Semester I
Course Name: Classical Mechanics
Course Code: PP2011

No. of hours per week	No. of credits	Total No. of hours	Marks
6	4	90	100

Objectives

1. To have in depth knowledge in classical mechanics.
2. To enable students to develop skills in formulating and solving physics problems.
3. To study the kinematics of the rigid body through Euler equation.
4. To get knowledge in central force field and relativity.

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	understand the basic mechanical concepts related to single and system of particles.	PSO - 1	U
CO - 2	apply various mechanical principles to find solution for physical problems.	PSO - 4	Ap
CO - 3	solve the equations of motion using Lagrangian, Hamilton and Hamilton-Jacobi equations.	PSO - 6	C
CO - 4	explain the origin of coriolis and centrifugal terms in the equation of motion in a rotating frame.	PSO - 1	R
CO - 5	understand and develop a scientific knowledge in central force problems and relativity	PSO - 7	U

Teaching Plan

Total contact hours: 90 (Including lectures, assignments and Tests)

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	Lagrangian Formulation					
	1	Lagrangian formulation: System of particles - Constraints and degrees of freedom-	4	To understand the basic concepts of system of particles and	Illustration, Theoretical formulation, Lecture discussion	Evaluation through:

		Generalized coordinates, Force and Energy		generalized coordinates		multiple choice questions
	2	Conservation laws - Conservations of linear and angular momenta - Symmetric properties – Homogeneity and isotropy	4	To be able to understand the concept of conservation laws, homogeneity and isotropy	Theoretical formulation, Illustration, Lecture discussion	Quiz, short questions Problem solving
	3	D'Alemberts principle of virtual work - Lagrange's equation of motion - non holonomic systems	3	To formulate Lagrange's equation of motion using D'Alembert' s principle	Theoretical formulation, Illustration, Lecture discussion, PPT	Formative assessment
	4	velocity dependent potential - Dissipative force – Newtonian and Lagrangian Formalism	4	To understand the Newtonian and Lagrangian formalism	Illustration, Theoretical formulation, Lecture discussion	Deriving theoretical formulas Short test
II	Hamilton's Equation and Canonical Transformation					
	1	Calculus of variation - Principle of least action - Hamilton's principle - Hamilton`s function	4	To formulate Hamilton's function using Hamilton's principle	Illustration, PPT, theoretical formulation	Evaluation through: multiple choice questions
	2	Lagrange's equation from Hamilton's principle - Hamilton's	3	To derive Lagrange's equation from	Illustration, PPT, theoretical formulation	Quiz, short questions

		principle for non holonomic system		Hamilton's principle		Problem solving
	3	Variational principle - Hamilton's equations from variational principle - Legendre transformation and Hamilton's equation of motion	4	To understand the concept of variational principle and derive Hamilton's equation from variational principle	Lecture discussion, Illustration, PPT, theoretical formulation	Formative assessment
	4	Canonical transformations- Hamilton's canonical equations - Generating functions- Examples - Poisson brackets and its properties.	4	To understand the concept of canonical transformation and poisson bracket	Illustration, Lecture discussion, theoretical formulation	Deriving theoretical formulas Short test
III	**Hamilton-Jacobi Theory and Small Oscillations**					
	1	Hamilton-Jacobi equation for Hamilton's principal function - Example: Harmonic oscillator problem	4	To derive the Hamilton-Jacobi equation for Hamilton's principal function and to solve the Harmonic oscillator problem.	Illustration, theoretical formulation, Lecture discussion	Evaluation through: multiple choice questions Quiz, short questions
	2	Hamilton's characteristic function -	3	To formulate the Hamilton's	Illustration, PPT, theoretical formulation	

		Action - Angle variable		characteristic function and explain the Action - Angle variable		Problem solving
	3	Application to Kepler problem in action angle variables. Eigen value equation	4	To analyze the application to Kepler problem in action angle variables; To solve Eigen value equation.	Illustration, theoretical formulation, Lecture discussion	Formative assessment
	4	Normal coordinates - Normal frequencies of vibration – Free Vibrations of linear tri atomic molecule.	4	To discuss the Normal coordinates and Normal frequencies of vibration and to derive the normal frequencies of free vibrations of linear tri atomic molecule.	Illustration, PPT, theoretical formulation	Deriving theoretical formulas Short te**st**
IV	**Kinematics of Rigid Body**					
	1	Independent coordinates of rigid body - Orthogonal transformation - Properties of transformation matrix	4	To understand the concept of Independent coordinates of rigid body. To derive the Orthogonal transformation and Properties of transformation matrix	Illustration, theoretical formulation, Lecture discussion	Evaluation through: multiple choice questions Quiz, short questions
	2	Euler angle and Euler's theorem - Infinitesimal	3	To derive Euler angle and Euler's theorem. To	Illustration, PPT, theoretical formulation	Problem solving

		rotation - Coriolis force		understand the concept of Infinitesimal rotation and Coriolis force.		Formative assessment
	3	Angular momentum and kinetic energy of motion about a point - Moment of inertia tensor - Euler's equations of motion	4	To derive the relation between the angular momentum and kinetic energy of motion about a point. To derive the Moment of inertia tensor and Euler's equations of motion.	Illustration, theoretical formulation, Lecture discussion	Deriving theoretical formulas Short test
	4	Force free motion of a symmetrical top - Heavy symmetrical top with one point fixed	4	To analyze the torque free motion of a symmetrical top and to discuss the heavy symmetrical top with one point fixed.	Illustration, PPT, theoretical formulation	
V	**Central Force Problem and Theory of Relativity**					
	1	Reduction to the equivalent one body problem- Centre of mass- Equation of motion and first integral- classification of orbits	3	To derive the reduced mass of the equivalent one body problem. To understand the concept of Centre of mass, Equation of motion and first integral. To discuss	Illustration, theoretical formulation, Lecture discussion	Evaluation through: multiple choice questions Quiz, short questions

				the classification of orbits based on the eccentricity.		Problem solving
	2	Kepler problem: Inverse-Square law of force - Scattering in a central force field - Transformation of scattering to laboratory coordinates.	4	To derive the Kepler problem: Inverse-Square law of force. To understand the concept of Scattering in a central force field. To transfer the scattering to laboratory coordinates.	Illustration, theoretical formulation, Lecture discussion	Formative assessment Deriving theoretical formulas
	3	Virial theorem – Lorentz transformation - Relativistic Mechanics - Relativistic Lagrangian and Hamiltonian for a particle	4	To understand the Virial theorem. To derive the Lorentz transformation. To understand the concepts of Relativistic Mechanics and to derive the Relativistic Lagrangian and Hamiltonian for a particle.	Illustration, PPT, theoretical formulation, Lecture discussion	Short test
	4	Mass in Relativity - Mass and energy – Space-time diagram – Momentum vectors	4	To understand the concept of mass in relativity. To discuss the relation between	Illustration, PPT, theoretical formulation, Lecture discussion	

				Mass and energy; To analyze Space-time diagram and to derive the Momentum vectors.		

CO- Course Outcome; CL-Cognitive Level; R- Remember; U- Understand; Ap- Apply; C - Create.

Course Instructors: Dr.M.Priya Dharshini and Ms.S.Virgin Jeba

Semester I

Course Name: Mathematical Physics

Course Code: PP2012

No. of hours per week	No. of credits	Total No. of hours	Marks
6	4	90	100

Objectives

1. To emphasize the use of mathematical tools like evaluation of definite integrals in the field of classical and quantum mechanics.

2. To demonstrate competence with a wide variety of mathematical techniques to enhance problem solving skills.

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	apply the various theorems in complex analysis to evaluate definite integrals.	PSO - 4	E
CO - 2	determine the series solutions and the recurrence relations (Bessel, Legendre and Hermite differential equations) and solve problems associated with them.	PSO - 3	E
CO - 3	discuss the basic principles and methods used for the analysis of partial differential equations and apply the techniques to related problems.	PSO - 4	C
CO - 4	discuss the concepts of Fourier, Laplace and inverse Laplace transform, tensors, group theory and their properties.	PSO - 5	C
CO - 5	develop expertise in mathematical techniques required in physics and to enhance problem solving skills.	PSO - 6	An

Modules

Credit:4 **Total Hours:90 (Incl. Seminar & Test)**

Unit	Modules	Topics	Lecture hours	Learning outcome	Pedagogy	Assesment /Evaluation
I	**Complex Analysis**					
	1	Functions of Complex variable- Analytic functions – Cauchy – Riemann equations in cartesian and polar forms – Harmonic functions - Cauchy's integral theorem	4	To be able to identify the analytic functions by using the Cauchy's Riemann equations	PPT, Theoretical formulation and Problem solving	Evaluation through: Online quiz, through Google Classroom Assignments on Problem solving Short questions Descriptive answers Formative assessment
	2	Cauchy's integral formula – Taylor's Series – Laurent series	3	To be able to evaluate the integrals using Cauchy's formula and able to apply the series in computational science and approximation	Analysis and Problem solving	
	3	Cauchy's residue theorem – Singular points of an Analytic function – Evaluation of residues - application to evaluation of definite integrals –	4	To be able to apply the Cauchy's Residue theorem to evaluate the definite integrals of analytic functions	Analysis and Problem solving	
	4	Integration around a unit circle –Jordan's Lemma.	3	To be able to apply the Jordan's lemma to evaluate contour integrals	Analysis and Problem solving	
II	**Polynomials**					
	1	Legendre differential equation and Legendre functions – Generating functions	4	To acquire basic understanding of the partial differential equations and learn some	Analysis and Problem solving	Evaluation through: Online quiz, through Google Classroom

				methods for solving them.		Assignments on Problem solving Short questions Descriptive answers Formative assessment
	2	Rodrigue's formula – Orthogonal Properties - recurrence formula	3	To accomplish operations with differential equations along with the recurrence formulae	Analysis and Problem solving	
	3	Bessel differential equation – Bessel functions of I kind - recurrence formula and generating functions	4	To execute operations with Bessel differential equations	Analysis, Problem solving and comparative study	
	4	Hermite differential equations and Hermite polynomials - Generating functions & recurrence formula.	3	To carry out operations with Hermite differential equations along with the recurrence formulae	Analysis, Problem solving and comparative study	
III	**Differential and Partial Differential equations**					
	1	Homogeneous linear equations of second order with constant coefficients and their solutions	3	To be able to solve second order Homogenous differential equations	Analysis and Problem solving	Evaluation through: Online quiz, through Google Classroom Assignments on Problem solving Short questions Descriptive answers Formative assessment
	2	Ordinary second order differential with variable coefficients and their solution by power series and Frobenius methods	4	To be able to apply the power series and Frobenius methods to evaluate the solution of second order differential equations	Analysis and Problem solving	
	3	Solution of Laplace equation in Cartesian coordinates- Solution of heat flow equations	3	To be able to solve boundary value problems occur in steady state temperatures and of hydrodynamics	Analysis and Problem solving	
	4	Method of separation of variables – variable linear flow – One and two dimensional heat flow.	4	To be able to solve problems for heat flow	Analysis and Problem solving	

				equations in different dimensions under certain boundary conditions		
IV	**Tensors, Fourier and Laplace transforms**					
	1	Contravarient and Covarient Tensors - Addition and Subtraction – Outer product - inner product of tensors	3	To be able to solve mathematical problems involving tensors	Analysis and Problem solving	Evaluation through: Online quiz, through Google Classroom Assignments on Problem solving Short questions Descriptive answers Formative assessment
	2	Contraction of a tensor - Symmetric and anti-symmetric tensors – The Kronecker delta	3	To be equipped to use tensor algebra as a tool in the field of applied sciences	Analysis and Problem solving	
	3	Fourier transform- properties of Fourier transform - Fourier transform of a derivative	4	To be able to understand and apply the concept of Fourier transform to waveforms and spectra.	Analysis and Problem solving	
	4	Laplace transform- properties of Laplace transform- Inverse Laplace Transform.	4	To be able to use the Laplace transform equations for solving boundary value problems by directly changing the ordinary differential equations into algebraic equations.	Analysis and Problem solving	
V	**Group theory**					
	1	Group postulates – Abelian group – Cyclic group – Group multiplication table – Rearrangement theorem – Subgroups	3	To understand the mathematics of group theory	Descriptive lecture, Analysis and Problem solving	Evaluation through: Online quiz, through Google Classroom Assignments on Problem solving
	2	Isomorphism and Homomorphism – Symmetry elements and symmetry operations	4	To understand the symmetry and point group of molecules	Descriptive lecture, Analysis and Problem solving	

	3	Reducible and irreducible representations	3	To generate a representation and to reduce it to its irreducible representation	Descriptive lecture Analysis and Problem solving	Short questions
	4	The great orthogonality theorem - Character table for C_{2V}& C_{3V} point groups.	4	To determine the irreducibility of a reducible representation	Descriptive lecture Analysis and Problem solving	Descriptive answers Formative assessment

PO- Program outcome; LO – Learning outcome;
Cognitive Level R – Remember; U – Understand; Ap- Apply, An- Analyze; E-Evaluate; C- Create

Semester: I

Course Name: QUANTUM MECHANICS -I
Course code: PP2013

No. of hours per week	No. of credits	Total No. of hours	Marks
6	5	90	100

Objective

To help the students to acquire understanding of the fundamental concepts and mathematical tools necessary to solve the wave equations.

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	summarize the concept of wave function and the postulates of quantum mechanics.	PSO-1	U
CO - 2	formulate time dependent and time independent equation and solve them for simple potentials.	PSO-4	C
CO - 3	evaluate the eigen values and eigen function spin and total angular momenta and determine the matrices.	PSO-4	E
CO - 4	analyze the principles of quantum theory, equation of motion, scattering theory and angular momentum.	PSO-4	An

Modules

Credit:5 **Total Hours:90 (Incl. Seminar & Test)**

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Foundations of Wave Mechanics**					

		Wave packet – Time dependent Schrödinger equation – Interpretation of the wave function	4	To understand basic concepts of quantum mechanics by deriving group velocity, phase velocity and time dependent Schrodinger equation	PPT, Illustration and theoretical derivation	Evaluation through: Online quiz, Problem solving short questions Descriptive answers Formative assessment
		Admissibility conditions on the wave function – Hermitian operator – Postulates of quantum mechanics	4	To be able tounderstand the wave function and postulates of quantum mechanics	Illustration, Theoretical formulation Problem Solving	
		Simultaneous measurability of observables – General uncertainty relation – Ehrenfest's theorem	4	To analyze observables and their properties	PPT, Theoretical formulation and Problem solving	
II	**Eigen States and Many Electron Atoms**					
	1	Square-well Potential with Rigid Walls- Square Potential Barrier –Alpha Emision- Time independent Schrodinger equation	3	To understand the basic concepts and features related to Square-well Potential	PPT Illustration, lecture, and Problem solving	Evaluation through: Online quiz, short questions Descriptive answers Problem solving Formative assessment
	2	Time dependent Schrödinger equation – Stationary states - Eigen functions and eigen values	3	To relate time independent and time dependent Schrodinger equation	Descriptive lecturecomparative study	
	3	Kronig Penny square well periodic potential- Indistinguishable Particles- Particle Exchange Operator	3	Toformulate Kronig Penny square well periodic potential and operators	PPT, Theoretical formulation and Problem solving	

	4	Symmetric and Antisymmetric Wave Functions - Pauli Principle – Inclusion of spin	3	To understand Symmetric and Antisymmetric Wave Functions	Illustration, Theoretical formulation and Problem solving	
III	**Exactly Soluble Eigen value Problems**					
	1	One dimensional linear harmonic oscillator – operator method - Particle moving in a spherically symmetric potential	3	To solve the one-dimensional linear harmonic oscillator problem	Illustration, Theoretical formulation and Problem solving	Evaluation through: Online quiz, short questions Descriptive answers Assignment on applications Formative assessment
	2	Spherical harmonics- Radial equation- Rigid rotator- Hydrogen atom- solution of the radial equation	2	To formulate radial equations of hydrogen atom	PPT, Illustration,Theoretical formulation and Problem solving	
	3	Energy eigen values- Radial wave functions- Wave functions of hydrogen-like atom	3	To understand the eigen values and wave functions	Illustration, Theoretical formulation and Problem solving	
	4	Radial Probability density- Three-Dimensional square-well potential.	4	To formulate three-Dimensional square-well potential.	Illustration, Theoretical formulation comparative study and Problem solving	
IV	**Matrix Formulation of Quantum Theory, Equation of Motion & Angular Momentum**					
	1	Linear vector space- Dirac's notation-Equation of motions	2	To derive equation of motion using Quantum mechanical concepts	Theoretical formulation	Evaluation through: Online quiz, short questions Descriptive answers Problem solving Formative assessment
	2	Schrodinger, Heisenberg and Interaction representation.	2	To compare representation of equation of motion	Theoretical formulation	
	3	Angular momentum operators – Angular momentum commutation relations – Eigen values and eigen functions of L^2 and L_z	2	To understand the basic concepts and features related to Angular momentum	PPT Illustration, lecture, and Problem solving	

	4	General angular momentum – Eigen values of J^2 and J_z	2	To relate angular momentum and general angular momentum	Descriptive lecture comparative study	
	5	Angular momentum matrices – Spin angular momentum – Spin vectors for spin-(1/2) System	2	To formulate angular momentum matrices	Theoretical formulation and Problem solving	
	6	Addition of angular momentum: Clebsch-Gordon coeffiecients	2	To obtain C-G coefficient from angular momentum	Illustration,Theoretical formulation and Problem solving	
	7	Stern Gerlach Experiment.	1	To prove concept of spin experimentally	Demonstration	
V	**Scattering theory**					
	1	Scattering cross-section – Scattering amplitude	1	To understand the basic	PPT Illustration,	
				concepts and features related to scattering	And Descriptive lecture	Evaluation through: Online quiz,
	2	Partial waves – Scattering by a central potential: Asymptotic solution.	3	To understand the concept of partial waves	Descriptive lecture and Theoretical formulation	short questions
	3	Optical theorem- Ramsauer-Townsend effect- Partial wave analysis	2	To apply the concept of partial waves	Descriptive lecture and Theoretical formulation	Descriptive answers
	4	Scattering by an attractive square-well potential – Breit-Wigner Formula - Scattering length - Expression for phase shifts - Integral equation	3	To apply scattering theory to physical problems	Descriptive lecture and Theoretical formulation	Problem Solving
	5	The Born approximation – Scattering by screened coulomb potential – validity of Born approximation	2	To understand Born approximation	Descriptive lecture and Theoretical formulation	Formative assessment

PO- Program outcome; LO – Learning outcome; Cognitive Level R – Remember; U – Understand; Ap- Apply, An- Analyze; E-Evaluate; C- Create

Staff –in –charge :Ms.Sonia & Ms.Aji Udhaya

Semester I

Course code: Numerical Methods

Course code: PP2016

No. of hours per week	No. of credits	Total No. of hours	Marks
6	4	90	100

Objective

To understand various numerical methods used to solve the physical problems.

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO- 1	understand the various interpolation methods and finite difference concepts	PSO - 1	U
CO- 2	analyze the numerical solutions of linear and non linear equations	PSO - 4	An
CO- 3	utilize various numerical methods for differentiation and integration	PSO - 4	Ap
CO -4	discuss the concepts of ordinary differential equations	PSO - 5	C

Modules

Credit:4 **Total Hours:90 (Incl. Seminar& Test)**

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
I	**Interpolation**					
	1.	Introduction, Polynomial Forms, Linear interpolation.	4	To understand the basic concepts of interpolation	PPT, Illustration and theoretical derivation	Evaluation through: Online quiz, Problem solving short
	2.	Lagrange Interpolation Polynomial, Newton Interpolation Polynomial	4	To be able to solve the problems of Lagrange and Newton Interpolation	Illustration, Theoretical formulation Problem Solving	

	3.	Divided difference table, Interpolation with equidistance points, Spline interpolation	4	To solve the problems of Divided difference table, Interpolation with equidistance points, Spline interpolation	PPT, Theoretical formulation and Problem solving	questions Descriptiv e answers Formative assessment
II	**Roots Of Nonlinear Equations**					
	1	**15 Hours** Introduction, Methods of Solution, Iterative Methods, Starting and Stopping an Iterative Process, evaluation of Polynomials	3	To understand the basic concepts of Iterative Methods	PPT Illustration, lecture, and Problem solving	Evaluation through: Online quiz, short questions Descriptiv e answers Problem solving Formative assessment
	2	Bisection method, False Position Method, Newton- Raphson Method	3	To solve various methods like Bisection, False Position and Newton-Raphson Method	Descriptive lecture solving problems	
	3	Secant Method, Fixed Point Method	3	To find the roots using Secant and Fixed Point Method	PPT, Theoretical formulation and Problem solving	
	4	Determining All Possible Roots.	3	To determine all Possible roots for the Polynomial equation	Illustration, Theoretical formulation and Problem solving	
III	**Solutions of Linear Equations**					

	1	**15 Hours** Need and Scope, Existence of Solutions, Solution by Elimination,	3	To understand the basics of elimination method	Illustration, Theoretical formulation and Problem solving	Evaluation through: Online quiz, short questions Descriptiv e answers Assignmen t on applicatio ns Formative assessmen t
	2	Basic Gauss Elimination Method, Gauss Elimination with Pivoting, Gauss- Jordan Method	2	To solve the problems of Gauss Elimination, Gauss Elimination with Pivoting and Gauss-Jordan Method	PPT, Illustration, Theoretical formulation and Problem solving	
	3	Triangular Factorization Methods, Round-off Errors and Refinement, Ill- Conditioned Systems,	3	To understand the Triangular Factorization Methods and Round-off Errors	Illustration, Theoretical formulation and Problem solving	
	4	Matrix Inversion Method, Jacobi Iteration Method, Gauss Seidel Method.	4	To solve the problems of Matrix Inversion Method, Jacobi Iteration Method and Gauss Seidel Method.	Illustration, Theoretical formulation comparative study and Problem solving	
IV	**Numerical Differentiation and Integration**					
	1	Numerical Differentiaton: Need and Scope, differentiatig continuous functions,	4	To understand the basic concepts of Numerical Differentiation	Theoretical formulation and Problem solving	Evaluation through: Online quiz, short questions Descriptiv e answers Problem solving
	2	Differentiating tabulated functions, Difference tables, Numerical Integration.	4	To solve problems for Difference tables and study the basics of Numerical Integration.	Theoretical formulation and Problem solving	

	3	Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Higher Order Rules.	4	To solve problems using Trapezoidal Rule, Simpson's 1/3 Rule and Simpson's 3/8 Rule	PPT Illustration, lecture, and Problem solving	Formative assessment
V	**Numerical Solutions of Ordinary Differential Equations**					
	1	**15 Hours** Need and Scope, Tailor Series Method – Improving accuracy,	3	To understand the basic concepts and features of Tailor Series	PPT Illustration, And problem solving	Evaluation through: Online quiz, short questions Descriptiv e answers Problem Solving Formative assessment
	2	Picard's method, Euler's Method – accuracy of Euler's method, .	3	To solve differential Equations using Picard's, Euler's Method , Euler's method,	problem solving	
	3	Heun's Method – Error analysis, Polygon Method,	3	To apply the concept of Heun's Method , Error analysis, Polygon Method to solve the equations	PPT Illustration, And problem solving	
	4	Runge-Kutta Methods- Determination of weights, Fourth order Runge-Kutta methods.	3	To apply Runge-Kutta Methods to solve the problems	PPT Illustration, And problem solving	

PO- Program outcome; LO – Learning outcome; Cognitive Level R – Remember; U – Understand; Ap- Apply, An- Analyze; E-Evaluate; C-Create

Staff-in charge: Ms.Shally & Ms.Lesly

Semester III
Core VII: Integrated Electronics
Subject Code: PP1731

Number of hours per week	No of credits	Total number of hours	Marks
6	4	90	100

Objectives: 1. To provide knowledge in the basic structure and working concepts of electronic devices.
2.To acquire application skills involving digital integrated circuit.

Course Outcomes

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO- 1	Understand the basic operation ,features and parameters related to diodes,transistor, switching devices and interpret their applications (FET,JFET,D-MOSFET,EMOSFET,SCR,DIAC,TRIAC)	PSO-1	U
CO- 2	Explain about the internal circuitry and logic behind any digital system (AND,OR,NOT,NAND,NOR,RTL,TTL,I^2L).	PSO-2	U
CO- 3	Assess the working of combinational circuits.(flipflops , counters)	PSO-3	E
CO -4	Design various synchronous and asynchronous sequential circuits.	PSO-6	C
CO- 5	Understand the characteristics of op-amps and the applications of op-amps	PSO-2	U
CO -6	Analyse the behaviourof active filters and IC555	PSO-4	C

Teaching Plan

Credit:5 **Total Hours: 90 (Incl. Seminar & Test)**

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Devices and Applications**					
	1	FET – Types, Principle and working, Salient features and Important Terms / parameters, Practical JFET and FET applications	4	Understand the concepts and salient features of FET and JFET	Illustration, Descriptive lecture	Evaluation through: quiz, Problem solving short questions Descriptive answers Formative assessment (I)
	2	MOSFET – Types and circuit operation, D-MOSFET	3	Distinguish between MOSFET and D-MOSFET and their working	Illustration, Descriptive lecture	
	3	SCR – Working and Equivalent circuit, SCR as a switch and Application of SCR	3	Understand the working of SCR as a switch.	Illustration, Descriptive lecture of Circuit theory	
	4	Triac - Construction / Operation / Characteristics and Applications, Diac and its Applications	3	Differentiate DIAC and TRIAC their working and applications	Discussion on circuit working differences.	
II	**Digital Logic circuits and Flip Flops**					
	1	Digital IC characteristics, Diodes and	4	Identify the use of	PPT	Evaluation

		transistors in logic circuits,		and transistors in logic circuits	Illustration, Descriptive lecture	through: quiz,
	2	DTL type – AND, OR, NAND and NOR, RTL and TTL type NAND, ECL and I^2L circuits	4	Explain about the internal circuitry and working of basic logic circuits	Discussion on circuit working differences.	short questions
	3	Flip flops – NAND Latch, SR, D, JK flip flop	3	Assess the functioning of various flip flops	Descriptive lecture on circuit working differences.	Descriptive answers Assignment
	4	T and JK master – Slave flip flop	2	Understand the working of various flip flops	Discussion on circuit working differences	Formative assessment (I&II)
III	**Registers and Counters**					
	1	Shift register, Ring counter , Shift counter (Johnson's counter)	4	Understand the principle and working of registers and counters	Illustration, Descriptive lecture	Evaluation through: quiz,
	2	Asynchronous counter / Ripple counter, Mod counters, 4-bit binary down counters and 4 Bit up/down counters, BCD counter using decoding gates	5	Identify the different construction and circuit design of asynchronous counters	Discussion on circuit working differences. Practical demonstration	short questions Descriptive answers
	3	Synchronous counters –Design, Mod 3 counter, Random Sequence generator, Synchronous BCD counter	4	Able to design counters with random counting sequence	Lecture discussion on design techniques of Mod counters	Formative assessment (II)
IV	**Op-Amp Circuits**					
	1	Characteristics and parameters, Op-amp comparator, Schmitt Trigger, Inverting and non-inverting amplifier, Voltage follower , summing and difference amplifier, Differentiator and Integrator	4	Understand the basic operations, features and application of OP-amp	PPT Illustration, Descriptive lecture. Practical demonstration	Evaluation through: quiz, Problem solving
	2	Current to voltage converter, Solution of Differential equation and simultaneous equation using op-amp, Instrumentation Amplifier using Transducer Bridge	4	Assess the instrumental Applications of OP-amp	Group design of instrumentation amplifiers	short questions Descriptive answers
	3	Temperature indicator and controller, Light intensity meter , Measurement	3	Apply the OP-amp for different	Discussion on design	Assignment

		of flow and thermal conductivity, Analog weight scale		applications	techniques of Mod counters	Formative assessment (II&III)
	4	Differential input and output amplifier, Voltage to current converter, Very high impedence circuit , sample and hold system	3	Identify the use of OP-amp in various circuits .	Discussion on circuit working differences	
V	**Filter circuits and 555 Timer**					
	1	Active filters , First and second order Low pass Butterworth filter, Filter design, frequency scaling	3	Understand the principle of filter design	PPT Illustration, Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Formative assessment (III)
	2	First order and Second order High pass Butterworth filter	3	Differentiate between the working of first and second order filter	Descriptive lecture with PPT Illustration,	
	3	Higher order filters, Band pass filter, Wide and Narrow Band Rejection filter,Wide and Narrow Band Rejection filter, All pass Filter	4	Extend the design and application of various types of filters.	Descriptive lecture	
	4	555 Timer - internal structure, Schmitt Trigger, Astable multivibrators, Monostable multivibrators	4	Understand the working and applications of 555 timer	Practical demonstration Descriptive lecture with PPT Illustration,	

Course Instructor : Dr. V.Shally **Head of the Department:**Dr.S.Mary Delphine

Semester III
Core VIII: Microprocessor and Microcontroller
Subject Code: PP1732

No of hours per week	No of credits	Total no of hours	Marks
6	4	90	100

Objectives: **1.** To provide knowledge on the hardware, programming and applications of 8085 microprocessor and 8051 microcontroller.

2. To gain hands on experience in interfacing peripherals to the microprocessor.

Course Outcomes

CO	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Explain the operation of various components of the microprocessor 8085 and Pheripheral I/O, memory mapped I/O.	PSO-1	A
CO-2	Explain the various addressing modes and the instruction set of 8085 microprocessor	PSO-1	A

CO-3	Develop skill in writing programs for 8085 microprocessor	PSO-2	Ap
CO-4	Understand the various data transfer schemes, interrupts and interfacing circuits of 8085 microprocessor	PSO-1	U
CO-5	Experiment with the common applications of microprocessor (Display of decimal numbers, Generation of waves forms, Microprocessor based traffic control,Measurement of frequency, resistance, temperature, display of speed of a motor)	PSO-4	A
CO-6	Explain the architecture of 8051 microcontroller and some applications	PSO-1	U

Teaching Plan

Credit:4 **Total Hours:90 (Incl. Seminar & Test)**

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Evolution and architecture of microprocessor 8085**					
	1	Evolution of microprocessors – Intel 8085 microprocessor – Architecture – ALU – Timing and control unit	4	To be able to describe the architecture of 8085 microprocessor	PPT Illustration, Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Formative assessment(I)
	2	Registers (general purpose & special purpose registers) – Flags – Data and address bus – Pin configuration – 8085-based microcomputer	4	To explain the organization of 8085 microprocessor	PPT Illustration, Descriptive lecture, comparative study	
	3	8085 machine cycles and bus timings	4	To understand the working of each instruction and its execution	Descriptive lecture, comparative study	
	4	Memory interfacing – Peripheral I/O – Memory mapped I/O	3	To realize the interfacing of memory & various I/O devices with 8085 microprocessor	Descriptive lecture and group discussion	
II	**Introduction to assembly language programming**					
	1	Intel 8085 instructions – Opcode and operands – Instruction word size	4	To understand the instruction set of 8085 microprocessor	Descriptive lecture, comparative study	Evaluation through: quiz, short questions Descriptive answers Formative assessment(I& II)
	2	Instruction set of Intel 8085 – Instruction and data formats	4	To classify the instruction set of 8085 microprocessor	Descriptive lecture	
	3	Addressing modes – Stack – Subroutines	3	To identify the addressing mode of an instruction	PPT Illustration, Descriptive lecture, comparative study	
	4	Examples of assembly language	4	To distinguish the use	Descriptive	

		programs: addition of two 8-bit numbers – 8-bit subtraction – One's compliment – Two's compliment – Square of a number – Largest number in an array – Ascending or descending order – Smallest number in an array		of different instructions and apply it in assembly language programming.	lecture and comparative study	
III	**(a) Data transfer schemes – Interrupts – Interfacing (b) Microprocessor based data acquisition system**					
	1	Address space partitioning – Memory and I/O interfacing – Data transfer schemes – Programmed data transfer schemes, DMA data transfer scheme	4	To understand the various data transfer schemes of 8085 microprocessor	Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Formative assessment(II)
	2	– Interrupts of Intel 8085 – Hardware and software interrupts – Interrupt call locations – RST 7.5, 6.5 and 5.5 – Interfacing I/O devices – I/O ports: non programmable I/O port Intel 8212, Programmable Peripheral Interface (PPI) Intel 8255	4	To understand the operation of Programmable Interface devices	Descriptive lecture	
	3	Analog to digital converter – Sample and hold circuit – Analog multiplexer – ADC 0800 – Interfacing of A/D converter ADC 0800	4	To be able to describe the interfacing of A/D converter	PPT Illustration, Descriptive lecture	
	4	Interfacing of ADC 0800 and analog multiplexer AM 3705 – Interfacing of ADC 0800, analog multiplexer and sample and hold circuit	3	To realize the programming & interfacing of various devices with 8085 microprocessor	PPT Illustration, Descriptive lecture	
IV	**Microprocessor applications**					
	1	Delay subroutine – 7 Segment LED display	4	To demonstrate the assembly language programming for delays and subroutines	Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Assignment on applications. Formative
	2	Display of decimal numbers – Display of alphanumeric characters – Formation of codes for alphanumeric characters	3	To demonstrate the interfacing of display	Descriptive lecture	
	3	Generation of square wave or pulse – 8-bit multiplication – 8-bit division – Measurement of electrical quantities – Frequency	4	To develop programming skills in assembly language	Descriptive lecture	

		measurement – Resistance measurement				assessment(II & III)
	4	Measurement of physical quantities – Temperature measurement and control – Measurement and display of speed of a motor – Microprocessor based traffic control	4	To build up the assembly language programming skills and real time applications of microprocessor	Descriptive lecture	
V	**The 8051 Microcontroller**					
	1	Inside the 8051 – Introduction to 8051 assembly programming – Assembling and running an 8051 program – The program counter and ROM space in the 8051	5	To understand the basic concepts and architecture of 8051	PPT Illustration, Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Group discussion Formative assessment (III)
	2	Data types and directives – 8051 Flag bits and the PSW register – 8051 register banks and stack – Pin description of 8051 –	4	To explain the register organization of 8081	PPT Illustration, Descriptive lecture	
	3	– I/O programming – Bit Manipulation. Arithmetic Instructions: Addition of unsigned numbers, - Addition of Individual bytes	4	To develop knowledge about assembly language programs of 8051	Descriptive lecture	
	4	Subtraction of unsigned numbers– Unsigned multiplication and division.	2	To build up knowledge about assembly language programs of 8051	Descriptive lecture and comparative study	

Course Instructor :M. Mary Freeda Head of the Department: Dr.S.Mary Delphine

Semester III
Elective III (a): Physics of the Cosmos
Subject Code: PP1733

No of hours per week	No of credits	Total no of hours	Marks
6	5	90	100

Objectives: 1. The course enables the students to understand and realize the historical evolution of Universe and principles involved in Astrophysics
2. The topics included are Solar system, Comets, Galaxy, Cosmology and Astronomical Instruments which play a key role in the future employability and global progress of students.

Course Outcomes

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO- 1	**Perceive** the historical evolution of solar system and universe	PSO-3	E

CO- 2	**Describe** the principles of physics in the formation of astronomical objects like planets-Satellites - Asteroids and Comets	PSO-1	U
CO- 3	**Examine** the requirements and limitations of instrumentation for modern astrophysical observations (Optical telescopes and Radio telescopes)	PSO-2	An
CO -4	**Explain** the basic issues involved in present day astrophysical investigations (Red shift and the expansion of the universe)	PSO-6	U
CO- 5	**Analyse** the formation of Binary stars, multiple stars, Neutron stars and Black holes	PSO-4	An
CO -6	**Interpret** the observations of Galaxies, dark matter, quasars and pulsars.	PSO-5	E
CO -7	Distinguish between of some important models of the universe and its observational tests.	PSO-5	An

Teaching Plan

Total contact hours: 90 (Including lectures, assignment and tests)

Unit	Module	Topics	Lecture Hours	Learning outcomes	Pedagogy	Assessment/ Evaluation
I	**Solar system**					
	1	Components of the solar system - The Sun - The Planet - Two types of planets- Satellites	**4**	Define the basic Components of the solar system	Lecture discussion	Evaluation Class test, oral question assignment Formative assessment I
	2	Asteroids and Comets - Composition differences between the Inner and Outer planets - Bode's law: The search for order - Density as a measure of a planet's composition –	**4**	Apply various Inner and Outer planets	Discussion and PPT Seminar	
	3	Age of solar system - Origin of solar system - Interstellar cloud - Formation of the solar Nebula	**4**	Study of solar system	Discussion and PPT	
	4	Condensation in solar Nebula - Accretion and Planetesimals - Formation of Planets - Formation of Moons - Final stages of Planet formation - Formation of Atmospheres - Cleaning up the solar system	**3**	Formation of Planets	Derivation and group discussion	
II	**Stars**					
	1	Introduction – Visual Binary – Spectroscopic Binary – Eclipsing Binary – Multiple stars – Origin of Binary stars	**4**	Study on Binary and multiple stars	Derivation discussion	Evaluation Class test, oral question

						Assignment, seminar Formative assessment I
	2	Stellar masses and mass Luminosity Relation – Mass transfer in close Binary systems.	**3**	Define and derive mass Luminosity Relation	Discussion and PPT	
	3	Discovery of pulsars – Rotating Neutron star model of pulsars – Period distribution and loss of rotational energy	**4**	Study on Neutron stars and Black holes	Derivation and group discussion PPT Seminar	
	4	Test of rotating neutron star model of pulsars Gold's model of pulsars, Black holes.	**4**	Neutron star and its models	Discussion and PPT	
III	**Galaxies**					
	1	Discovering Galaxies - early observations of Galaxies - Types of Galaxies - Differences in Stellar and Gas content of Galaxies	**4**	Study on galaxies	Derivation discussion,PPT	Evaluation Class test, oral question Assignment, seminar Formative assessment II
	2	The cause of Galaxy types - Galaxy collisions and Mergers - Measuring properties of Galaxies - Galaxy distances - using Cepheid Variables -	**2**	Define and derive Galaxy types	Derivation and group discussion	
	3	The Red shift and Hubble Law - Measuring the diameter of a Galaxy -Measuring the Mass of a Galaxy - Dark Matter- Quasars as probes of Intergalactic Space	**5**	Define and Derive Red shift and Hubble Law, Dark Matter and Quasars	Derivation and group discussion,PPT	
	4	Gravitational Lenses-Galaxy clusters - The local group-Rich and Poor Galaxy clusters - Super clusters	**4**	Define , derive and apply Gravitational Lenses and Galaxy clusters	Derivation and group discussion,PPT Seminar	
IV	**Cosmology**					
	1	Introduction – Red shift and the expansion of the universe – Matter Density in the universe and Declaration parameter	**4**	Prove Red shift and the expansion of the universe	Derivation, discussion,PPT	Evaluation Class test, oral question Assignment, seminar Formative assessment II/III
	2	Perfect cosmological principle – Fundamental equation of cosmology.	**4**	Define and derive Fundamenta	Derivation and group discussion,	

				l equation of cosmology	PPT	
	3	The current theories – Some important models of the universe	**3**	Define and Derive Some important models of the universe	Derivation and group discussion Seminar	
	4	Observational tests of cosmological models.	**4**	Define , derive and apply cosmological models.	Derivation and group discussion	
V	**Astronomical Instruments**					
	1	Light and its properties – Earth atmosphere and the electromagnetic radiation	**4**	Study on light and Earth atmosphere	Discussion, PPT	Evaluation Class test, oral question Assignment, Seminar Formative assessment III
	2	Optical telescopes	**3**	Define, discus and sketch Optical telescopes	discussion, PPT Seminar	
	3	Radio telescopes – Hubble space telescopes – Astronomical spectrographs – Photoelectric photometry	**4**	Define, discus and sketch Radio telescopes	discussion, PPT	
	4	Spectrophotometry – Detectors and Image processing.	**4**	Define, discus and sketch Detectors and Image processing.	discussion, PPT	

Course Instructor: Dr.C .Nirmala Louis

Head of the Department: Dr.S.Mary Delphine