmetic, Underflow and overflow, Emphasize the importance of making equations in terms of dimensionless variables, Iterative methods.

Errors and Error-Analysis: Truncation and round off errors, Absolute and relative errors, Floating point computations.

Review of C & C++ Programming Fundamentals: Introduction to Programming, Constants, Variables, Data types, Operators and expressions, I/O statements, scanf and printf, cin and cout, Manipulators for data formatting, Control statements (Decision making statements: if statement, if else Statement, Nested if structure, else if ladder statement, Ternary Operator, goto statement, switch case statement. Unconditional and conditional looping: while loop, do-while loop, for loop, break and continue statements, Nested loops). Arrays (1D & 2D), Strings, User defined functions, Structure and Union, Idea of classes and objects.

1. Write and execute a program in C/C++ to compute the factorial of a positive integer including Zero.
2. Write and execute a program in C/C++ to calculate sum of squares of n natural numbers.
3. Write and execute a program in C/C++ to find the area and the volume of a Sphere by varying the radius.
4. Write and execute a program in C/C++ to display Fibonacci series.
5. Write and execute a program in C/C++ to find the value of Sine function using power series
6. Write and execute a program in C/C++ to find the value of Cosine function using power series
7. Write and execute a program in C/C++ to find the value of ex (x will be given during execution of the program).
8. Write and execute a program in C/C++ to sort elements of an array of elements in ascending/ descending order.
9. Write and execute a program in C/C++ to separate odd and even integers in arrays.
10. Write and execute a program in C/C++ to find the largest and smallest in a given set of numbers.
11. Write and execute a program in C/C++ to calculate value of π.

Course Outcome (CO)		Paper: PHYS1011		
Sl. No.	**Course Outcome (CO)**	**Knowledge Level**	**POs**	**PSOs**
Theory				
1	**Discussion** of the fundamental concepts of calculus, graphical representation, and approximation techniques. **Identification** and classification of different types of differential equations.	**L1: Remembering**	**1,2,3,7,8,9**	**1,2,3**
2	**Computation** of the First Order and Second Order Differential Equations, and solution of Particular Integral of a non-homogeneous linear differential equation. **Demonstration** of the concept of Partial derivatives.	**L3: Applying**	**1,2,3,4,5,6,7,8,9**	**1,2,3**
3	**Discussion** of the fundamental properties of vector algebra.	**L1: Remembering**	**1,2,3,4,5,7,9**	**1,2,3**
4	**Computation** of the differentiation and integration of vector fields and application of the techniques to solve problems in electromagnetism, fluid dynamics, and other fields.	**L3: Applying**	**1,2,3,4,5,6,7,8,9**	**1,2,3**
5	**Development** of a deeper understanding of orthogonal curvilinear coordinate systems of vector calculus and its geometric underpinnings.	**L6: Creating**	**1,2,3,4,5,6,7,8,9**	**1,2,3**
Practical				
1	**Outline** of the C Programming fundamentals	**L1: Remembering**	**1,2,3,4,5,6,7,8,9**	**1,2,3**
2	**Computation** of basic mathematical operation using C programinning	**L3: Applying**	**1,2,3,4,5,6,7,8,9**	**1,2,3**

Programme Articulation Matrix (CO-PO Matrix)

		Program Outcome (PO) & Program Specific Outcome (PSO)											
	CO	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3
Theory	1	3	3	2	-	-	-	2	3	3	3	2	2
	2	3	3	2	2	2	2	2	2	2	2	2	2
	3	2	2	3	3	3	-	3	-	3	3	3	3
	4	3	3	3	3	3	3	3	2	2	2	3	3
	5	3	2	3	3	2	3	3	2	2	2	3	3
Practical	1	3	3	3	3	3	3	3	3	3	3	3	3
	2	3	3	3	3	3	3	3	3	3	3	3	3
	Average	2.9	2.7	2.7	2.8	2.7	2.8	2.7	2.8	2.6	2.6	2.7	2.7

Course Content

Semester: I

Course code : Minor-Physics

Course name: Mathematical Physics-I

Course Code: PHYS1021
(Credits: Theory-03, Practicals-01)

MINOR-I: F.M.=75 (Theory-40, Practical–20, Internal Assessment–15)

COURSE OBJECTIVE: The aim of this course is to equip the students with mathematical methods that are important prerequisites for physics courses.

Theory: 45 Lectures

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	4	3	3	3	3	3	3	3	2	2	2	3	3
	5	3	2	3	3	2	3	3	2	2	2	3	3
Practical	1	3	3	3	3	3	3	3	3	3	3	3	3
	2	3	3	3	3	3	3	3	3	3	3	3	3
	Average	2.9	2.7	2.7	2.8	2.7	2.8	2.7	2.8	2.6	2.6	2.7	2.7