KONGUNADU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)

Re-accredited by NAAC with 'A+' Grade (4th Cycle)

College of Excellence (UGC)

Coimbatore – 641 029

DEPARTMENT OF PHYSICS (Aided)

COURSE OUTCOMES (CO)

M.Sc. PHYSICS

For the students
admitted inthe
Academic Year 2020-2021

Sub Code: 20PPH101

Programme code : 03		M.Sc. Physics		
Title of the Paper		Core Paper 1 – Classical Mechanics		
Batch 2020-2021	Semester I	Hours/Week 5	Total Hours 75	Credits 5

Course Objectives

To enable the learners to know about the

1. Mechanics of single and system of particle,
2. Generalized 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 outcomes (CO)

K1 to K4	**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.
	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.
	CO3	Get knowledge about Mechanics of Rigid Body motion.
	CO4	Know about the theory of small oscillations and its applications

Sub Code: 20PPH102

Programme code : 03		M.Sc. Physics		
Title of the Paper		Core Paper 2 - Mathematical Physics		
Batch 2020-2021	Semester I	Hours/Week 5	Total Hours 75	Credits 5

Course Objectives

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 outcomes (CO)

K1 to K4	**CO1**	Have a good understanding of complex analysis including important theorems and determination of residues to evaluate certain types of definite integrals
	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
	CO3	Have knowledge in abstract group theory and tensors
	CO4	Apply numerical methods to obtain appropriate solutions to mathematical problems

Sub Code: 20PPH103

Programme code : 03		M.Sc. Physics		
Title of the Paper		**Core Paper 3 – Condensed Matter Physics - I**		
Batch **2020-2021**	**Semester** **I**	**Hours/Week** **5**	**Total Hours** **75**	**Credits** **5**

Course Objectives

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 outcomes (CO)

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

Sub Code: 20PPH204

Programme code : 03		M.Sc. Physics		
Title of the Paper		**Core Paper 4 – Quantum Mechanics I**		
Batch **2020-2021**	**Semester** **II**	**Hours/Week** **5**	**Total Hours** **75**	**Credits** **4**

Course Objectives

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

Course Outcomes (CO)

K1 to K4	**CO1**	After successfully completing the course, students will be able to spot, identify and relate the eigenvalue problems for energy, momentum and angular momentum.
	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.
	CO3	This course will introduce Dirac's bra-ket formulation of quantum mechanics and make students familiar with various approximation methods.
	CO4	The students will be able to understand the time-independent and time-dependent perturbation theory, Schrodinger, Heisenberg and Interaction pictures.

Sub Code: 20PPH205

Programme code : 03		M.Sc. Physics		
Title of the Paper		Core Paper 5 - Thermodynamics and Statistical Mechanics		
Batch 2020-2021	Semester II	Hours/Week 5	Total Hours 75	Credits 4

Objectives: To enable the learner to know about

(i) Basic laws in Thermodynamics,
(ii) Classical law and distributions,
(iii) Basic concepts in quantum statistics.

Course outcomes (CO)

K1 to K4	**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.
	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.
	CO3	Get knowledge about basic concepts and relations including phase space, ensemble, statistical equilibrium, thermal equilibrium and mechanical equilibrium.
	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

Sub Code: 20PPH206

Programme: 03		M.Sc. Physics		
Title of the Paper		Core Paper 6 - Problems in Physics		
Batch 2020-2021	Semester II	Hours/Week 5	Total Hours 75	Credits 4

Objectives

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 outcomes (CO)

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

Sub Code: 20PPH2CL

Programme code : 03		M.Sc. Physics		
Title of the Paper		Core Practical I – General Experiments		
Batch 2020-2021	Semester I & II	Hours/Week 5	Total Hours 150	Credits 3

Course Objectives

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 outcomes (CO)

K3,K4,K5	**CO1**	Have a good foundation in the fundamentals and applications of general Physics
	CO2	Able to design, carry out record and analyze experimental data.
	CO3	Provide hands on experiences in conducting scientific investigations and laboratory experiments.
	CO4	Understand the relationship between theory and experimental results.

Sub Code: 20PPH2CM

Programme code : 03		M.Sc. Physics		
Title of the Paper		Core Practical II – Electronics Experiments		
Batch 2020-2021	Semester I & II	Hours/Week 5	Total Hours 150	Credits 3

Course Objectives

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 outcomes (CO)

K3,K4,K5	**CO1**	Acquire a basic knowledge in solid state electronics including FET, UJT and OP AMP.
	CO2	Develop the ability to analyse and design analog electronic circuits using discrete components.
	CO3	Observe the amplitude frequency response of common amplification circuits.
	CO4	Take measurements to compare experimental results in the laboratory with the theoretical analysis.

Sub Code: 20PPH307

Programme: 03		M.Sc. Physics		
Title of the Paper		Core Paper 7 - Quantum Mechanics – II		
Batch 2020-2021	Semester III	Hours/Week 5	Total Hours 75	Credits 5

Course Objectives

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 outcomes (CO)

K1 to K4	**CO1**	Understand different approximations and models to describe a many electron system
	CO2	Comparison of MO and VB theories to explain molecular structure of hydrogen molecule and hydrogen ion
	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.
	CO4	Interpret scattering theory interms of quantum aspects.

Sub Code: 20PPH308

Programme: 03		M.Sc. Physics		
Title of the Paper		Core Paper 8 – Electromagnetic Theory and Electrodynamics		
Batch 2020-2021	Semester III	Hours/Week 5	Total Hours 75	Credits 5

Course Objectives

To know about

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

Course outcomes (CO)

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

Sub Code: 20PPH309

Programme: 03		M.Sc. Physics		
Title of the Paper		Core paper 9 – Condensed Matter Physics-II		
Batch 2020-2021	Semester III	Hours/Week 4	Total Hours 60	Credits 5

Course Objectives

To gain knowledge about
1. Different types of bonding
2. Polarization effect on dielectric materials
3. Density states of electron

Course Outcomes (CO)

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

Sub Code: 20PPH410

Programme: 03		M.Sc. Physics		
Title of the Paper		Core paper 10 - Communication Physics		
Batch 2020-2021	Semester IV	Hours/Week 5	Total Hours 75	Credits 4

Course Objectives

To enable the learners to understand
1. Various modulation and detection techniques
2. Generation and propagation of microwaves
3. Radar and communication electronics

Course Outcomes (CO)

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

Sub Code: 20PPH411

Programme: 03		M.Sc. Physics		
Title of the Paper		**Core Paper 11 - Atomic and Molecular Spectroscopy**		
Batch 2020-2021	**Semester IV**	**Hours/Week 5**	**Total Hours 75**	**Credits 4**

Course Objectives

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 outcomes (CO)

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

Sub Code: 20PPH412

Programme code : 03		M.Sc. Physics		
Title of the Paper		**Core Paper 12 - Nuclear and Particle Physics**		
Batch 2020-2021	**Semester IV**	**Hours/Week 5**	**Total Hours 75**	**Credits 4**

Course Objectives

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 Outcomes (CO)

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

Sub Code: 20PPH4CN

Programme: 03		M.Sc. Physics		
Title of the Paper		Core Practical III – Advanced Experiments		
Batch 2020-2021	Semester III & IV	Hours/Week 5	Total Hours 150	Credits 3

Course Objectives

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 outcomes (CO)

K3,K4,K5	**CO1**	Fundamental knowledge on applications of advanced Physics.
	CO2	Understand the relationship between theory and experiments
	CO3	Provide hands on experiences in conducting scientific investigations and laboratory experiments.
	CO4	Design, carry out record and analyze experimental data.

Sub Code: 20PPH4CO

Programme: 03		M.Sc. Physics		
Title of the Paper		Core Practical IV – Special Electronics Experiments		
Batch 2020-2021	Semester III & IV	Hours/Week 5	Total Hours 150	Credits 3

Course Objectives

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 outcomes (CO)

K3,K4,K5	**CO1**	Acquire a basic knowledge in solid state electronics including OP AMP and 555 timer and understand the ALP using 8085 processor
	CO2	Develop the ability to analyze and design analog electronic circuits using discrete components.
	CO3	Observe the physical entities by constructing a sensor circuits such as temperature and light intensity using Op-amp
	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		
Title of the Paper		Major Elective Paper1- Electronics and Microprocessors		
Batch 2020-2021	Semester I / II	Hours/Week 5	Total Hours 75	Credits 5

Course Objectives

To study about the

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

Course Outcomes (CO)

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

Programme code: 03		M.Sc. Physics		
Title of the Paper		Major Elective Paper 2- Applied Physics		
Batch 2020-2021	Semester I / II	Hours/Week 5	Total Hours 75	Credits 5

Course Objectives

i. To impart knowledge on semiconducting materials
ii. To understand the working of solar cells and LED
iii. To impart knowledge on different deposition technique

Course outcomes (CO)

K1 to K4	**CO1**	Able to identify the different type semiconducting materials
	CO2	Able to describe the working of solar cells
	CO3	Able to design the experiment to estimate the device parameters
	CO4	Able to apply the knowledge on synthesis / deposition of different semiconductors and to demonstrate the potential applications.

Programme code : 03		M.Sc. Physics		
Title of the Paper		Major Elective Paper 3 - Energy Physics		
Batch 2020-2021	Semester I / II	Hours/Week 5	Total Hours 75	Credits 5

Course Objectives

To enable the leaners

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

Course Outcomes (CO)

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

Programme code : 03		M.Sc. Physics		
Title of the Paper		Major Elective Paper 4 - Industrial Physics		
Batch 2020-2021	Semester I / II	Hours/Week 5	Total Hours 75	Credits 5

Course Objectives

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 Outcomes (CO)

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

Programme: 03		M.Sc. Physics		
Title of the Paper		Non-Major Elective – Nanotechnology: Principles and Applications		
Batch 2020-2021	Semester III / IV	Hours/Week 4	Total Hours 60	Credits 4

Course Objectives

To impart knowledge on

i) To understand the nanomaterial and nanotechnology
ii) To know the different synthesis processes for making nanomaterials
iii) To know the characterization techniques available for nanomaterials
iv) To explore the nano-devices and various applications

Course Outcomes (CO)

K1 to K4	**CO1**	Understand the basic concepts of nanoscience, physical principles of quantum confinement and classification of nanostructures.
	CO2	Know the synthesis methods of 0-D, 1-D, 2-D and 3-D nanomaterials and its own advantages.
	CO3	Know the various characterization methods to study material's morphological, structural and optical properties.
	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		
Title of the Paper		Non-Major Elective- Thin Film Physics, Plasma Physics and Crystal Growth		
Batch 2018-2019	Semester III / IV	Hours/Week 4	Total Hours 60	Credits 4

Course Objectives

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 outcomes (CO)

K1 to K4	**CO1**	Have knowledge on the mechanism and process for the synthesis and evolution of thin films
	CO2	Be able to understand the principles, advantages and disadvantages of different thin film deposition methods
	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
	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		
Title of the Paper		Non-Major Elective -Atmospheric Science		
Batch 2020-2021	Semester III / IV	Hours/Week 4	Total Hours 60	Credits 4

Course Objectives

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 Outcomes (CO)

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

Programme code : 03		M.Sc. Physics		
Title of the Paper		Non-Major Elective -Modern Optics		
Batch 2018-2019	Semester III / IV	Hours/Week 4	Total Hours 60	Credits 4

Course Objectives

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 outcomes (CO)

K1 to K4	**CO1**	Acquire basic knowledge about optics of solids, scattering, polarization
	CO2	Understand about Magneto-optic effects ,Electro-optic effects and non-linear optical effects
	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
	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.

Subject Code: 20PPH3X1

Programme: 03		M.Sc. Physics		
Title of the Paper		**EDC - Biomedical Instrumentation**		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2020-2021	**III**	**2**	**30**	**2**

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

ADVANCED LEARNERS COURSE **Credit: 2**

Advanced Experimental Techniques

Course Objective

To enable the learners to

1. Understand different types of structural and surface morphological andspectroscopic characterization techniques
2. Gain knowledge about magnetic techniques
3. Understand thermal analytical techniques

Course outcome (CO)

K1 to K5	**CO1**	Gain knowledge on structural characterization
	CO2	Acquire knowledge on spectroscopic analysis
	CO3	Gain knowledge on morphological techniques
	CO4	Acquire knowledge on magnetic properties of materials
	CO5	Gain knowledge on thermal analytical techniques