



V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

(Belonging to Virudhunagar Hindu Nadars)

An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai

Re-accredited with 'A' Grade (3rd Cycle) by NAAC

VIRUDHUNAGAR - 626 001

PEOs, POs, PSOs and COs

M.Sc. PHYSICS

Programme Educational Objectives (PEOs)

PEOs are broad statements that describe the career and professional achievements that the Programme is preparing the graduates to achieve within the first few years after graduation. PEOs are framed for each Programme and should be consistent with the Mission of the Institution.

Programme Outcomes (POs)

POs shall be based on Graduate Attributes (GAs) of the Programme. The GAs are the attributes expected of a graduate from a Programme in terms of knowledge, skills, attitude and values. The Graduate Attributes include Disciplinary Knowledge, Communication Skills, Critical Thinking, Problem Solving, Analytical Reasoning, Research Related Skills, Co-operation/Team Work, Scientific Reasoning, Reflective Thinking, Information/Digital Literacy, Multicultural Competence, Moral and Ethical Awareness/Reasoning, Leadership Qualities and Lifelong Learning.

On successful completion of the Programme, the students will be able to

- 1 Apply their in depth domain knowledge and practical skills in interdisciplinary fields for research-based endeavours, employment and entrepreneurship development. (*Disciplinary Knowledge*)
- 2 Communicate proficiently and confidently with the ability to present complex ideas in a concise manner to assorted groups. (*Communication Skills*)
- 3 Identify, formulate and solve problems in a consistent and systematic way with updated skills using modern tools and techniques. (*Scientific Reasoning and Problem Solving*)

- 4 Analyze the data, synthesise the findings and provide valid conclusion by critical evaluation of theories, policies and practices for the betterment of society. (*Critical Thinking and Analytical Reasoning*)
- 5 Explore and evaluate globally competent research methodologies to apply appropriately in interdisciplinary research; Develop and sustain the research capabilities to meet the emerging needs for the welfare of the society. (*Research Related Skills*)
- 6 Use ICT to mould themselves for lifelong learning activities to face career challenges in the changing environment. (*Digital Literacy, Self - directed and Lifelong Learning*)
- 7 Self-manage and function efficiently as a member or a leader in diverse teams in a multicultural society for nation building. (*Co-operation/Team Work and Multicultural Competence*)
- 8 Uphold the imbibed ethical and moral values in personal, professional and social life for sustainable environment. (*Moral and Ethical Awareness*)

Programme Educational Objectives (PEOs)

The students will be able to

- apply obtained knowledge and wisdom in Physics to real life situations.
- think critically and practice recent methodologies for conducting research in the chosen field.
- incur values and skills for professional empowerment and social recognition.

| Key Components of Mission Statement | PEO1 | PEO2 | PEO3 |
|--|-------------|-------------|-------------|
| Mastery of the Subject | ✓ | ✓ | - |
| Research Skills | - | ✓ | ✓ |
| Professional Skills | ✓ | ✓ | ✓ |
| Ethical Values | ✓ | ✓ | ✓ |

Programme Specific Outcomes (PSOs)

Based on the Programme Outcomes, Programme Specific Outcomes are framed for each PG Programme. Programme Specific Outcomes denote what the students would be able to do at the time of graduation. They are Programme-specific and it is mandatory that each

PO should be mapped to the respective PSO.

On successful completion of M.Sc. Physics Programme, the students will be able to

PO 1: *Disciplinary Knowledge*

PSO 1a: Apply their academic proficiency of concepts, theories, current and emerging development in the field of Physics to meet challenges in interdisciplinary research work, teaching and government/public sector.

PSO 1b: Execute Physics related experiments in a systematic manner, analyse and interpret the results using appropriate methods and report accurately the findings/conclusions of the experiments with relevant theories of Physics.

PO 2: *Communication Skills*

PSO 2: Communicate profoundly their acquired knowledge in the academic field of Physics through oral/written mode where assessment of their knowledge is needed and share their proficiency in diverse fields to assorted audience.

PO 3: *Scientific Reasoning and Problem Solving*

PSO 3: Develop problem solving skills that are required to solve different types of Physics related problems with well-defined solutions and tackle open ended problems that belong to disciplinary area bounded.

PO 4: *Critical Thinking and Analytical Reasoning*

PSO 4: Analyse theories/equations of physical concepts to realize their significance in emerging technical aspects, industrial applications and critically evaluate them to be beneficial for the advancement of society.

PO 5: *Research Related Skills*

PSO 5: Adapt recent developments to execute interdisciplinary research for the environmental safety in global and social context.

PO 6: *Digital Literacy, Self-directed and lifelong learning*

PSO 6a: Use programming/computational techniques to represent, evaluate and analyse physical concepts that helps to progress research effectively.

PSO 6b: Identify, access and manage wide range of online resources for self-directed lifelong learning in their field of interest to compete in the digital environment and have a successful career.

PO 7: *Co-operation/Team Work and Multi-Cultural Competence*

PSO 7: Get acquainted with cultural diversity and work as a proficient member in a globalised team, or as an individual for personal and professional development that leads to the progress of the nation.

PO 8: *Moral and Ethical Awareness*

PSO 8: Respect individuality, appreciate the accomplishment of people in every phase of life adhering to ethical standard and integrity in Physics community around the world to build a prosperous living environment.



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| | | | |
|-------------------------|------------------------|----------------|----------------|
| Semester I | MATHEMATICAL PHYSICS-I | Hours/Week: 6 | |
| Core Course-1 | | Credits: 4 | |
| Course Code 20PPHC11 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : explain vector operators, matrices and special functions like Legendre, Bessel and Hermite polynomials. [K2]
- CO2 : solve problems using vector identities, matrices and linear differential equations using power series method. [K3]
- CO3 : analyze Gauss's and Stoke's theorems in vectors, operations in matrices, Laplace's and Bessel's integrals. [K4]
- CO4 : develop vector operators in orthogonal curvilinear coordinates, systems of linear equations general, generating function and recurrence relations of special functions. [K4]
- CO5 : determine the equation of heat flow in solids, Trigonometric series for $P_n(x)$, Jacobi Series of $J_n(x)$, orthogonality of special functions, eigen values and eigen vectors in matrices.[K5]

| Course Code 20PPHC11 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|--------|--------|------|------|------|------|--------|--------|------|------|
| | PSO 1a | PSO 1b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6a | PSO 6b | PSO7 | PSO8 |
| CO1 | H | L | H | H | M | M | L | M | - | - |
| CO2 | H | L | H | H | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | H | L | H | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | L | L | H | H | H | L | H | - | - |



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|-------------------------|---------------------|----------------|----------------|
| Semester I | CLASSICAL MECHANICS | Hours/Week: 6 | |
| Core Course-2 | | Credits: 5 | |
| Course Code 20PPHC12 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : understand the Lagrangian, Hamiltonian, Canonical Transformation, Hamilton-Jacobi method, and the basic mechanical concepts related to advanced problems involving the dynamic motion of classical mechanical systems. [K2]
- CO2 : illustrate the motion of a mechanical system using Lagrange – Hamilton formulation. [K3]
- CO3 : explain canonical transformation equations, Lagrange & Poisson brackets, Action and angle variable method, the reduction of two- body problem and classification of orbits, Virial theorem, Kepler's law of planetary motion, theory of small oscillations.[K4]
- CO4 : analyze principle of least action, Liouville's theorem, application of Lagrangian equation, Hamiltonian equations of motion and its functions. [K4]
- CO5 : assess the various aspects of dynamics and oscillations of bodies using Lagrange & Poisson brackets, Lagrangian& Hamiltonian equations and Hamilton-Jacobi method. [K5]

| Course Code 20PPHC12 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|------|------|------|------|---------|---------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | L | H | M | M | M | L | M | - | - |
| CO2 | H | L | H | M | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | M | L | H | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | L | L | H | H | H | L | H | - | - |



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| | | | |
|-------------------------|----------------------|----------------|----------------|
| Semester I | ADVANCED ELECTRONICS | Hours/Week: 6 | |
| Core Course-3 | | Credits: 5 | |
| Course Code 20PPHC13 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : understand the basic concepts of different amplifiers, modulation and 8051 microcontroller. [K2]
- CO2 : illustrate various amplifier circuits, modulators and architecture of 8051. [K3]
- CO3 : analyze the operations of feedback amplifiers, operational amplifiers, modulators and the instruction sets of 8051 microcontroller. [K4]
- CO4 : solve simple programs using 8051 microcontroller. [K4]
- CO5 : access amplifier, modulator and op-amp for various applications and explain interfacing of 8051 microcontroller. [K5]

| Course Code 20PPHC13 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|------|------|------|------|---------|---------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | L | H | L | L | L | M | M | - | - |
| CO2 | H | M | H | L | L | L | M | M | - | - |
| CO3 | H | H | H | H | H | H | H | H | - | - |
| CO4 | H | H | L | H | H | H | H | H | - | - |
| CO5 | H | H | L | H | H | H | H | H | - | - |



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| | | | |
|--------------------------|--|----------------|----------------|
| Semester I | ELECTRONICS & GENERAL PHYSICS LAB – I | Hours/Week: 6 | |
| Core Practical-I | | Credits: 3 | |
| Course Code 20PPHC11P | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : Apply the theoretical concepts of Physics and Electronics to formulate the experiment. [K3]
- CO2 : Sketch/write the circuit diagram, tabular column, model graph, C++ program to calculate the required physical parameters. [K3]
- CO3 : Use the technical skills to efficiently handle the instruments, measure the required physical parameters, obtain the result and complete the records.[K3]
- CO4 : Analyze the accuracy of the obtained result and assess the experimental results. [K4]
- CO5 : Justify the observations of the experiment under different conditions. [K5]

| Course Code 20PPHC11P | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|--------------------------|---------|---------|------|------|------|------|---------|---------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | H | M | H | H | M | H | M | L | L |
| CO2 | H | H | L | H | H | H | H | M | L | L |
| CO3 | H | H | L | H | M | H | M | H | L | - |
| CO4 | H | H | L | H | H | H | H | H | L | - |
| CO5 | H | H | L | H | H | H | H | H | L | - |



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|---------------------------------------|---|------------------------------|------------------------------|
| Semester I | NUMERICAL METHODS AND PROGRAMMING IN C++ | Hours/Week: 6 | |
| DSEC-1 | | Credits: 5 | |
| Course Code 20PPHE11 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : explain direct, iterative and least square methods, numerical differentiation and integration, operators, control statements and functions in C++. [K2]
- CO2 : apply the concepts in numerical methods to solve problems. [K3]
- CO3 : compute the C++ programs using operators, control statements and functions. [K3]
- CO4 : analyze the principles and practices of numerical methods and C++ programs. [K4]
- CO5 : evaluate the simultaneous equation, least square approximation of functions, numerical differentiation & integration and C++ programs. [K5]

| Course Code 20PPHE11 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|------|------|------|------|---------|---------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | H | H | H | H | M | M | M | - | - |
| CO2 | H | H | H | H | H | M | M | M | - | - |
| CO3 | H | H | H | H | H | H | H | H | - | - |
| CO4 | H | H | L | H | H | H | H | H | - | - |
| CO5 | H | H | L | H | H | H | H | H | - | - |



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| | | | |
|---------------------------------------|------------------------|------------------------------|------------------------------|
| Semester I | MICROPROCESSORS | Hours/Week: 6 | |
| DSEC-1 | | Credits: 5 | |
| Course Code 20PPHE12 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : explain the architecture of 8085, Instruction set and programming techniques. [K2]
- CO2 : discuss about the counters, time delays, stack and stack subroutines. [K3]
- CO3 : develop an assembly language program for arithmetic operations 8 bit and 16 bit data conversion, code conversion, binary conversion, BCD arithmetic operations, interfacing devices ADC, DAC, 8255 PPI, waveform generator. [K3]
- CO4 : summarize the applications of 8085, 8085 interrupts and waveform generation. [K4]
- CO5 : construct assembly language programs. [K5]

| Course Code 20PPHE12 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|------|------|------|------|---------|---------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | H | H | L | H | M | H | M | - | - |
| CO2 | H | H | H | L | H | M | H | M | - | - |
| CO3 | H | H | H | H | H | H | H | H | - | - |
| CO4 | H | H | L | H | H | H | H | H | - | - |
| CO5 | H | H | L | H | H | H | H | H | - | - |



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|---------------------------------------|---------------------------------|------------------------------|------------------------------|
| Semester I | Renewable Energy Sources | Hours/Week: 6 | |
| DSEC-1 | | Credits: 5 | |
| Course Code 20PPHE13 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : describe conventional and renewable energy sources, Solar thermal and Photovoltaic systems, types of energies (wind, biomass, geothermal, ocean) and non – conventional energy technologies. [K2]
- CO2 : explain energy sources, solar thermal and photovoltaic systems, types of energies, hydro resources and non – conventional energy technologies. [K3]
- CO3 : demonstrate new energy technologies, solar thermal and photovoltaic system. [K3]
- CO4 : analyze commercial and renewable energy sources, solar thermal and photovoltaic systems, types of energies, miscellaneous non – conventional energy technologies. [K4]
- CO5 : evaluate energy sources and their availability, new energy technologies, solar photovoltaic systems, types of energies and small hydro resources. [K5]

| Course Code 20PPHE13 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|------|------|------|------|---------|---------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | L | H | - | M | M | - | M | - | - |
| CO2 | H | L | H | - | M | M | - | M | - | - |
| CO3 | H | L | H | - | H | H | L | H | - | - |
| CO4 | H | L | L | - | H | H | L | H | - | - |
| CO5 | H | L | L | - | H | H | L | H | - | - |



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|---------------------------------|--------------------------------|------------------------|------------------------|
| Semester II | MATHEMATICAL PHYSICS-II | Hours/Week: 6 | |
| Core Course-4 | | Credits: 4 | |
| Course Code 20PPHC21 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : illustrate tensors, complex variables, Fourier series & transform, probability and group. [K2]
- CO2 : solve problems using tensors, complex variables & residues, Fourier series, probability distribution and group theory. [K3]
- CO3 : explain covariant differentiation of vectors, Cauchy Riemann differential equation, Fourier transform of function of two or three variables, probability distribution function and symmetry operation of square & triangle. [K3]
- CO4 : discuss the algebraic operations in tensor, Fourier series & transform of a function, theorems in complex variables & residues, probability distribution and group theory. [K4]
- CO5 : evaluate fundamental & associated tensor, definite integrals using Cauchy's residue theorem, finite Fourier transform, probability distribution function and character table. [K5]

| Course Code 20PPHC21 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|------|------|------|------|---------|---------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | L | H | H | M | M | L | M | - | - |
| CO2 | H | L | H | H | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | H | L | M | - | - |
| CO4 | H | L | L | H | H | H | L | M | - | - |
| CO5 | H | L | L | H | H | H | L | M | - | - |



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|--------------------------|--------------------------------|----------------|----------------|
| Semester II | MATHEMATICAL PHYSICS-II | Hours/Week: 6 | |
| Core Course-4 | | Credits: 4 | |
| Course Code 20PPHC21N | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1: illustrate tensors, complex variables, Fourier series & transform, probability and group. [K2]

CO2: solve problems using tensors, complex variables & residues, Fourier series, probability distribution and group theory. [K3]

CO3: explain covariant differentiation of vectors, Cauchy Riemann differential equation, Fourier transform of function of two or three variables, probability distribution function and symmetry operation of square & triangle. [K3]

CO4: discuss the algebraic operations in tensor, Fourier series & transform of a function, theorems in complex variables & residues, probability distribution and group theory. [K4]

CO5 : evaluate fundamental & associated tensor, definite integrals using Cauchy's residue theorem, finite Fourier transform, probability distribution function, character table and application. [K5]

| Course code 20PPHC21N | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|--------------------------|------------|------------|----------|----------|----------|----------|------------|------------|------|------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | L | H | H | M | M | L | M | - | - |
| CO2 | H | L | H | H | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | H | L | M | - | - |
| CO4 | H | L | L | H | H | H | L | M | - | - |
| CO5 | H | L | L | H | H | H | L | M | - | - |



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|---------------------------------------|------------------------------|------------------------------|------------------------------|
| Semester II | STATISTICAL MECHANICS | Hours/Week: 6 | |
| Core Course-5 | | Credits: 5 | |
| Course Code 20PPHC22 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : internalize ideas on thermodynamics, ensembles, classical and quantum statistics. [K2]
- CO2 : explain second and third law of thermodynamics, classical and quantum statistics, various ensemble theories to calculate the thermodynamic functions, Einstein & Debye theory of the specific heat capacity of a solid. [K3]
- CO3 : analyze black body radiation, statistical distribution law, ensembles, F-D, M-B & B-E Statistics, M-B speed distribution and ideal gas in a gravitational field. [K4]
- CO4 : deduce Wien's displacement law, Rayleigh Jeans law, distribution theory for classical and quantum statistics, partition function for ensembles, theory of specific heat of a solid using quantum statistics. [K4]
- CO5 : evaluate thermodynamic potential, thermodynamic probability, partition function, energy and pressure of ideal gas, specific heat capacity of diatomic gas and linear oscillator using quantum statistics. [K5]

| Course Code 20PPHC22 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|------|------|------|------|---------|---------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | L | H | M | L | M | L | L | - | - |
| CO2 | H | L | H | M | L | M | L | L | - | - |
| CO3 | H | L | H | H | H | H | L | M | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | L | L | H | H | H | L | H | - | - |



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|---------------------------------|------------------------------|------------------------|------------------------|
| Semester II | QUANTUM MECHANICS - I | Hours/Week: 6 | |
| Core Course-6 | | Credits: 5 | |
| Course Code 20PPHC23 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : understand the inadequacy of classical concepts, Schrodinger equation and stationary states, quantization of angular momentum and general formalism of wave mechanics. [K2]
- CO2 : illustrate the macroscopic statistical phenomena, Schrodinger equation, Dirac delta function, simple harmonic oscillator, perturbation theory for discrete levels. [K3]
- CO3 : explain electromagnetic radiation- wave-particle duality, stationary states and energy spectra, physical interpretation of eigenvalues and eigen functions and expansion coefficients, angular momentum, perturbation theory, parity and variation method in Quantum mechanics. [K4]
- CO4 : summarize the concepts of atomic structure and atomic spectra, square well potential, operators and approximation methods in Stationary states. [K5]
- CO5 : evaluate eigenvalue problems, matter waves, operators and approximation methods in Stationary states. [K5]

| Course Code 20PPHC23 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|------|------|------|------|---------|---------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | L | H | M | M | M | L | M | - | - |
| CO2 | H | L | H | M | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | H | L | M | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | L | L | H | H | H | L | H | - | - |



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|--------------------------|-----------------------|----------------|----------------|
| Semester II | QUANTUM MECHANICS - I | Hours/Week: 6 | |
| Core Course-6 | | Credits: 5 | |
| Course Code 20PPHC23N | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1 : understand the inadequacy of classical concepts, wave mechanics, Schrodinger Equation, angular momentum operators and perturbation theory. [K2]

CO2 : explain about uncertainties, removal of degeneracy and Ehrenfest's theorem.[K3]

CO3 : derive Schrodinger wave equation and equations for Eigen value & Eigen function of various 1D & 3D problems, J^2 , J_z , L^2 and L_z operator. [K3]

CO4 : solve simple problems related to learnt concepts. [K4]

CO5 : Interpret equation motion in various pictures, LHO problem, Zeeman and Start effect. [K5]

| Course code 20PPHC23N | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|--------------------------|------------|------------|----------|----------|----------|----------|------------|------------|----------|----------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | L | H | M | M | M | L | M | - | - |
| CO2 | H | L | H | M | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | H | L | M | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | L | L | H | H | H | L | H | - | - |



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VIRUDHUNAGAR - 626 001

| | | | |
|--------------------------|---|----------------|----------------|
| Semester II | ELECTRONICS & GENERAL PHYSICS LAB – II | Hours/Week: 6 | |
| Core Practical-II | | Credits: 3 | |
| Course Code 20PPHC21P | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : apply the theoretical concepts of Physics and Electronics to formulate the experiment. [K3]
- CO2 : sketch the circuit diagram, tabular column, model graph to calculate the required physical parameters [K3]
- CO3 : use the technical skills to efficiently handle the instruments, measure the required physical parameters, obtain the result and complete the records. [K3]
- CO4 : analyze the accuracy of the obtained result and assess the experimental errors. [K4]
- CO5 : justify the observations of the experiment under different conditions. [K5]

| Course Code 20PPHC21P | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|--------------------------|---------|---------|------|------|------|------|---------|---------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | H | M | H | H | M | H | M | L | L |
| CO2 | H | H | L | H | H | H | H | M | L | L |
| CO3 | H | H | L | H | M | H | M | H | L | L |
| CO4 | H | H | L | H | H | H | H | H | L | L |
| CO5 | H | H | L | H | H | H | H | H | L | L |



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| | | | |
|---------------------------------------|-------------------------------------|------------------------------|------------------------------|
| Semester II | NUCLEAR AND PARTICLE PHYSICS | Hours/Week: 6 | |
| DSEC-2 | | Credits: 5 | |
| Course Code 20PPHE21 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : identify nuclei properties ,various nuclear detectors, decay modes, nuclear reactions, binding energy & fundamental particles. [K2]
- CO2 : explain mass energy relation & Q equations, decay modes, deuteron properties and particle interactions. [K3]
- CO3 : analyse nuclear detectors, consequences of decay, nuclear force & energy, and interaction theory. [K4]
- CO4 : summarize centre of mass frame, nuclear spin theory, decay probabilities for spontaneous fission, meson theory, conservation laws in particle interactions. [K5]
- CO5 : Support particle & matter interaction, nuclear models, quantum chromo dynamics and Grand Unification theory. [K5]

| Course Code 20PPHE21 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|------|------|------|------|---------|---------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | L | H | M | M | M | L | M | - | - |
| CO2 | H | L | H | M | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | H | L | H | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | L | L | H | H | H | L | H | - | - |



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| | | | |
|--------------------|---|----------------------|-----------------|
| Semester II | NUCLEAR AND PARTICLE PHYSICS | Hours/Week: 6 | |
| DSEC-2 | | Credits: 5 | |
| Course Code | | Internal | External |
| 20PPHE21N | | 40 | 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : identify nuclei properties ,various nuclear detectors, decay modes, nuclear reactions, binding energy & fundamental particles. [K2]
- CO2 : explain mass energy relation & Q equations, decay modes, deuteron properties and particle interactions. [K3]
- CO3 : analyse nuclear detectors, consequences of decay, nuclear force & energy, and interaction theory. [K4]
- CO4 : summarize centre of mass frame, nuclear spin theory, decay probabilities for spontaneous fission, meson theory, conservation laws in particle interactions.[K5]
- CO5 : Support particle & matter interaction, nuclear models, quantum chromo dynamics and Grand Unification theory. [K5]

| Course code 20PPHE21N | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-----------------------------|------------|------------|----------|----------|----------|----------|------------|------------|----------|----------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | L | H | M | M | M | L | M | - | - |
| CO2 | H | L | H | M | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | H | L | H | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | L | L | H | H | H | L | H | - | - |



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| | | | |
|---------------------------------|---|------------------------|------------------------|
| Semester II | APPLIED OPTICS AND LASER PHYSICS | Hours/Week: 6 | |
| DSEC-2 | | Credits: 5 | |
| Course Code 20PPHE22 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : describe the concepts of Gaussian optics, Fourier optics, non-linear optics, Fourier analysis of imaging systems, and laser production. [K2]
- CO2 : illustrate image formation process, Fourier transforming properties of lenses, frequency response, parametric generation of light, principles and operation of laser. [K3]
- CO3 : infer interference by reflection, imaging by lens, coherent transfer function, self focusing of light and laser operation. [K4]
- CO4 : discriminate Matrix representation in polarization, Fresnel and Fraunhofer diffraction pattern, spatial and temporal coherence, harmonic generations, laser oscillation. [K5]
- CO5 : develop refraction and translation matrices, filtering systems, fourier response of incoherent systems, second and third harmonic generations and theory of various laser types. [K5]

| Course Code 20PPHE22 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|----------------------------|------------|------------|------|------|------|------|------------|------------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| | CO1 | H | M | H | M | L | M | L | M | - |
| CO2 | H | M | H | M | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | H | L | H | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | L | L | H | H | H | L | H | - | - |



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| | | | |
|---------------------------------|---------------------------------------|------------------------|------------------------|
| Semester II | FIBER OPTICS COMMUNICATION | Hours/Week: 6 | |
| DSEC-2 | | Credits: 5 | |
| Course Code 20PPHE23 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : explain optical fiber theory, losses and attenuation in fibers, fiber optic communication systems, fiber optic sensors. [K2]
- CO2 : solve problems related to fibre optic communication system. [K3]
- CO3 : distinguish between various CVD processes for fiber fabrication, scattering losses, analog and digital transmitters, link power and rise time budget, laser instrumentation techniques for material processing. [K4]
- CO4 : evaluate light propagation through fibers, scattering and absorption losses, different modulation techniques, repeaters & generators, holographic techniques. [K5]
- CO5 : assess fiber materials, dispersion measurements, preamplifier, optical amplifier and multiplexers, intensity and phase modulated fiber optic sensors. [K5]

| Course Code 20PPHE23 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|------|------|------|------|---------|---------|------|------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO3 | PSO4 | PSO5 | PSO 6.a | PSO 6.b | PSO7 | PSO8 |
| CO1 | H | M | H | L | L | L | - | M | - | - |
| CO2 | H | L | H | H | M | L | - | M | - | - |
| CO3 | H | L | H | M | M | M | L | H | - | - |
| CO4 | H | L | L | M | H | M | L | H | - | - |
| CO5 | H | L | L | M | H | M | L | H | - | - |



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| | | | |
|-------------------------|-------------------------|----------------|----------------|
| Semester III | SOLID STATE PHYSICS - I | Hours/Week: 6 | |
| Core Course-7 | | Credits: 4 | |
| Course Code 20PPHC31 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : explain crystal structure, crystal binding, crystal vibration, fermi gas, energy band and semiconductor crystals. [K2]
- CO2 : illustrate various types of crystal structure, crystal binding, phonon properties, thermal & electrical conductivities of metals. [K3]
- CO3 : Determine properties, energy states and energy band of crystal. [K3]
- CO4 : analyze crystal structure, elastic constants in cubic crystal, crystal vibrations of n-atomic basis, free electron gas, quantization of orbits and impurity energy states in semiconductors. [K4]
- CO5 : evaluate structure factor for bcc and fcc lattices, elastic waves in cubic crystals, thermal properties of crystals, wave equation of electron in periodic potential, electrical properties of semiconductor crystals and fermi surfaces. [K5]

| Course Code 20PPHC31 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|-------|-------|-------|-------|---------|---------|-------|-------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | L | H | M | L | H | L | M | - | - |
| CO2 | H | L | H | M | M | H | L | M | - | - |
| CO3 | H | L | H | H | M | H | L | M | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | H | L | H | H | H | L | H | - | - |



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| | | | |
|--------------------------|-------------------------|----------------|----------------|
| Semester III | SOLID STATE PHYSICS - I | Hours/Week: 6 | |
| Core Course-7 | | Credits: 4 | |
| Course Code 20PPHC31N | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : explain crystal structure, crystal diffraction, crystal binding, crystal vibration, fermi gas, energy band and semiconductor crystals. [K2]
- CO2 : illustrate various types of crystal structure, crystal binding, phonon properties, thermal & electrical conductivities of metals. [K3]
- CO3 : Determine properties, energy states and energy band of crystal. [K3]
- CO4 : analyze crystal structure, elastic constants in cubic crystal, crystal vibrations of n-atomic basis, free electron gas, quantization of orbits and impurity energy states in semiconductors. [K4]
- CO5 : evaluate structure factor for bcc and fcc lattices, elastic waves in cubic crystals, thermal properties of crystals, wave equation of electron in periodic potential, electrical properties of semiconductor crystals and fermi surfaces. [K5]

| Course code 20PPHC31N | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|--------------------------|-------------|-------------|----------|----------|----------|----------|-------------|------------|----------|----------|
| | PS O 1.a | PS O 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PS O 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | L | H | M | L | H | L | M | - | - |
| CO2 | H | L | H | M | M | H | L | M | - | - |
| CO3 | H | L | H | H | M | H | L | M | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | H | L | H | H | H | L | H | - | - |



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| | | | |
|---------------------------------------|-------------------------------|------------------------------|------------------------------|
| Semester III | ELECTROMAGNETIC THEORY | Hours/Week: 6 | |
| Core Course-8 | | Credits: 5 | |
| Course Code 20PPHC32 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : explain electrostatic fields, magnetic fields, electromagnetic induction, propagation and radiation of electromagnetic waves. [K2]
- CO2 : apply the basic laws of electromagnetic fields to calculate the intensities of electric & magnetic fields. [K3]
- CO3 : Use Maxwell's equation to find propagating modes, average power of electromagnetic waves in different media, average power of EM waves radiated from dipole & Half wave antenna. [K3]
- CO4 : analyse the electrostatic fields due to electric dipole, quadrupole, polar and nonpolar dielectrics, solution of Laplace equation in rectangular & spherical coordinates, magnetic fields, propagation and radiation of electromagnetic waves. [K4]
- CO5 : evaluate the equations involved in calculation of static & induced field intensities, propagating modes and radiated power. [K5]

| Course Code 20PPHC32 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|-------|-------|-------|-------|---------|---------|-------|-------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | L | H | M | L | L | L | M | - | - |
| CO2 | H | L | H | H | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | H | L | H | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | L | L | H | H | H | L | H | - | - |



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| | | | |
|---------------|---------------------------|---------------|----------|
| Semester III | ELECTROMAGNETIC THEORY | Hours/Week: 6 | |
| Core Course-8 | | Credits: 5 | |
| Course Code | | Internal | External |
| 20PPHC32N | | 40 | 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1 : explain electrostatic fields, magnetic fields, electromagnetic induction, propagation and radiation of electromagnetic waves. [K2]

CO2 : apply the basic laws of electromagnetic fields to calculate the intensities of electric & magnetic fields. [K3]

CO3: Use Maxwell's equation to find propagating modes, average power of electromagnetic waves in different media, average power of EM waves radiated from dipole & Half wave antenna. [K3]

CO4 : analyse the electrostatic fields due to electric dipole, quadrupole, polar and nonpolar dielectrics, solution of Laplace equation in rectangular & spherical coordinates, magnetic fields, propagation and radiation of electromagnetic waves. [K4]

CO5 : evaluate the equations involved in calculation of static & induced field intensities, propagating modes and radiated power. [K5]

| Course code 20PPHC32N | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|--------------------------|------------|------------|----------|----------|----------|----------|------------|------------|----------|----------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | L | H | M | L | L | L | M | - | - |
| CO2 | H | L | H | H | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | H | L | H | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | L | L | H | H | H | L | H | - | - |



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| | | | |
|-------------------------|------------------------|----------------|----------------|
| Semester III | QUANTUM MECHANICS - II | Hours/Week: 6 | |
| Core Course-9 | | Credits: 5 | |
| Course Code 20PPHC33 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : understand scattering theory, representations, transformations, symmetries, angular momentum, evolution with time and relativistic wave equations. [K2]
- CO2 : illustrate scattering cross section, Born and Eikonal approximation, partial wave analysis, Klein- Gordon and Dirac equation. [K3]
- CO3 : explain representations, transformations, symmetries, eigenvalue spectrum, Clebsch Gordon coefficients and perturbation theory. [K3]
- CO4 : analyze scattering cross section, Born series, partial waves, unitary transformations, addition of angular momenta, constant perturbations and relativistic wave equations. [K4]
- CO5 : assess Born and Eikonal approximations, behavior of partial waves, Clebsch – Gordon coefficients, perturbation theory and relativistic wave equations. [K5]

| Course Code 20PPHC33 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|-------|-------|-------|-------|---------|---------|-------|-------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | L | H | M | M | M | L | M | - | - |
| CO2 | H | L | H | M | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | H | L | H | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | L | L | H | H | H | L | H | - | - |



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| | | | |
|---------------------------------|--|------------------------|------------------------|
| Semester III | ELECTRONICS AND GENERAL PHYSICS LAB - III | Hours/Week: 6 | |
| Core Practical-III | | Credits: 3 | |
| Course Code 20PPHC31P | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : apply the theoretical concepts of Physics and Electronics to formulate the experiment. [K3]
- CO2 : sketch/write the circuit diagram, tabular column, model graph, micro controller 8051 programs to calculate the required physical parameters. [K3]
- CO3 : use the technical skills to efficiently handle the instruments, measure the required physical parameters, obtain the result and complete the records. [K3]
- CO4 : analyze the accuracy of the obtained result and assess the experimental results. [K4]
- CO5 : justify the observations of the experiment under different conditions. [K5]

| Course Code 20PPHC31P | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|--------------------------|------------|------------|----------|----------|----------|----------|------------|------------|----------|----------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | H | M | H | H | M | H | M | L | L |
| CO2 | H | H | L | H | H | H | H | M | L | L |
| CO3 | H | H | L | H | M | H | M | H | L | - |
| CO4 | H | H | L | H | H | H | H | H | L | - |
| CO5 | H | H | L | H | H | H | H | H | L | - |



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| | | | |
|---------------------------|--|----------------------|-----------------|
| Semester III | ELECTRONICS AND GENERAL PHYSICS LAB - III | Hours/Week: 6 | |
| Core Practical-III | | Credits: 3 | |
| Course Code | | Internal | External |
| 20PPHC31PN | | 40 | 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : apply the theoretical concepts of Physics and Electronics to formulate the experiment. [K3]
- CO2 : sketch/write the circuit diagram, tabular column, model graph and programs to calculate the required physical parameters. [K3]
- CO3 : use the technical skills to efficiently handle the instruments, measure the required physical parameters, obtain the result and complete the records. [K3]
- CO4 : analyze the accuracy of the obtained result and assess the experimental results or numerical results. [K4]
- CO5 : justify the observations of the experiment under different conditions. [K5]

| Course code 20PPHC31PN | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | PSO | PSO | PSO | PSO | PSO | PSO | PSO | PSO | PSO | PSO |
| | 1.a | 1.b | 2 | 3 | 4 | 5 | 6.a | 6.b | 7 | 8 |
| CO1 | H | H | M | H | H | M | H | M | L | L |
| CO2 | H | H | L | H | H | H | H | M | L | L |
| CO3 | H | H | L | H | M | H | M | H | L | - |
| CO4 | H | H | L | H | H | H | H | H | L | - |
| CO5 | H | H | L | H | H | H | H | H | L | - |



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| | | | |
|--------------|--|-----------------|---------------|
| Semester III | PRACTICE FOR CSIR / NET – GENERAL PAPER | Hours/Week:1 | |
| Course Code | | Credits: 1 | |
| 20PGOL32 | | Internal 100 | External - |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : explain various concepts related to numbers, quantitative comparison, monetary problems and logical reasoning. [K2]
- CO2 : apply the analytical skills and logical reasoning in solving problems related to competitive examinations. [K3]
- CO3 : solve typical problems, geometrical type problems, daily life problems in an effective manner. [K3]
- CO4 : analyze the techniques used in solving complicated real life problems. [K4]
- CO5 : interpret the data using logical reasoning and observational ability. [K5]

| Course Code 20PGOL32 | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | H | H | M | M | - | M | - | - |
| CO2 | H | H | H | H | - | M | - | - |
| CO3 | H | H | H | H | - | H | - | - |
| CO4 | H | M | H | H | - | H | - | - |
| CO5 | H | M | H | H | - | H | - | - |



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| | | | |
|---------------------------------------|----------------------------|------------------------------|------------------------------|
| Semester III | DIGITAL ELECTRONICS | Hours/Week: 5 | |
| NMEC | | Credits: 4 | |
| Course Code 20PPHN31 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1: understand number system, Boolean algebra, combinational and sequential circuits. [K1]

CO2: explain basic laws of Boolean algebra, logic diagram using logic gates, combinational and sequential circuits. [K2]

CO3: construct Boolean function using laws, property & theorems, converters, combinational & sequential circuits. [K3]

CO4: discuss about number system, Karnaugh map, arithmetic circuits, types of flip-Flop, converters, counters and registers. [K4]

CO5: design logic function using SOP & POS, EX-OR gate using NOR & NAND gates, half adder & full adder using NOR gate and MOD-12 counter. [K5]

| Course code 20PPHN31 | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
| CO1 | H | H | H | M | L | M | - | - |
| CO2 | H | H | H | M | L | M | - | - |
| CO3 | H | H | H | M | M | H | - | - |
| CO4 | H | H | H | M | M | H | - | - |
| CO5 | H | H | H | H | M | H | - | - |



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| | | | |
|-------------------------|--------------------------|----------------|----------------|
| Semester IV | SOLID STATE PHYSICS - II | Hours/Week: 6 | |
| Core Course-10 | | Credits: 5 | |
| Course Code 20PPHC41 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : understand the concepts of electric & magnetic properties of materials, quasi particles, surface & interface physics and defects in crystals. [K2]
- CO2 : explain the parameters of superconductors, surface crystallography, dielectrics, quasi particles and magnetic resonance. [K3]
- CO3 : illustrate the types of superconductors, magnetic materials, ferroelectric crystals and defects & dislocations in crystals. [K3]
- CO4 : discuss the screening in quasi particles, theories of electric & magnetic materials, magnetic resonance, surface physics, defects & dislocations in crystals. [K4]
- CO5 : evaluate the interactions of quasi particles, electric & magnetic effects on materials and defects & dislocations in crystals. [K5]

| Course Code 20PPHC41 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|-------|-------|-------|-------|---------|---------|-------|-------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | L | H | L | L | M | L | M | - | - |
| CO2 | H | L | H | H | M | M | L | M | - | - |
| CO3 | H | L | H | H | M | H | L | M | - | - |
| CO4 | H | M | L | H | H | H | L | H | - | - |
| CO5 | H | H | L | H | H | H | L | H | - | - |



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| | | | |
|---------------------------------|---------------------------------|----------------|----------------|
| Semester IV | SOLID STATE PHYSICS - II | Hours/Week: 6 | |
| Core Course-10 | | Credits: 5 | |
| Course Code 20PPHC41N | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1 : understand the concepts of electric & magnetic properties of materials, quasi particles, surface & interface physics and defects in crystals. [K2]

CO2 :explain the parameters of superconductors, surface crystallography, dielectrics and quasi particles. [K3]

CO3 : illustrate the types of superconductors, magnetic materials, ferroelectric crystals and defects & dislocations in crystals. [K3]

CO4 : discuss the screening in quasi particles, theories of electric & magnetic materials, surface physics, defects & dislocations in crystals. [K4]

CO5 : evaluate the interactions of quasi particles, electric & magnetic effects on materials and defects & dislocations in crystals. [K5]

| Course code 20PPHC41N | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|--------------------------|------------|------------|------|----------|----------|----------|------------|------------|----------|----------|
| | PSO 1.a | PSO 1.b | PSO2 | PSO 3 | PS O4 | PS O5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | L | H | L | L | M | L | M | - | - |
| CO2 | H | L | H | H | M | M | L | M | - | - |
| CO3 | H | L | H | H | M | H | L | M | - | - |
| CO4 | H | M | L | H | H | H | L | H | - | - |
| CO5 | H | H | L | H | H | H | L | H | - | - |



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| | | | |
|-------------------------|------------------------|----------------|----------------|
| Semester IV | MOLECULAR SPECTROSCOPY | Hours/Week: 6 | |
| Core Course-11 | | Credits: 5 | |
| Course Code 20PPHC42 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : understand the basics of electromagnetic radiation interaction with matter applied in various spectroscopic techniques. [K2]
- CO2 : apply the physics principles to understand the instrumentation techniques in rotational, vibrational & raman spectroscopic methods and figure out the structural and compositional information of molecules. [K3]
- CO3 : illustrate the electronic, nuclear magnetic resonance & mossbauer spectroscopic methods and its applications. [K3]
- CO4 : analyze the rotational, vibrational, raman, electronic, nuclear magnetic resonance and mossbauer spectra of molecules. [K4]
- CO5 : appraise the energy level diagram and wave number expression of rotational, vibrational and rotation-vibration spectra of molecules. [K5]

| Course Code 20PPHC42 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|-------|-------|-------|-------|---------|---------|-------|-------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | L | H | H | M | M | L | M | - | - |
| CO2 | H | L | H | H | M | M | L | M | - | - |
| CO3 | H | L | H | H | H | H | L | H | - | - |
| CO4 | H | L | L | H | H | H | L | H | - | - |
| CO5 | H | L | L | H | H | H | L | H | - | - |



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|--------------------------------|--------------------------------------|------------------------|------------------------|
| Semester IV | ELECTRONIC COMMUNICATIONS | Hours/Week: 6 | |
| Core Course-12 | | Credits: 5 | |
| Course Code 20PPHC43 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : understand the basic principles and concepts of various digital communication systems, wave guides and antennas. [K2]
- CO2 : illustrate the methods, types, modes of propagation of communication systems, transmission lines, cables, wave guides and antennas. [K3]
- CO3 : examine the losses, reduction and errors occurs in digital communication system. [K3]
- CO4 : analyze the parameters used in satellite, mobile, optical fiber communication systems, antennas, transmission lines and cables. [K4]
- CO5 : assess the transmitters, receivers and other devices for digital communication system. [K5]

| Course code 20PPHC43 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|-------|-------|-------|-------|---------|---------|-------|-------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | L | H | L | L | L | L | M | - | - |
| CO2 | H | M | H | L | M | M | L | M | - | - |
| CO3 | H | M | H | L | M | M | L | M | - | - |
| CO4 | H | H | L | H | H | H | L | H | - | - |
| CO5 | H | H | L | H | H | H | L | H | - | - |



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| | | | |
|--------------------------|------------------------------|----------------|----------------|
| Semester IV | ELECTRONIC COMMUNICATIONS | Hours/Week: 6 | |
| Core Course-12 | | Credits: 5 | |
| Course Code 20PPHC43N | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : understand the basic principles and concepts of Various digital communication systems, wave guides and antennas. [K2]
- CO2 : illustrate the methods, types, modes of propagation of communication systems, transmission lines, cables, wave guides and antennas. [K3]
- CO3 : examine the losses, reduction and errors occurs in digital communication system. [K3]
- CO4 : analyze the parameters used in satellite, mobile, optical fiber communication systems, antennas, transmission lines and cables. [K4]
- CO5 : assess the transmitters, receivers and other devices for digital communication system. [K5]

| Course code 20PPHC43N | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|--------------------------|---------|---------|-------|-------|-------|-------|---------|---------|-------|-------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | L | H | L | L | L | L | M | - | - |
| CO2 | H | M | H | L | M | M | L | M | - | - |
| CO3 | H | M | H | L | M | M | L | M | - | - |
| CO4 | H | H | L | H | H | H | L | H | - | - |
| CO5 | H | H | L | H | H | H | L | H | - | - |



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|---------------------------------|---------------------|------------------------|------------------------|
| Semester: IV | NANO PHYSICS | Hours/Week: 6 | |
| Core Course - 13 | | Credits: 5 | |
| Course Code 20PPHC44 | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : explain characterization & synthesis of nanoparticles, CNT's and quantum nanostructures. [K2]
- CO2 : apply the relevant physics theories to characterize and synthesize nanoparticles, understand properties of nanomaterials. [K3]
- CO3 : illustrate the structure and properties of CNT's, MEM's, NEM's and quantum nanostructures. [K3]
- CO4 : analyze the characterization & synthesis methods, properties of nanomaterials, nanomachines & devices and behaviour of quantum nanostructures. [K4]
- CO5 : appraise the characterization & synthesis methods, improved properties of nanomaterials, applications of nanomachines & quantum nanodevices. [K5]

| Course Code 20PPHC44 | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|-------------------------|---------|---------|-------|-------|-------|-------|---------|---------|-------|-------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | H | H | M | M | H | M | M | - | - |
| CO2 | H | H | H | H | H | H | H | M | - | - |
| CO3 | H | M | H | H | H | H | H | H | - | - |
| CO4 | H | M | L | H | H | H | H | H | - | - |
| CO5 | H | M | L | H | H | H | H | H | - | - |



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|--------------------------|---------------------|----------------|----------------|
| Semester: IV | NANO PHYSICS | Hours/Week: 6 | |
| Core Course - 13 | | Credits: 5 | |
| Course Code 20PPHC44N | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : explain characterization & synthesis of nanoparticles, CNT's and quantum nanostructures. [K2]
- CO2 : apply the relevant physics theories to characterize and synthesize nanoparticles, understand properties of nanomaterials. [K3]
- CO3 : illustrate the structure and properties of CNT's, MEM's, NEM's and quantum nanostructures. [K3]
- CO4 : analyze the characterization & synthesis methods, properties of nanomaterials, nanomachines & devices and behaviour of quantum nanostructures. [K4]
- CO5 : appraise the characterization & synthesis methods, improved properties Of nanomaterials, applications of nanomachines & quantum nanodevices. [K5]

| Course code 20PPHC44N | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|--------------------------|------------|------------|----------|----------|----------|----------|------------|------------|----------|----------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | H | H | M | M | H | M | M | - | - |
| CO2 | H | H | H | H | H | H | H | M | - | - |
| CO3 | H | M | H | H | H | H | H | H | - | - |
| CO4 | H | M | L | H | H | H | H | H | - | - |
| CO5 | H | M | L | H | H | H | H | H | - | - |



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| | | | |
|---|----------------|------------------------------|------------------------------|
| Semester IV | PROJECT | Hours/Week: 6 | |
| Core Course-13 | | Credits: 4 | |
| Course Code 20PPHC41PR | | Internal 40 | External 60 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : use literature review to formulate the project work. [K3]
- CO2 : apply inter disciplinary knowledge to carry out project work. [K3]
- CO3 : analyze the results of the work carried. [K4]
- CO4 : conclude the findings with the existing results. [K5]
- CO5 : assess the project work to fulfil the needs of society. [K5]

| Course Code 20PPHC41PR | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|----------------------------------|------------|------------|----------|----------|----------|----------|------------|------------|----------|----------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | H | H | H | L | H | H | M | L | L |
| CO2 | H | H | H | H | M | H | H | M | L | L |
| CO3 | H | H | H | H | H | H | H | H | L | - |
| CO4 | H | H | L | H | H | H | H | H | L | - |
| CO5 | H | H | L | H | H | H | H | H | L | - |



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| | | | |
|----------------------------------|--|------------------------|------------------------|
| Semester IV | PROJECT – Research Methodology & Ethics | Hours/Week: 6 | |
| Core Course-13 | | Credits: 4 | |
| Course Code 22PPHC41PR | | Internal 60 | External 40 |

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 : apply research methodologies to formulate the project work. [K3]
- CO2 : apply inter disciplinary knowledge and research ethics to carry out project work. [K3]
- CO3 : analyze the results of the work carried upholding research ethics. [K4]
- CO4 : conclude the findings with the existing results. [K5]
- CO5 : develop the project work to fulfill the needs of society. [K5]

| Course code 22PPHC41PR | PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | PO8 |
|---------------------------|------------|------------|----------|----------|----------|----------|------------|------------|----------|----------|
| | PSO 1.a | PSO 1.b | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6.a | PSO 6.b | PSO 7 | PSO 8 |
| CO1 | H | H | H | H | L | H | H | M | L | L |
| CO2 | H | H | H | H | M | H | H | M | L | L |
| CO3 | H | H | H | H | H | H | H | H | L | - |
| CO4 | H | H | L | H | H | H | H | H | L | - |
| CO5 | H | H | L | H | H | H | H | H | L | - |