FATIMA COLLEGE (AUTONOMOUS), MADURAI – 625018

2021 - 2022

1.1.1 Curricula developed and implemented have relevance to the local, national, regional and global developmental needs which is reflected in Programme outcomes (POs), Programme specific outcomes (PSOs) and Course Outcomes (COs), of the Programmes offered by the Institution.

NAME OF THE PROGRAMME: B.Sc Physics

Programme outcomes (POs)

PO 1	Acquire knowledge on the concepts of general laws of physics governing the universe
PO2	Relate the principles behind the fundamental theory of Physics including microscopic and macroscopic levels
PO3	Develop technologies to meet the requirements of the society

Programme specific outcomes (PSOs)

PSO 1	Acquire thorough knowledge of the basic concepts of the frontier areas of Physics comprising Mechanics, Properties of matter, Electromagnetism, Electronics, Thermodynamics, Modern Physics, optics, Medical Physics and Opto electronics.
PSO 2	Understand and solve the physics problems in everyday life using the acquired basic knowledge.
PSO 3	develop skills to perform experiments based on the theoretical understanding
PSO 4	Apply the knowledge acquired to analyse and design models in the versatile realm of physics.
PSO 5	Equip with the essential foundations for higher education and research in physics.

Course Outcomes (COs)

Course Code	Course Title	Nature of the Course (Local/National/ Regional/Global)	Course Description	Course Outcomes
19P1CC1	Mechnanics And Properties of Matter	National	The objective of this course is to understand the basic properties of matter and mechanics of fluids	CO1: Understand in depth the gravitational force, field, potential and energy. CO2: Study the acceleration due to gravity at various positions CO3: Gain knowledge about the properties of matter and compute the same CO4. Discuss the mechanics of fluid motion and its applications
19P1CC2	Thermal Physics	National	The course provides a conceptually based exposure to the fundamental principles and processes of significant topics of thermal physics like Kinetic theory of	CO1: Students will be able to analyse a microscopic approach and seek to account for the macroscopic properties of a gas in terms of properties of its molecules CO2: Students will be able to explain the classical Maxwell's

			gases, Transport phenomena in gases and Liquefaction of gases.	distribution law of velocity and its inference. CO3: Students will be able to describe molecular collisions and its mean free path, understand the process of thermal conductivity, viscosity and diffusion in gases CO4: Students will be able to depict the manner in which the energy changes take place and outline the different methods to produce low temperature CO5: Students will be able to demonstrate the liquefaction of gases and explain the nature of gases in the neighbourhood of absolute zero temperature.
19P1CC3	Major Practicals I	National	This course offers opportunity to handle the laboratory equipment and	Students will be able to CO1: determine the properties of materials relevant to the theory learnt in core courses.

			develop skills to determine elastic properties, thermal properties, surface tension	
19P2CC4	Oscillations And Waves	National	To understand waves, oscillations and its applications in human ear, musical instruments. To know about Doppler effect, Ultrasonic and various applications of them	CO1: Students will be able to understand simple harmonic motion CO2: Students will be able to understand Principle of Superposition and apply to derive mathematical representation of stationary waves, interference waves and beats. Determine the conditions for the same. CO3: Students will be able to understand the Doppler effect in acoustics and apply the same and solve problems CO4: Students will be able to distinguish the different range of acoustic waves. CO5: Students will be able to study the ultrasonic waves generation and application of the same

19P2CC5	Applied Mechanics	National	The course enables the students to understand the fundamental and advanced concepts of Central force, Projectile motion, interrelationship between energy and work, linear momentum and angular momentum	CO1: Students will be able to demonstrate an understanding of central forces and explain Kepler's laws of Planetary motion CO2: Students will be able to compute the path of projectile launched with horizontal and vertical velocity components in the Earth's gravity CO3: Students will be able to evaluate the interrelationship between energy and work CO4: Students will be able to describe the motion of the center of mass of an object, state the conservation principles involving momentum and explore its applications, analyse collisions between two objects CO5: Students will be able to apply law of conservation angular momentum appropriately in rigid body rotations, relate the rotational and translational parameters

				based on rotational kinematics.
19P2CC6	Major Practicals II	National	This course offers opportunity to handle the laboratory equipment and develop skills to determine elastic properties, thermal properties, surface tension	Students will be able to CO1: determine the properties of materials relevant to the theory learnt in core courses
19P3CC7	Electromagnetism	Global	This course imparts a sound knowledge in electromagnetism.	CO1: students will be able to Calculate electric field for a distribution of charges by applying method of calculus. CO2: students will be able to Evaluate electric field for problems involving symmetry by using Gauss's law CO3: students will be able to Estimate the magnetic field of a current using Biot Savarat law and Ampere's law CO4: students will be able to Describe the working of generators and motors based

				on Faraday's law of induction and Lenz law. Also, they will be able to classify magnetic materials based on magnetic dipole moments CO5: Students will be able to Comprehend Maxwell's equations and generation of electromagnetic waves
19P3CC8	Solid State Physics	National	This course aims at giving an idea about crystal structure and various properties of solids like magnetic and dielectric behaviours. This course also deals with the super conductors and their applications	CO1: Students will be able to Define the different parameters of crystal system and explain the basic concepts. CO2: Students will be able to Describe the various magnetic behaviours of solids CO3: Students will be able to Explain the working of dielectric materials. CO4: Students will be able to Understand the basic concepts in super conductivity. CO5: Students will be able to Describe working and various applications of superconductors.
19P3CC9	Major Practicals-	National	This laboratory course explores the	Students will be able to CO1: Understand and Analyse

	III		basic principles of electricity and magnetism, basic elements of electric circuits through experiments	electric, magnetic and electromagnetic principles and laws through experiments
19P4CC10	Analog Electronics	National	The aim of this course is to provide a basic knowledge in semiconductor, transistor, amplifier, oscillator and digital electronics	CO1: Students will be able to Acquire basic knowledge of PN junction diode, different rectifiers and filters CO2: Explain different transistor configuration and various biasing circuits CO3: Obtain the knowledge of transistor amplifier and analyse using DC and AC load line CO4: Elucidate the concept of feedback in amplifiers and design various types of oscillators CO5: Describe the parameters of OP-AMP and to design OP-AMP circuits
19P4CC11	Material Science	National	The course provides concept based exposure to conducting,	CO1: Students will be able to Explain the classical Maxwell's distribution law of velocity and its inference

			dielectric, magnetic, superconducting and other emerging new materials	CO2: Determine electrical conductivity, thermal conductivity of conducting materials CO3: Gain the knowledge of properties of various materials CO4: Explain theory of various magnetic and superconducting materials CO5: Identify new materials that find diverse applications.
19P4CC12	Major Practicals IV	National	This laboratory course explores the basic principles of electronics through experiments	Students will be able to CO1: Understand and electronics principles and laws through experiments
19P5CC13	Digital Electronics And Communication	National	This course is designed to impart depth knowledge on combinational logic circuits, flip-flops, registers and counters, digital-analog conversion, different modulation techniques of communication systems and satellite	CO1: Students will be able to Demonstrate the knowledge in Combinational logic circuits and Flip-Flops and apply skills in solving problems and drawing Karnaugh Maps. CO2: Students will be able to Analyse the working of different types of registers and counters CO3: Students will be able to Explain the concepts involved

			communications.	in D/A Conversion and A/D Conversion, continuous A/D conversion and A/D techniques CO4: Students will be able to Explicate the different types of analog modulation techniques in communication systems. CO5: Students will be able to Communicate clearly the principles of digital modulation and Satellite communication
19P5CC14	Optics	National	This course aims at giving a detailed study of interference, diffraction, polarization, Holography, Laser and Maser.	CO1: Students will be able to Gain knowledge on interference of light waves and understand the interference in a wedge shaped film, Newton's rings and Michelson's interferometer CO2: Students will be able to describe interference of light due to division of wave front, characteristics and Principle of Laser action, different types of Lasers, Lasers in Medicine and Holography. CO3: Students will be able to Explain Diffraction of light,

				Diffraction at an opaque disc and the construction and working of zone plate. CO4: Students will be able to Insight of the Fraunhofer diffraction at a single slit and double slit, Resolving Power of Prism, Grating, telescope and Microscope. CO5: Students will be able to Deduce the concepts of Polarization, Brewster's and Malus law and explain production and analysis of polarized light.
19P5CC15	Major Practicals V (Electronics)	National	This laboratory course explores the basic principles of electronics through experiments	Students will be able to CO1: understand physical laws using appropriate equipments through experiments
19P5CC16	Major Practicals VI (Non Electronics)	National	The lab course deals with Experiments of optics, thermal and electricity in Physics.	Students will be able to CO1: understand electrical, thermal and optical measurements like Refractive index of a liquid, Determination of wavelength of Fraunhofer lines using

				Grating, Determination of using Hartmann's Interpolation Formula, determination of by forming Newtens rings and characteristics of a thermistor.
19P6CC17	Thermodynamics And Statistical Mechanics	National	The aim of this course is to deal with thermodynamics, entropy and thermodynamic potentials. This course also deals with statistical thermodynamics and applications of statistics to gases.	Students will be able to CO1: Analyse the basics of thermodynamic systems and derive the internal energy equation as Pressure, Volume and Temperature as independent CO2: Explain the entropy and the second law of thermodynamics and deduce the Tds equations and discuss the properties of an ideal gas and Vander Waals gas CO3: Gain knowledge on thermodynamic potentials, Helmoltz and Gibbs functions and derive Maxwell's relations. CO4: Distinguish Bose Einstein, Fermi-Dirac statistics, Maxwell-Boltzmann Statistics and study their distribution functions.

				CO5: Demonstrate and explain the application of quantum statistics
19P6CC18	Modern Physics	Global	This course is an informative and comprehensive course on modern physics encompassing the basic quantum mechanical properties of particles, nuclear models and special relativity	CO1: Describe the wave properties of particles CO2: Arrive at Schrodinger wave equations and apply it for accounting the behaviour of atoms, nuclei and particles on the basis of it. CO3: Explain the vector atom model and understand the role of spin in atomic phenomena CO4: Discuss the properties of atomic nuclei and interpret its behavior through detailed models like liquid drop and shell model CO5: Explain the concepts of relativity and explain the intimate relationships between space and time, mass and energy.
19P6CC19	Major Practicals VII (Electronics)	National	This laboratory course explores the basic principles of	Students will be able to CO1: understand physical laws using appropriate

			electronics through experiments	equipments through experiments
19P6CC20	Major Practicals VIII (Non Electronics)	National	The lab course deals with Experiments of optics, thermal and electricity in Physics.	Students will be able to CO1: understand electrical, thermal and optical measurements like Refractive index of a liquid, Determination of groove spacing of CD, Determination of CO2: wavelength using biprism and calcite prism ,determination of thickness of the wire using Airwedge, numerical aperature of optical fiber, conversion of galvanometer into voltmeter etc.
19P1ACC1/ 19M3ACP1/ 19G3ACP1	Allied Physics - I	National	The course provides a conceptually based exposure to the fundamental principal and processes of significant topics of physics like Waves and Oscillations, Properties of matter,	CO1: Students will be able to Define and discuss about the simple harmonic waves and its oscillations and laws of transverse vibrations of strings. CO2: Students will be able to Classify and describe the properties of matter such as electricity, viscosity and

			Electricity and Magnetism and Geometrical Optics.	surface tension. CO3: Students will be able to Summarise the basic concepts of thermal physics and apply the laws of thermodynamics in higher learning concepts such as entropy and its reversible and irreversible process. CO4: Students will be able to Explain the principles and laws used in electricity and magnetism those are useful in defining the energy of a capacitor and magnetic effect of electric current. CO5: Students will be able to Demonstrate the properties of geometrical optics and explain the refraction and dispersion through a prism.
19P1ACB1	Digital Principles And Applications	National	Aim of this course is to enable the students to understand digital principles and applications	CO1: Students will be able to Define the different types of number systems and explain the basic and universal logic circuits CO2: Students will be able to Simplify the logic expressions using Boolean laws and Kmap

				CO3: Students will be able to describe the principles behind the data processing and arithmetic circuits CO4: Students will be able to explain the working of basic flipflops and design master slave flipflops CO5: Students will be able to Understand the working of shift registers and counters CO6: Students will be able to describe D/A and A/D conversion techniques
19P1ACC2 / 19M3ACP2/ 19G3ACP2	Allied Physics Practicals I	National	This course enables the students to develop basic lab skills.	Students will be able to CO1: determine the properties of materials relevant to the theory learnt in core courses
19M4ACP3/ 19P2ACC3/ 19G4ACP3	Allied Physics- II	National	The course provides a conceptually based exposure to the fundamental principal and processes of significant topics of physics like geometrical Optics,	CO1: Students will be able to categorize and clarify the different optical phenomena of interference, diffraction, polarization. CO2: Students will be able to explain the atom model and calculate the total energy of an atom and account for the

			Atomic Physics, Nuclear Physics and Electronics.	spectral series of hydrogen atom. CO3: Students will be able to elucidate the models of nuclear structure and to learn the principle behind atom bomb, nuclear reactors. CO4: Students will be able to summarize the working principle of p-n junction diode in forward and reverse biasing, its V-I characteristics, the Zener Diode, n-p-n transistor in common emitter characteristics. CO5: Students will be able to classify the number system and demonstrate the skill in conversion of Number systems, Boolean algebra and its associated laws.
19M4ACP4/ 19P2ACC4/ 19G4ACP4	Allied Physics Practical II	National	This course enables the student to develop broad array of basic skills and tools of experimental physics	Students will be able to CO1: determine the properties of materials relevant to the theory learnt in core courses

19P6ME1	Microprocessor	Global	Aim of this course is to enable the student to understand microprocessor architecture and assembly language programming	CO1: Acquire knowledge of Microprocessor Architecture CO2: Comprehend the instructions in assembly language program CO3: Describe the various operations and debugging CO4: Understand the programming techniques in microcontroller CO5: Explore the role of counters and time delay
19P6ME2	Medical Physics	Global	This course introduces physics of medical instruments used for diagnosis and therapy	CO1: Acquire knowledge of terminologies, modeling and measurements in medical physics. Also, application of low frequency and high frequency electricity in medicine. CO2: Comprehend properties of light in medicine and to study various applications of light in medicine CO3: Describe the role of nuclear medicine techniques for diagnosis and therapy CO4: Understand the radiation

				protection in medicine CO5: Explore the role of computers in diagnosis, testing and therapy
19P6ME3	Opto Electronics	National	Aim of this course is to enable the student to understand the concepts in semiconducting materials and fiber optic systems which forms the basis for communication systems.	Students will be able to CO1: Define the different parameters of fiber optics system and explain the basic concepts. CO2: Solve the problems in various losses of fibers CO3: Understand the working of LED, semiconductor lasers and PN diode. CO4: Describe working and various parameters of photo detectors CO5: Understand the working and application of optical fiber sensors.
19P6ME4	Energy Physics	National	This course intends to give a comprehensive description of existing types of	CO1: Distinguish the energy resources as conventional and nonconventional and describe each one of its types.

			conventional energy sources and aims to give a potential notion to resolve the challenges with regard to future supply and demand with the usage of various types of renewable energy sources like solar energy, geothermal energy, wind, biomass, tidal energy.	CO2: Describe the physics behind harnessing solar radiation as renewable energy resource and its applications CO3: explain the basic concepts of geothermalenergy, magnetohydrodynamics and fuel cell. C04: describe the energy conversion principles of wind , biomass and ocean tides and waves CO5: suggest energy options for developing countries based on energy conservation approach.
19P1NME/ 19P2NME	Physics In Everyday Life	National	Aim of this course is to enable the student to understand the physics concepts in day today life.	CO1: Discuss and illustrate the importance of paying attention to the basic units of physical quantities and the standards accepted for their measurement CO2: Describe the motion in terms of particle's position, velocity and acceleration and analyse the cause of motion

				CO3: Understand the concepts of heat and electromagnetic radiation waves, sound, electricity, magnetism and explore their nature. CO4: Explain the characteristics of Sound CO5: Comprehend the attributes of electricity and magnetism.
19P3SB1	Biomechanics	National	This course aims to introduce the Biomechanical concepts and to give an idea about the anatomic pulleys and lever systems	CO1: Students will be able to acquire a skill to apply the laws of kinematics to biological systems. C02: Students will be able to Identify the anatomical pulleys and lever systems CO3: Students will be able to Access the types of levers in our body CO4: Students will be able to Explain how the biological machines inside our body CO5: Students will be able to Discuss different kinds of activities, equilibrium and stability of the body using law

				of physics
19P4SB2	Physics Of Stars	National	This course briefly explains the life cycle of a star. It throws light on various nuclear reactions taking place in a star. It explains about the mysterious objects of the universe. It creates passion for Astronomy among the students	Students will be able to CO1: Explain the life cycle of stars CO2: Students will be able to discuss the spectral classification of stars CO3: Students will be able to outline the nuclear reactions taking place in stars CO4: Students will be able to distinguish between various mysterious objects of the universe like supernova, white dwarfs, pulsars, red giants, black holes etc CO5: Students will be able to explain classification of galaxies, red and blue shift of spectral lines
19P5SB3	Physics of Measuring Instruments	National	This course describes the basic principles of thermodynamical and pressure measurements, aircraft	Students will be able to CO1 Describe the qualitative aspects of thermodynamic quantities temperature and its measurement techniques. CO2 Describe the qualitative aspects of pressure, density

			instrumentation.	and humidity and their measurement technique. CO3 Explain a basic idea of aircraft instrumentation CO4 list the factors affecting wind speed and gain insight on wind speed measurement techniques CO5 Discuss the mechanical and electrical measurements comprising of temperature transducers, biosensors, chemical and optical sensors.
19P5SB4	Physics of medical instruments	National	This course emphasise the basic concepts and applications of Medical instruments which involves Keratometer, Opthalmoscope , electromyogram, ECG, EEG, Electroretinogram, Cardio vascular Instrumentation- Bio potential of heart,	Students will be able to CO1 Explain the physics of some common lung disease and instrumentation of Sphygmomanometer CO2 Understand the application of sound in medicine and demonstrate the functioning of Stethoscope CO3 Study the application of Lasers in the field of medicine. CO4 Gain knowledge on the construction, working principle of instruments such

			Pacemakers and Angiography	as Ophthalmoscope &Keratometer CO5 Learn about the applications of the cardio vascular instrumentation and medical instrumentation utilising the principle of electricity within the body .
19P6SB5	Physics of Instruments for Astronomical Measurements And Materials Characterization	National	This course emphasis the basic principles and their measurement techniques of astronomical instruments such as optical telescope, Hubble space telescope, astronomical spectrograph, photoelectric photometry, spectrometry and also electron microscopes such as scanning electron microscopy, transmission	Students will be able to CO1 Discusses the basic physics behind astronomical measurements and material characterization CO2 Explains the principles behind astronomical instruments and their main parts CO3 Explains the principles behind astronomical measurement techniques CO4 Describes the principles and working of electron microscopy CO5 Characterizes the structural properties of materials using X ray diffraction measurements

			electron microscopy and atomic force microscopy and X-ray diffraction measurements.	
19P6SB6	Physics of Advanced Medical Instruments	National	This course emphasise the basic concepts and applications of Medical instruments which involves Radiography, X- Ray, Endoscopy, Computed Tomography, Magnetic Resonance Imaging, Linear Accelerator. Also provides the knowledge on radiation protection in Diagnostic Radiology and Biomedical Computer Applications.	Students will be able to CO1 Understand the working principle of medical instruments used in X- ray, radiography and endoscopy CO2 Comprehend the Principle and application of Computed Tomography, Magnetic Resonance Imaging, Linear Accelerator in medicine CO3 Gain knowledge on the medical applications of Ultrasonography CO4 Acquire knowledge on applications of Nuclear Medicine such as Radio Therapy and the key factors of radiation protection CO5 Understand the biomedical Computer Applications.

19UGSLP1	Nanoscience and Nanotechnology	National	This course provides knowledge about nano scale, carbon nanotubes, nanobiology, nanosensors and nanomedicines.	Students will be able to CO1 Find suitable materials to prepare nanomaterials. CO2 Synthesis carbon nanotubes and apply them for various applications CO3 Describe Biological Imaging using Semiconductor naocrystals. CO4 Explain about nanosensors. CO5 Understand the nanoshells, nanopores and Tectodendrimers.
21UGSLP2	Amazing Universe And Indian Space Missions	Global	This course provides information about Astronomy and cosmology, Indian space research organization, ISRO's Rockets and Satellites and Saris	Students will be able to CO1 Understsand about Astronomy and cosmology. CO2 Explain the Clustered objects in the Universe. CO3 Describe the Indian Space Research Organisation. CO4 Understand basics in rockets. CO5 Explain the Satellites and Saris
21UGIDPB1	Fundamentals & Programming of Microprocessor	National	This course provides knowledge about microprocessor, its	Students will be able to CO1 Understand Evolution of Microprocessors and

	8085		architecture, instruction set of 8085 and some Assembly language programming	embedded Microprocessors. CO2 Explain the Microprocessor Architecture. CO3 Describe the various Instruction set of 8085. CO4 Write Assembly language programming. CO5 Write Programs using looping statements.
21UGIDPM1	Space Science	Global	This course emphasises about Cosmology, galaxy, sun, moon and eclipses	Students will be able to CO1 Understand Big Bang theory and cosmology. CO2 Describe the structure of galaxy. CO3 Explain basic features of the sun CO4 Explain the sidereal and synodic month and various phases of moon. CO5 Understand the eclipses, solarandlunar and conditions for the occurrences.
19UGVAP1	Digital Photography	National	This course teaches the most important functions and techniques of digital photography that will enable the	CO1 Students will be able to Understand the basic phenomena of photography. CO2 Students will be able to comprehend the basic parts of camera, its important control

			students to take the perfect shot every time.	parameters and composition techniques of photography CO3 Students will be able to handle SLR camera and apply various composition techniques and shoot professional photographs CO4 Students will be able to understand the modern technique of photoshop and develop skills to manipulate, edit and enhance the real time photographs using photoshop. CO5 Students will be able to prepare their own digital ids and greeting cards with photoshop

19UGVACP1	Mobile Servicing	National	This course teaches the most important functions and techniques of Mobile servicing that will enable the students to troubleshoot the faults in mobiles.	Students will be able to CO1 Repair and diagnose the problem of all kinds of faults in Mobile Phone. CO2 Understand handsets in Hardware as well Software and rectify the faults using tools and equipment. CO3 Known to uses various softwares in the mobile. CO4 Identify the business opportunities in this sector to run a Mobile Handset Repairing unit CO5 Describe various reparing techniques and apps in the mobile.