Paper **Units**	**Course Content** **Semester-III** **Mathematical Physics II**	**Nos. Of** **Lecture in** **hour**	**July,19-** **September'19** **10 weeks**	**October,2019 to December,2019** **6weeks**
PHSACOR 05T	**Fourier Series :** Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only). Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients. Euler relation -- Complex representation of Fourier series. Expansion of functions with arbitrary period. Expansion of non-periodic functions over an interval. Even and odd functions and their Fourier expansions. Application. Summing of Infinite Series. Term-by-Term differentiation and integration of Fourier Series. Parseval Identity. **Frobenius Method and Special Functions:** Singular Points of Second Order Linear Differential Equations and their importance. Frobenius method and its applications to differential equations. Legendre, Bessel, Hermite and Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Generating Function, Orthogonality. Simple recurrence relations. Expansion of function in a series of Legendre Polynomials. Multipole expansion in Electrostatics. Orthonormality of Hermite and Laguerre polynomials (statements only). Bessel Functions of the First Kind: Generating Function, simple recurrence relations. Zeros of Bessel Functions (Jo(x) and J1(x))and Orthogonality. Airy's disc for Fraunhofer	10 25	10 15	INTERNAL ASSESSMENT 10	PERIODICAL EXAMINATION 10	END SEMESTER TEXT EXAMINATION UNIVERSITY

	diffraction through circular aperture, resolving power of a telesco **Some Special Integrals:** Beta and Gamma Functions and Relation between them. Expression of Integrals in terms of Gamma Functions. Error Function (Probability Integral). **Variational calculus in physics:** Idea of functionals. Euler-Lagrange equation from calculus of variation. Idea of constraints (holonomic only), degrees of freedom and generalised co-ordinates. Hamilton's principle and Lagrange's equation from it. **Analytical Dynamics:** Applications of Lagrange's equation in simple problems. Canonically cojugate momentum. Idea of cyclic coordinate and conservation principles from different symmetries. Idea of Legendre transformation. Its application in mechanics and thermodynamics. Definition of Hamiltonian. Page Canonical equations of motion. Poisson bracket and its properties. Time variation of a dynamical variable in terms of in terms of Poisson bracket and the condition related to the constants of motion. **Partial Differential Equations :** Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of **rectangular** symmetry. Wave equation and its solution for vibrational modes of a stretched string..	4 5 10 6	5 8		4 2 6		

Paper Units	Course Content Semester-III Thermal Physics	Nos. Of Lecture in hour	July,19- September'19 10 weeks		October,2019 to December,2019 6weeks		
PHSACOR 06T	**Introduction to Thermodynamics** : Zeroth and First Law of Thermodynamics: Extensive and intensive Thermodynamic Variables, Thermodynamic Equilibrium, Zeroth Law of Thermodynamics & Concept of Temperature, Concept of Work & Heat, State Functions, First Law of Thermodynamics and its differential form, Internal Energy, First Law & various processes, Applications of First Law: General Relation between CP and CV, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Co-efficient. Second Law of Thermodynamics: Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work. Heat Engines. Carnot's Cycle, Carnot engine & efficiency. Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem. Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale. Entropy: Concept of Entropy, Clausius Theorem. Clausius Inequality, Second Law of Thermodynamics in terms of Entropy. Entropy of a perfect gas. Principle of Increase of Entropy. Entropy Changes in Reversible and Irreversible processes with examples. Entropy of the Universe. Entropy Changes in Reversible and Irreversible Processes. Principle of Increase of Entropy. Temperature–Entropy diagrams for Cycle.	8 7 2 8	8 7 2 8	INTERNAL ASSESSMENT		PERIODICAL EXAMINATION	ENDSEMESTER UNIVERSITY

	Third Law of Thermodynamics. Unattainability of Absolute Zero. **Thermodynamic Potentials :** Thermodynamic Potentials: Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy. Their Definitions, Properties and Applications. Surface Films and Variation of Surface Tension with Temperature. Magnetic Work, Cooling due to adiabatic demagnetization (basic principle only), First and second order Phase Transitions with examples, Clausius Clapeyron Equation and Ehrenfest equations Derivations and applications of Maxwell's Relations, Maxwell's Relations:(1) Clausius Clapeyron equation, (2) Values of Cp-Cv, (3) TdS Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process. **Kinetic Theory of Gases :** Distribution of Velocities: Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification. Doppler Broadening of Spectral Lines and Stern's Experiment. Mean, RMS and Most Probable Speeds. Degrees of Freedom. Law of Equipartition of Energy (No proof required). Specific heats of Gases. Molecular Collisions: Mean Free Path. Collision Probability. Estimates of Mean Free Path. Transport Phenomenon in Ideal Gases: (1) Viscosity, (2) Thermal Conductivity and (3) Diffusion. Brownian Motion and its Significance. Real Gases: Behavior of Real Gases: Deviations from the Ideal Gas Equation. The Virial Equation. Andrew's Experiments on CO2 Gas. Critical Constants. Continuity of Liquid and	8 7 7 5 8	5 7		3 7 5 8		

	Gaseous State. Vapour and Gas. Boyle Temperature. Van der Waal's Equation of State for Real Gases. Values of Critical Constants. Law of Corresponding States. Comparison with Experimental Curves. P-V Diagrams. Joule's Experiment. Free Adiabatic Expansion of a Perfect Gas. Joule-Thomson Porous Plug Experiment. Joule- Thomson Effect for Real and Van der Waal Gases. Temperature of Inversion. Joule- Thomson Cooling.						

Paper Units	Course Content Semester-III	Nos. Of Lecture hour	July,19-September'19 10 weeks	October,2019 to December,2019 6weeks
PHSACOR 07T	**Digital System and Application:** **Introduction :** Electronic Components and Measuring devices (which are generally used for studying the following circuits) and their general Characteristics, Cathode-Ray Oscilloscope (CRO), Block diagram of CRO. Electron Gun. Deflection System and Time Base. Deflection Sensitivity. Applications of CRO:1)Study of waveform, 2)Measurement of Voltage , Current, Frequency and Phase difference. **Integrated Circuits :** Active & Passive components. Discrete components. Wafer. Chip. Advantages and drawbacks of ICs. Scale of integration: SSI, MSI, LSI and VLSI (basic idea and definitions only). Classification of ICs. Examples of Linear and Digital lCs. **Digital Circuits:** Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion. BCD, Octal and Hexadecimal numbers. De Morgan's Theorems. Boolean Laws. AND, OR and NOT Gates (realization using Diodes and Transistor). Simplification of Logic Circuit using Boolean Algebra. NAND and NOR Gates as Universal Gates. XOR and XNOR Gates and application as Parity Checkers. Fundamental Products. Idea of Minterms and Maxterms. Conversion of a Truth table into Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.	4 5 16	4 5 16	INTERNAL ASSESSMENT PERIODICAL EXAMINATION ENDSEMESTER EXAMINATION ATTENDANCE

	Arithmatic circuits : Binary Addition. Binary Subtraction using 2's Complement. Half and Full Adders. Half & Full Subtractors, 4-bit binary Adder/Subtractor. **Data processing circuits**: Basic idea of Multiplexers, De-multiplexers, Decoders, Encoders. **Sequential circuits**: SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race- Page around conditions in JK Flip-Flop. M/S JK Flip-Flop. M/S JK Flip-Flop, Combinational logic for the development of sequential circuit. **Timers**: IC 555: block diagram and applications: Astable multivibrator and Monostable multivibrator. **Registers:** Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits). **Counters (4 bits)** : Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter. **Computer Organization** : Input/Output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing. Memory Interfacing. Memory Map.	5 5 6 4 4 4 7	5 5 2		6 4 2 4 7		