+KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Re-accredited by NAAC with 'A' Grade – 3.64 CGPA out of 4 (3rd Cycle)

College of Excellence (UGC)

Coimbatore – 641 029

DEPARTMENT OF PHYSICS (Aided)

COURSE OUTCOMES (CO)

M.Sc. PHYSICS

For the students admitted
In the
Academic Year 2018-2019

Programme code : 03		M.Sc Physics		
Course Code: 18PPH101		Core Paper 1 – Classical Mechanics		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**I**	**5**	**75**	**5**

Course Objective

To enable the learners to know about the

1. Mechanics of single and system of particle,
2. Generalised coordinates, Lagrangian formulation and mechanics of rigid body motion,
3. Hamiltonian formulation of mechanics, Hamilton-Jacobi theory, harmonic oscillator problem, theory and applications of small oscillations.

Course outcome (CO)

K1	**CO1**	Know about Newtonian mechanics which provides models of the mechanical behavior of objects; conservation principles involving momentum, angular momentum, energy which the fundamental equations of motion.
K2	**CO2**	Get knowledge about coordinate transformations, oscillatory motion, gravitation and other central forces, Lagrangian mechanics and applications of Lagrangian mechanics to solve the physical problems.
K3	**CO3**	Get knowledge about Mechanics of Rigid Body motion.
K4	**CO4**	Know about the theory of small oscillations and its applications

Programme code : 03		M.Sc Physics		
Course Code: 18PPH102		Core Paper 2 - Mathematical Physics		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**I**	**5**	**75**	**5**

Course Objective

To enable the learners to

1. Understand complex variables, group theory & tensors

2. Know about different differential equations and partial differential equations in Physics

3. Study about some of the numerical methods

Course outcome (CO)

K1	**CO1**	Have a good understanding of complex analytsis including important theorems and determination of residues to evaluate certain types of definite integrals
K2	**CO2**	Solve physically relevant partial differential equations using the method of separation of variables and be familiar with the most important special functions such as Bessel, Legendre and Hermite to solve differential equations
K3	**CO3**	Have knowledge in abstract group theory and tensors
K4	**CO4**	Apply numerical methods to obtain appropriate solutions to mathematical problems

Programme code : 03		M.Sc Physics		
Course Code: 18PPH103		Core Paper 3 – Modern Optics		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**I**	**5**	**75**	**5**

Course Objective

To explore

1. Necessary and sufficient condition for laser
2. Basic principles involved in Non-linear optical effects
3. Different types of optical fibers and its applications

Course outcome (CO)

K1	**CO1**	Acquire basic knowledge about optics of solids, scattering, polarization
K2	**CO2**	Understand about Magneto-optic effects ,Electro-optic effects and non-linear optical effects
K3	**CO3**	Acquire relevant information about fabrication of optical fibers by various processes about latest developed fibres. fiber optic sensors and their application in medical field
K4	**CO4**	Have good knowledge about various fiber optic sensors and their application in medical field.They also know about fiber losses in core ,cladding material and also dispersion in fibres.

Programme code : 03		M.Sc Physics		
Course Code: 18PPH204		Core Paper 4 – Quantum Mechanics I		
Batch	Semester	Hours/Week	Total Hours	Credits
2018-2019	II	5	75	4

Course Objective

1. To impart knowledge on topics of advanced quantum mechanics
2. To understand and to develop problem solving ability on formalism of quant mechanics, energy Eigen value problems and approximation methods.
3. To understand time dependent and independent theories and perturbation theories.

Course Outcome (CO)

K1	**CO1**	After successfully completing the course, students will be able to spot, identify and relate the eigenvalue problems for energy, momentum and angular momentum.
K2	**CO2**	Solutions of the Schrodinger equation for one and three-dimensional potentials, the square well, the harmonic oscillator and algebraic solution of the harmonic oscillator, barrier penetration and the Ramsauer-Townsend effect will be effectively learned.
K3	**CO3**	This course will introduce Dirac's bra-ket formulation of quantum mechanics and make students familiar with various approximation methods.
K4	**CO4**	The students will be able to understand the time-independent and time-dependent perturbation theory, Schrodinger, Heisenberg and Interaction pictures.

Programme code : 03		M.Sc Physics		
Course Code: 18PPH205		Core Paper 5 - Thermodynamics and Statistical Mechanics		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**II**	**5**	**75**	**4**

Objective: To enable the learner to know about

1. Basic laws in Thermodynamics,
2. Classical law and distributions,
3. Basic concepts in quantum statistics.

Course outcome (CO)

K1	**CO1**	Know about statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, chemical potential and apply the concepts and principles of black body radiation to analyze radiation phenomena in thermodynamic systems.
K2	**CO2**	Get knowledge about using the statistical Physics methods, such as Boltzmann distribution, Gibbs distribution, Fermi-Dirac and Bose-Einstein distributions to solve problems in some physical systems.
K3	**CO3**	Get knowledge about basic concepts and relations including phase space, ensemble, statistical equilibrium, thermal equilibrium and mechanical equilibrium.
K4	**CO4**	Get knowledge about the statistical mechanics of quantum fluids (bosons or fermions), classical limit and strongly degenerate quantum systems, including Fermi gases and Bose-Einstein condensate

Programme code : 03		M.Sc Physics		
Course Code: 18PPH206		Core Paper – 6 : Thin Film Physics, Plasma Physics and Crystal Growth		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**II**	**4**	**60**	**4**

Course Objective

To enable the learners to understand the

1. Preparation and characterization of thin films
2. Fundamentals of plasma Physics
3. Techniques of crystal growth

Course outcome (CO)

K1	**CO1**	Have knowledge on the mechanism and process for the synthesis and evolution of thin films
K2	**CO2**	Be able to understand the principles, advantages and disadvantages of different thin film deposition methods
K3	**CO3**	Be able to the fundamental plasma parameters (under what conditions an ionized gas can be treated as plasma) and to distinguish single particle approach and fluid approach
K4	**CO4**	Be able to understand the physical and chemical processes for the growth of crystals and the different growth techniques

Programme code : 03		M.Sc Physics		
Course Code: 18PPH207		Core Paper 7 - Nuclear and Particle Physics		
Batch **2018-2019**	**Semester** **II**	**Hours/Week** **4**	**Total Hours** **60**	**Credits** **4**

Course Objective

To study about the

1. Basic nuclear structure
2. Radio - Alpha decay, Beta decay and Gamma decay
3. Nuclear Models: Liquid Drop Model, Shell Model

Course Outcome (CO)

K1	**CO1**	Be able to study the structure of a nucleus and about nuclear forces
K2	**CO2**	Be able to understand the various types of decays in radioactive elements
K3	**CO3**	Have a thorough knowledge of the different nuclear models and different types of nuclear reactions
K4	**CO4**	A thorough knowledge about elementary particles

Programme code : 03		M.Sc Physics		
Course Code: 18PPH2CL		Core Practical I – General Experiments		
Batch 2018-2019	Semester I & II	Hours/Week 4	Total Hours 120	Credits 3

Course Objective

To enable the learners to

1. Perform experiments in the field of general Physics and gaining physical understanding of the results.
2. Explain physical phenomena and enable to relate physical laws and their applications and hence have a good foundation in Physics.
3. Will be able to apply standard techniques and assess the experimental result and output.

Course outcome (CO)

K5	**CO1**	Have a good foundation in the fundamentals and applications of general Physics
K5	**CO2**	Able to design, carry out record and analyze experimental data.
K5	**CO3**	Provide hands on experiences in conducting scientific investigations and laboratory experiments.
K5	**CO4**	Understand the relationship between theory and experimental results.

Programme code : 03		M.Sc Physics		
Course Code: 18PPH2CM		Core Practical II – Electronics Experiments		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**I & II**	**4**	**120**	**3**

Course Objective

To enable the learners to

1. To design and construct small electronic circuits
2. To develop experimental skills and understand relation between experimental data and theoretical analysis.
3. Have a good foundation in the fundamentals and applications of experimental Physics

Course outcome (CO)

K5	**CO1**	Acquire a basic knowledge in solid state electronics including FET, UJT and OP AMP.
K5	**CO2**	Develop the ability to analyse and design analog electronic circuits using discrete components.
K5	**CO3**	Observe the amplitude frequency response of common amplification circuits.
K5	**CO4**	Take measurements to compare experimental results in the laboratory with the theoretical analysis.

Programme: 03		M.Sc. Physics		
Course Code: 18PPH308		*Core Paper 8 - Quantum Mechanics – II*		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**III**	**5**	**75**	**5**

Course Objective

To enable the learners to
1. Understand the basic approximate methods in molecular Quantum Mechanics
2. Understand relativistic quantum theory, quantum optics and quantization of fields and scattering

Course outcome (CO)

K1	**CO1**	Understand different approximations and models to describe a many electron system
K2	**CO2**	Comparison of MO and VB theories to explain molecular structre of hydrogen molecule and hydrogen ion
K3	**CO3**	Understand the relation between relativistic theory and quantum mechanics through Dirac's and the related theories. The understandability of spin and negative energy states will be clear.
K4	**CO4**	Interpret scattering theory interms of quantum aspects.

Programme: 03		M.Sc Physics		
Course Code: 18PPH309		Core Paper 9 – Electromagnetic Theory and Electrodynamics		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**III**	**5**	**75**	**5**

Course Objective

To know about
1. Theoretical study on electrostatics and magneto statics
2. Applications of Maxwell's equations
3. Antenna Arrays

Course outcome (CO)

K1	**CO1**	Understanding of Maxwell's equations and will be able to manipulate and apply them to EM problems
K2	**CO2**	Define and derive expressions for energy of electrostatics and magnetostatics fields and derive Poynting's theorem
K3	**CO3**	Understanding of the propagation and losses of electromagnetic waves in different media.
K4	**CO4**	Study the interaction of electromagnetic waves with different media

Programme: 03		M.Sc Physics		
Course Code: 18PPH310		Core paper 10 - Solid State Physics		
Batch **2018-2019**	**Semester** **III**	**Hours/Week** **5**	**Total Hours** **75**	**Credits** **5**

Course Objective

To impart knowledge on

1. The different symmetry phases and structures that occur in native
2. Different types of defects, dislocations in crystals
3. Various physical properties of crystalline solids

Course Outcome (CO)

K1	**CO1**	Knowledge on structural, semiconducting, superconducting and magnetic properties of crystalline materials
K2	**CO2**	Understand the imperfections in crystals and also lattice vibrations
K3	**CO3**	Knowledge on characterization of semiconducting and superconducting materials
K4	**CO4**	Analyze the effect of temperature, impurity concentration on electrical and magnetic properties of various materials.

Programme: 03		M.Sc Physics		
Course Code: 18PPH411		Core paper 11 - Communication Physics		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**IV**	**5**	**75**	**4**

Course Objective

To enable the learners to understand

1. Various modulation and detection techniques

2. Generation and propagation of microwaves

3. Radar and communication electronics

Course Outcome (CO)

K1	**CO1**	Knowledge about wireless and wired telephony communication systems
K2	**CO2**	Understand the working principles of Radio, Television, Radar and Satellite communication
K3	**CO3**	Knowledge on modeling of different types of antennas and microwave generation
K4	**CO4**	Able analyze the problems involved in designing of wireless communications devices

Programme: 03		M.Sc Physics		
Course Code: 18PPH412		**Core Paper 12 - Atomic and Molecular Spectroscopy**		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**IV**	**5**	**75**	**4**

Course Objective

To study about the

1. Atomic Spectroscopy, Microwave Spectroscopy, IR Spectroscopy and Raman Spectroscopy
2. Electronic Spectra of diatomic molecules
3. NMR and AQR Spectroscopy.

Course outcome (CO)

K1	**CO1**	Explain the different spectroscopic methods for qualitative and quantitative analysis
K2	**CO2**	Explain electronic transitions, atomic spectra, excited states, hydrogenic and multielectron atoms.
K3	**CO3**	Understanding of quantum chemical principles
K4	**CO4**	Knowledge about binding of atoms into molecules, molecular degrees of freedom (electronic, vibrational and rotational) and elementary group theory.

Programme: 03		M.Sc. Physics		
Course Code: 18PPH4CN		Core Practical III – Advanced Experiments		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**III & IV**	**5**	**150**	**3**

Course Objective

To enable the learners to

1. Perform experiments in the field of advanced Physics and interpret the results.
2. Explain physical phenomena and enable to estimate various related parameters and to analyze them.
3. Apply the experimental techniques to the research level

Course outcome (CO)

K5	**CO1**	Fundamental knowledge on applications of advanced Physics.
K5	**CO2**	Understand the relationship between theory and experiments
K5	**CO3**	Provide hands on experiences in conducting scientific investigations and laboratory experiments.
K5	**CO4**	Design, carry out record and analyze experimental data.

Programme: 03		M.Sc. Physics		
Course Code: 18PPH4CO		Core Practical IV – Special Electronics Experiments		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**III & IV**	**5**	**150**	**3**

Course Objective

To enable the learners to

1. To design and construct small electronic circuits
2. To develop experimental skills and understand relation between experimental data and theoretical analysis.
3. Have a good foundation in the fundamentals and applications of experimental Physics

Course outcome (CO)

K5, K6	**CO1**	Acquire a basic knowledge in solid state electronics including OP AMP and 555 timer and understand the ALP using 8085 processor
K5, K6	**CO2**	Develop the ability to analyze and design analog electronic circuits using discrete components.
K5, K6	**CO3**	Observe the physical entities by constructing a sensor circuits such as temperature and light intensity using Op-amp
K5, K6	**CO4**	Take measurements to compare experimental results in the laboratory with the theoretical analysis and also simulate the ALP for the interfaces such as Traffic control, Stepper motor and A/D, D/A converters

Programme: 03		M.Sc Physics		
Course Code:		Nanotechnology Principles and Applications		
Batch 2018-2019	Semester	Hours/Week 5	Total Hours 75	Credits 5

Course Objective

To impart knowledge on

1. To understand the nanomaterial and nanotechnology
2. To know the different synthesis processes for making nanomaterials
3. To know the characterization techniques available for nanomaterials
4. To explore the nano-devices and various applications

Course Outcome (CO)

K1	**CO1**	Understand the basic concepts of nanoscience, physical principles of quantum confinement and classification of nanostructures.
K2	**CO2**	Know the synthesis methods of 0-D, 1-D, 2-D and 3-D nanomaterials and its own advantages.
K3	**CO3**	Know the various characterization methods to study material's morphological, structural and optical properties.
K4	**CO4**	Gain knowledge in the applications of nanotechnology in the field of data storage, biology solar cell, sensor and rechargeable batteries.

Programme: 03		M.Sc Physics		
Course Code:		Atmospheric Science		
Batch 2018-2019	Semester	Hours/Week 5	Total Hours 75	Credits 5

Course Objective

To enable the learners to

1. study about atmospheric thermodynamics and radiation
2. impart knowledge on clouds and precipitation and Air pollution.
3. study about meteorological systems and global energy balance

Course Outcome (CO)

K1	**CO1**	Know the composition and structure of atmosphere.
K2	**CO2**	Describe atmospheric thermodynamics and radiations
K3	**CO3**	Able to interpret clouds and precipitation
K4	**CO4**	Deliver the meteorological systems and global energy balance and to calibrate air pollution

Programme: 03		M.Sc Physics		
Course Code:		Biomedical Instrumentation		
Batch 2018-2019	Semester IV	Hours/Week 5	Total Hours 75	Credits 5

Course Objective

To enable the learners to

1. Impart knowledge on various biomedical instruments
2. understand the working of biomedical instruments

Course outcome (CO)

K1	**CO1**	Learn several signals that can be measured from the human body. Specific examples include temperature, electrical, and pressure signals.
K2	**CO2**	Understand theory and design on Measurement of blood flow and pressure.
K3	**CO3**	Understanding the problem and ability to identify the necessity of equipment to a specific problem.
K4	**CO4**	Study the designs of several instruments used to acquire signals from living systems. Integrate information learned about biomedical signals, sensors and instrumentation design.

Programme: 03		M.Sc. Physics		
Course Code:		**Problems in Physics**		
Batch 2018-2019	**Semester**	**Hours/Week 5**	**Total Hours 75**	**Credits 5**

Course Objective

1. To impart knowledge and skills to solve problem through the concept behind Physics
2. To apply multitude of creative thinking techniques towards the realistic problem
3. To define a plane for implementing lessons from the course once back on the job.

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Course outcome (CO)

K1	**CO1**	Understand the problem in the related nuclear, atomic, condensed matter, electromagnetics and electronics field
K2	**CO2**	Segregate the Physics involved in each section of the problem
K3	**CO3**	Recollect the related formulae and apply them in the respective areas necessary
K4	**CO4**	Solve problems in nuclear, atomic, condensed matter, electromagnetics and electronics

Programme code : 03		M.Sc Physics		
Course Code:		**Electronics and Microprocessors**		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019		**5**	**75**	**5**

Course Objective

To study about the

1. Power electronics, operational amplifiers and its applications and non linear IC circuits
2. Architecture, instruction set, interfacing and programming of 8085 microprocessors.

Course Outcome (CO)

K1	**CO1**	Will get knowledge on crystalline and amorphous nature of semiconductors
K2	**CO2**	Will be able to understand the method of preparation of thin films
K3	**CO3**	Will apply knowledge on Photolithography for manufacturing of LED
K4	**CO4**	Will be able analyze the problems in LED production and its performance

Programme code : 03		M.Sc Physics		
Course Code:		Applied Physics		
Batch 2018-2019	Semester	Hours/Week 5	Total Hours 75	Credits 5

Course Objective

1. To know about crystalline and amorphous semiconductors.
2. To know thin film deposition techniques.
3. To know about LED & production of laser diodes.

Course Outcome (CO)

K1	**CO1**	Get knowledge on crystalline and amorphous nature of semiconductors
K2	**CO2**	Understand the method of preparation of thin films
K3	**CO3**	Apply knowledge on Photolithography for manufacturing of LED
K4	**CO4**	Analyze the problems in LED production and its performance

Programme code : 03		M.Sc Physics		
Course Code:		Energy Physics		
Batch 2018-2019	Semester	Hours/Week 4	Total Hours 60	Credits 5

Course Objective

1. To know about solar radiation & solar pond
2. To know about photovoltaic energy conversion
3. Students to know hydrogen energy, wind energy & OTEC
4. Students to understand the importance of energy auditing and carbon credits.

Course Outcome (CO)

K1	**CO1**	Understand the nature of solar radiations and the conversation of solar radiation into thermal energy by means of solar energy collectors
K2	**CO2**	Understand the basics of solar energy into electrical energy conversion, material selection, solar cells and applications
K3	**CO3**	Know the principles of wind energy into electrical energy conversion, turbines, basic components of conversion system and its application
K4	**CO4**	Know the principles of principles of energy conservation and energy audit, global climate change, emissions from combustion of natural gas and carbon credits & its implantation projects.

Programme code : 03		M.Sc Physics		
Course Code:		Industrial Physics		
Batch 2018-2019	Semester	Hours/Week 4	Total Hours 60	Credits 5

Course Objective

To enable the learners to

1. Understand the working of SCR, UJT, Jones circuit and Triac circuits.
2. Understand the construction and working of flip-flops, registers converter and microprocessors.
3. Understand the working of the production of vacuum and construction of pumps and gauges
4. Understand the working of heating system, photodiode, gauges etc.,

Course Outcome (CO)

K1	**CO1**	Get knowledge on different types of transistors, regulators and microprocessors
K2	**CO2**	Understand the working mechanism of SCR, Flip-flops, Thermocouple and vacuum gauges
K3	**CO3**	Apply knowledge on vacuum techniques, applications of SCR, Switching circuits and Industrial heating systems
K4	**CO4**	Able analyze the problems involved in biasing of transistors, industrial transducers and production of vacuum

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DEPARTMENT OF PHYSICS (Aided)

COURSE OUTCOMES (CO)

M.Sc. PHYSICS

For the students admitted
In the
Academic Year 2019-2020

Programme code : 03		M.Sc Physics		
Course Code: 19PPH101		Core Paper 1 – Classical Mechanics		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2019-2020	**I**	**5**	**75**	**5**

Course Objective

To enable the learners to know about the

1. Mechanics of single and system of particle,
2. Generalised coordinates, Lagrangian formulation and mechanics of rigid body motion,
3. Hamiltonian formulation of mechanics, Hamilton-Jacobi theory, harmonic oscillator problem, theory and applications of small oscillations.

Course outcome (CO)

K1	CO1	Know about Newtonian mechanics which provides models of the mechanical behavior of objects; conservation principles involving momentum, angular momentum, energy which the fundamental equations of motion.
K2	CO2	Get knowledge about coordinate transformations, oscillatory motion, gravitation and other central forces, Lagrangian mechanics and applications of Lagrangian mechanics to solve the physical problems.
K3	CO3	Get knowledge about Mechanics of Rigid Body motion.
K4	CO4	Know about the theory of small oscillations and its applications

Programme code : 03		M.Sc Physics		
Course Code: 19PPH102		Core Paper 2 - Mathematical Physics		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2019-2020	**I**	**5**	**75**	**5**

Course Objective

To enable the learners to

1. Understand complex variables, group theory & tensors
2. Know about different differential equations and partial differential equations in Physics
3. Study about some of the numerical methods

Course outcome (CO)

K1	CO1	Have a good understanding of complex analytsis including important theorems and determination of residues to evaluate certain types of definite integrals
K2	CO2	Solve physically relevant partial differential equations using the method of separation of variables and be familiar with the most important special functions such as Bessel, Legendre and Hermite to solve differential equations
K3	CO3	Have knowledge in abstract group theory and tensors
K4	CO4	Apply numerical methods to obtain appropriate solutions to mathematical problems

Programme code : 03		M.Sc Physics		
Course Code: 19PPH103		Core Paper 3 – Condensed Matter Physics - I		
Batch	Semester	Hours/Week	Total Hours	Credits
2019-2020	I	5	75	5

Course Objective

To enable the learners to

1. Understand the crystal system of materials
2. Know about the role of free electron on thermal and electrical conductivity
3. Study about lattice vibrations in crystals

Course outcome (CO)

K1	**CO1**	Understand the fundamental principles and concepts of crystal physics
K2	**CO2**	Applying the reciprocal lattice to the crystal structure and explain how it gives rise to band structure
K3	**CO3**	Expand and evaluate the energy band structure of metal
K4	**CO4**	Acquire knowledge on solid materials

Programme code : 03		M.Sc Physics		
Course Code: 19PPH204		Core Paper 4 – Quantum Mechanics I		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2019-2020	**II**	**5**	**75**	**4**

Course Objective

1. To impart knowledge on topics of advanced quantum mechanics
2. To understand and to develop problem solving ability on formalism of quant mechanics, energy Eigen value problems and approximation methods.
3. To understand time dependent and independent theories and perturbation theories.

Course Outcome (CO)

K1	**CO1**	After successfully completing the course, students will be able to spot, identify and relate the eigenvalue problems for energy, momentum and angular momentum.
K2	**CO2**	Solutions of the Schrodinger equation for one and three-dimensional potentials, the square well, the harmonic oscillator and algebraic solution of the harmonic oscillator, barrier penetration and the Ramsauer-Townsend effect will be effectively learned.
K3	**CO3**	This course will introduce Dirac's bra-ket formulation of quantum mechanics and make students familiar with various approximation methods.
K4	**CO4**	The students will be able to understand the time-independent and time-dependent perturbation theory, Schrodinger, Heisenberg and Interaction pictures.

Programme code : 03		M.Sc Physics		
Course Code: 19PPH205		Core Paper 5 - Thermodynamics and Statistical Mechanics		
Batch 2019-2020	Semester II	Hours/Week 5	Total Hours 75	Credits 4

Course Objective

1. Basic laws in Thermodynamics,
2. Classical law and distributions,
3. Basic concepts in quantum statistics.

Course outcome (CO)

K1	**CO1**	Know about statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, chemical potential and apply the concepts and principles of black body radiation to analyze radiation phenomena in thermodynamic systems.
K2	**CO2**	Get knowledge about using the statistical Physics methods, such as Boltzmann distribution, Gibbs distribution, Fermi-Dirac and Bose-Einstein distributions to solve problems in some physical systems.
K3	**CO3**	Get knowledge about basic concepts and relations including phase space, ensemble, statistical equilibrium, thermal equilibrium and mechanical equilibrium.
K4	**CO4**	Get knowledge about the statistical mechanics of quantum fluids (bosons or fermions), classical limit and strongly degenerate quantum systems, including Fermi gases and Bose-Einstein condensate

Programme: 03		M.Sc. Physics		
Course Code: 19PPH206		Core Paper 6 - Problems in Physics		
Batch 2019-2020	Semester II	Hours/Week 5	Total Hours 75	Credits 4

Course Objective

1. To impart knowledge and skills to solve problem through the concept behind physics
2. To apply multitude of creative thinking techniques towards realistic problem
3. To visualize the basic concepts clearly

Course outcome (CO)

K1	**CO1**	Understand the problems in classical mechanics, quantum mechanics, electronics and thermodynamics
K2	**CO2**	Segregate the Physics involved in each section of the problem
K3	**CO3**	Recollect the related formulae and apply them in the respective areas necessary
K4	**CO4**	Solve problems in classical mechanics, quantum mechanics, electronics and thermodynamics

Programme code : 03		M.Sc Physics		
Course Code: 19PPH207		Core Paper 7 - Nuclear and Particle Physics		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2019-2020	**II**	**4**	**60**	**4**

Course Objective

To study about the

1. Basic nuclear structure
2. Radio - Alpha decay, Beta decay and Gamma decay
3. Nuclear Models: Liquid Drop Model, Shell Model

Course Outcome (CO)

K1	**CO1**	Be able to study the structure of a nucleus and about nuclear forces
K2	**CO2**	Be able to understand the various types of decays in radioactive elements
K3	**CO3**	Have a thorough knowledge of the different nuclear models and different types of nuclear reactions
K4	**CO4**	A thorough knowledge about elementary particles

Programme code : 03		M.Sc Physics		
Course Code: 19PPH2CL		Core Practical I – General Experiments		
Batch	Semester	Hours/Week	Total Hours	Credits
2019-2020	I & II	4	120	3

Course Objective

To enable the learners to

1. Perform experiments in the field of general Physics and gaining physical understanding of the results.
2. Explain physical phenomena and enable to relate physical laws and their applications and hence have a good foundation in Physics.
3. Will be able to apply standard techniques and assess the experimental result and output.

Course outcome (CO)

K5	**CO1**	Have a good foundation in the fundamentals and applications of general Physics
K5	**CO2**	Able to design, carry out record and analyze experimental data.
K5	**CO3**	Provide hands on experiences in conducting scientific investigations and laboratory experiments.
K5	**CO4**	Understand the relationship between theory and experimental results.

Programme code : 03		M.Sc Physics		
Course Code: 19PPH2CM		Core Practical II – Electronics Experiments		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2019-2020	**I & II**	**4**	**120**	**3**

Course Objective

To enable the learners to

1. To design and construct small electronic circuits
2. To develop experimental skills and understand relation between experimental data and theoretical analysis.
3. Have a good foundation in the fundamentals and applications of experimental Physics

Course outcome (CO)

K5	**CO1**	Acquire a basic knowledge in solid state electronics including FET, UJT and OP AMP.
K5	**CO2**	Develop the ability to analyse and design analog electronic circuits using discrete components.
K5	**CO3**	Observe the amplitude frequency response of common amplification circuits.
K5	**CO4**	Take measurements to compare experimental results in the laboratory with the theoretical analysis.

Programme: 03		M.Sc. Physics		
Course Code: 19PPH308		***Core Paper 8 - Quantum Mechanics – II***		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2019-2020	**III**	**5**	**75**	**5**

Course Objective

To enable the learners to

1. Understand the basic approximate methods in molecular Quantum Mechanics

2. Understand relativistic quantum theory, quantum optics and quantization of fields and scattering

Course outcome (CO)

K1	**CO1**	Understand different approximations and models to describe a many electron system
K2	**CO2**	Comparison of MO and VB theories to explain molecular structre of hydrogen molecule and hydrogen ion
K3	**CO3**	Understand the relation between relativistic theory and quantum mechanics through Dirac's and the related theories. The understandability of spin and negative energy states will be clear.
K4	**CO4**	Interpret scattering theory interms of quantum aspects.

Programme: 03		M.Sc Physics		
Course Code: 19PPH309		Core Paper 9 – Electromagnetic Theory and Electrodynamics		
Batch **2019-2020**	**Semester** **III**	**Hours/Week** **5**	**Total Hours** **75**	**Credits** **5**

Course Objective

To know about
1. Theoretical study on electrostatics and magneto statics
2. Applications of Maxwell's equations
3. Antenna Arrays

Course outcome (CO)

K1	**CO1**	Understanding of Maxwell's equations and will be able to manipulate and apply them to EM problems
K2	**CO2**	Define and derive expressions for energy of electrostatics and magnetostatics fields and derive Poynting's theorem
K3	**CO3**	Understanding of the propagation and losses of electromagnetic waves in different media.
K4	**CO4**	Study the interaction of electromagnetic waves with different media

Programme: 03		M.Sc Physics		
Course Code: 19PPH310		Core paper 9 – Condensed Matter Physics-II		
Batch 2019-2020	Semester III	Hours/Week 5	Total Hours 75	Credits 5

Course Objective

To gain knowledge about

1. Different types of bonding

2. Polarization effect on dielectric materials

3. Density states of electron

Course Outcome (CO)

K1	**CO1**	Knowledge on structural, semiconducting, superconducting and magnetic properties of crystalline materials
K2	**CO2**	Uunderstand the imperfections in crystals and also lattice vibrations
K3	**CO3**	Knowledge on ferroelectric nature materials
K4	**CO4**	Analyze the effect of temperature, impurity concentration on electrical and magnetic properties of materials.

Programme: 03		M.Sc Physics		
Course Code: 19PPH411		Core paper 11 - Communication Physics		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2019-2020	**IV**	**5**	**75**	**4**

Course Objective

To enable the learners to understand

1. Various modulation and detection techniques

2. Generation and propagation of microwaves

3. Radar and communication electronics

Course Outcome (CO)

K1	**CO1**	Knowledge about wireless and wired telephony communication systems
K2	**CO2**	Understand the working principles of Radio, Television, Radar and Satellite communication
K3	**CO3**	Knowledge on modeling of different types of antennas and microwave generation
K4	**CO4**	Able analyze the problems involved in designing of wireless communications devices

Programme code : 03		M.Sc Physics		
Course Code: 19PPH412		Core Paper 12 - Nuclear and Particle Physics		
Batch **2019-2020**	**Semester** **IV**	**Hours/Week** **5**	**Total Hours** **75**	**Credits** **4**

Course Objective

To study about the

1. Basic nuclear structure
2. Radio - Alpha decay, Beta decay and Gamma decay
3. Nuclear Models: Liquid Drop Model, Shell Model

Course Outcome (CO)

K1	**CO1**	Be able to study the structure of a nucleus and about nuclear forces
K2	**CO2**	Be able to understand the various types of decays in radioactive elements
K3	**CO3**	Have a thorough knowledge of the different nuclear models and different types of nuclear reactions
K4	**CO4**	A thorough knowledge about elementary particles

Programme: 03		M.Sc. Physics		
Course Code: 19PPH4CN		Core Practical III – Advanced Experiments		
Batch 2019-2020	Semester III & IV	Hours/Week 5	Total Hours 150	Credits 3

Course Objective

To enable the learners to

1. Perform experiments in the field of advanced Physics and interpret the results.
2. Explain physical phenomena and enable to estimate various related parameters and to analyze them.
3. Apply the experimental techniques to the research level

Course outcome (CO)

K5	**CO1**	Fundamental knowledge on applications of advanced Physics.
K5	**CO2**	Understand the relationship between theory and experiments
K5	**CO3**	Provide hands on experiences in conducting scientific investigations and laboratory experiments.
K5	**CO4**	Design, carry out record and analyze experimental data.

Programme: 03		M.Sc. Physics		
Course Code: 19PPH4CO		Core Practical IV – Special Electronics Experiments		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2019-2020	**III & IV**	**5**	**150**	**3**

Course Objective

To enable the learners to

1. To design and construct small electronic circuits
2. To develop experimental skills and understand relation between experimental data and theoretical analysis.
3. Have a good foundation in the fundamentals and applications of experimental Physics

Course outcome (CO)

K5, K6	**CO1**	Acquire a basic knowledge in solid state electronics including OP AMP and 555 timer and understand the ALP using 8085 processor
K5, K6	**CO2**	Develop the ability to analyze and design analog electronic circuits using discrete components.
K5, K6	**CO3**	Observe the physical entities by constructing a sensor circuits such as temperature and light intensity using Op-amp
K5, K6	**CO4**	Take measurements to compare experimental results in the laboratory with the theoretical analysis and also simulate the ALP for the interfaces such as Traffic control, Stepper motor and A/D, D/A converters

Programme code : 03		M.Sc Physics		
Course Code: 19PPH1E1		Major Elective Paper1- Electronics and Microprocessors		
Batch 2019-2020	Semester	Batch 2019-2020	Semester	Batch 2019-2020

Course Objective

To study about the

1. Power electronics, operational amplifiers and its applications and non linear IC circuits
2. Architecture, instruction set, interfacing and programming of 8085 microprocessors.

Course Outcome (CO)

K1	**CO1**	Will get knowledge on crystalline and amorphous nature of semiconductors
K2	**CO2**	Will be able to understand the method of preparation of thin films
K3	**CO3**	Will apply knowledge on Photolithography for manufacturing of LED
K4	**CO4**	Will be able analyze the problems in LED production and its performance

Programme code: 03		M.Sc., Physics		
CourseCode: 19PPH2E2		Major Elective Paper 2- Applied Physics		
Batch 2019-2020	**Semester**	**Batch 2019-2020**	**Semester**	**Batch 2019-2020**

Course Objective

1. To know about crystalline and amorphous semiconductors.

2. To know thin film deposition techniques.

3. To know about LED & production of laser diodes.

Course Outcome (CO)

K1	**CO1**	Get knowledge on crystalline and amorphous nature of semiconductors
K2	**CO2**	Understand the method of preparation of thin films
K3	**CO3**	Apply knowledge on Photolithography for manufacturing of LED
K4	**CO4**	Analyze the problems in LED production and its performance

Programme code : 03		M.Sc Physics		
Course Code:		Major Elective Paper 3 Energy Physics		
Batch	Semester	Hours/Week	Total Hours	Credits
2019-2020		4	60	5

Course Objective

1. To know about solar radiation & solar pond
2. To know about photovoltaic energy conversion
3. Students to know hydrogen energy, wind energy & OTEC
4. Students to understand the importance of energy auditing and carbon credits.

Course Outcome (CO)

K1	**CO1**	Understand the nature of solar radiations and the conversation of solar radiation into thermal energy by means of solar energy collectors
K2	**CO2**	Understand the basics of solar energy into electrical energy conversion, material selection, solar cells and applications
K3	**CO3**	Know the principles of wind energy into electrical energy conversion, turbines, basic components of conversion system and its application
K4	**CO4**	Know the principles of principles of energy conservation and energy audit, global climate change, emissions from combustion of natural gas and carbon credits & its implantation projects.

Programme code : 03		M.Sc Physics		
Course Code:		Major Elective Paper 4 Industrial Physics		
Batch	Semester	Hours/Week	Total Hours	Credits
2019-2020		4	60	5

Course Objective

To enable the learners to

1. Understand the working of SCR, UJT, Jones circuit and Triac circuits.
2. Understand the construction and working of flip-flops, registers converter and microprocessors.
3. Understand the working of the production of vacuum and construction of pumps and gauges
4. Understand the working of heating system, photodiode, gauges etc.,

Course Outcome (CO)

K1	**CO1**	Get knowledge on different types of transistors, regulators and microprocessors
K2	**CO2**	Understand the working mechanism of SCR, Flip-flops, Thermocouple and vacuum gauges
K3	**CO3**	Apply knowledge on vacuum techniques, applications of SCR, Switching circuits and Industrial heating systems
K4	**CO4**	Able analyze the problems involved in biasing of transistors, industrial transducers and production of vacuum

Programme: 03		M.Sc Physics		
Course Code: 19PPH3N1		**Non-Major Elective 1 - Nanotechnology Principles and Applications**		
Batch	**Semester**	**Batch**	**Semester**	**Batch**
2019-2020	**III**	**2019-2020**	**III**	**2019-2020**

Course Objective

To impart knowledge on

1. To understand the nanomaterial and nanotechnology
2. To know the different synthesis processes for making nanomaterials
3. To know the characterization techniques available for nanomaterials
4. To explore the nano-devices and various applications

Course Outcome (CO)

K1	**CO1**	Understand the basic concepts of nanoscience, physical principles of quantum confinement and classification of nanostructures.
K2	**CO2**	Know the synthesis methods of 0-D, 1-D, 2-D and 3-D nanomaterials and its own advantages.
K3	**CO3**	Know the various characterization methods to study material's morphological, structural and optical properties.
K4	**CO4**	Gain knowledge in the applications of nanotechnology in the field of data storage, biology solar cell, sensor and rechargeable batteries.

Programme code : 03		M.Sc Physics		
Course Code: 19PPH4N2		Non-Major Elective 2 : Thin Film Physics, Plasma Physics and Crystal Growth		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2018-2019	**IV**	**5**	**75**	**5**

Course Objective

To enable the learners to understand the

1. Preparation and characterization of thin films
2. Fundamentals of plasma Physics
3. Techniques of crystal growth

Course outcome (CO)

K1	**CO1**	Have knowledge on the mechanism and process for the synthesis and evolution of thin films
K2	**CO2**	Be able to understand the principles, advantages and disadvantages of different thin film deposition methods
K3	**CO3**	Be able to the fundamental plasma parameters (under what conditions an ionized gas can be treated as plasma) and to distinguish single particle approach and fluid approach
K4	**CO4**	Be able to understand the physical and chemical processes for the growth of crystals and the different growth techniques

Programme: 03		M.Sc Physics		
Non-Major Elective 3 -Atmospheric Science				
Batch 2019-2020	**Semester**	**Batch 2019-2020**	**Semester**	**Batch 2019-2020**

Course Objective

To enable the learners to

1. study about atmospheric thermodynamics and radiation
2. impart knowledge on clouds and precipitation and Air pollution.
3. study about meteorological systems and global energy balance

Course Outcome (CO)

K1	**CO1**	Know the composition and structure of atmosphere.
K2	**CO2**	Describe atmospheric thermodynamics and radiations
K3	**CO3**	Able to interpret clouds and precipitation
K4	**CO4**	Deliver the meteorological systems and global energy balance and to calibrate air pollution

Programme: 03		M.Sc Physics		
Non-Major Elective 4 - Biomedical Instrumentation				
Batch **2019-2020**	**Semester** **IV**	**Hours/Week** **5**	**Total Hours** **75**	**Credits** **5**

Course Objective

To enable the learners to

1. Impart knowledge on various biomedical instruments
2. understand the working of biomedical instruments

Course outcome (CO)

K1	**CO1**	Learn several signals that can be measured from the human body. Specific examples include temperature, electrical, and pressure signals.
K2	**CO2**	Understand theory and design on Measurement of blood flow and pressure.
K3	**CO3**	Understanding the problem and ability to identify the necessity of equipment to a specific problem.
K4	**CO4**	Study the designs of several instruments used to acquire signals from living systems. Integrate information learned about biomedical signals, sensors and instrumentation design.