



ST. JOSEPH'S DEGREE & PG COLLEGE

(Autonomous), Affiliated to Osmania University
 Re-accredited by NAAC (3rd Cycle) with B++ grade
 King Koti Road, Hyderabad

B. Sc (MPCs) - Physics Course Structure (W.E.F 2022-23 for the batches 2022-25, 2023-26 & 2024-27)

Paper Code	Paper	Instruction Hours/week	Credits	Total Hours
MEO-1-PH-22T	I Year / Semester I: Paper – 1 –DSC Mechanics and Oscillations (Theory)	4hrs/ Week	4	60 Hrs
MEO-1-PH-22P	I Year / Semester I: Paper – 1 - DSC Mechanics and Oscillations(Practical)	3hrs/ Week	1	45 Hrs
THP-2-PH-22T	I Year /Semester II: Paper - 2 - DSC Thermal Physics (Theory)	4hrs/ Week	4	60 Hrs
THP-2-PH-22P	I Year / Semester II: Paper - 2 - DSC Thermal Physics(Practical)	3hrs/ Week	1	45 Hrs
EMT-3-PH-22T	II Year / Semester III: Paper –3 - DSC Electromagnetic Theory (Theory)	4hrs/ Week	4	60 Hrs
EMT-3-PH-22P	II Year / Semester III: Paper –3 - DSC Electromagnetic Theory (Practical)	3hrs/ Week	1	45 Hrs
WOP-4-PH-22T	II Year / Semester IV: Paper – 4 - DSC Waves and Optics (Theory)	4hrs/ Week	4	60 Hrs
WOP-4-PH-22P	II Year / Semester IV: Paper – 4 - DSC Waves and Optics (Practical)	3hrs/ Week	1	45 Hrs
MP-5-PH-22T CP-5-PH-22T	III Year / Semester V: Paper – 5 - DSE 1.Modern Physics(Theory) 2.Computational Physics(Theory)	4hrs/ Week	4	60 Hrs
MP-5-PH-22P CP-6-PH-22P	III Year / Semester V: Paper – 5 - DSE 1.Modern Physics(Practical) 2. Computational physics(Practical)	3hrs/ Week	1	45 Hrs
PDL-5-PH-22T RER-5-PH-22T	III Year / Semester V: GE 1. Physics in Daily life(Theory) 2. Renewable Energy Resources(Theory)	5 hrs/ Week	4	45 Hrs

Paper Code	Paper	Instruction Hours/week	Credits	Total Hours
MEO-1-PH-22T	I Year / Semester I: Paper – 1 –DSC Mechanics and Oscillations (Theory)	4hrs/ Week	4	60 Hrs
MEO-1-PH-22P	I Year / Semester I: Paper – 1 - DSC Mechanics and Oscillations(Practical)	3hrs/ Week	1	45 Hrs
THP-2-PH-22T	I Year /Semester II: Paper - 2 - DSC Thermal Physics (Theory)	4hrs/ Week	4	60 Hrs
THP-2-PH-22P	I Year / Semester II: Paper - 2 - DSC Thermal Physics(Practical)	3hrs/ Week	1	45 Hrs
BI-5-PH-22T EME-5-PH-22T	III Year / Semester V: SEC-3 1.Basic Instrumentation (Theory) 2.Experimental Methods and Error Analysis (Theory)	2hrs/ Week	2	30 Hrs
EL-6-PH-22T AO-6-PH-22T	III Year / Semester VI: Paper–6 - DSE 1.Electronics(Theory) 2.Applied Optics(Theory)	4hrs/ Week	4	60 Hrs
EL-6-PH-22P AO-6-PH-22P	III Year / Semester VI: Paper–6 - DSE 1.Electronics(Practical) 2.Applied Optics(Practical)	3 hrs/ Week	1	45 Hrs
EH-6-PH-22T NS-6-PH-22T	III Year / Semester VI: SEC-4 1.Energy Harvesting 2.Nano Sciences	2hrs/ Week	2	30 Hrs
PR-6-PH-22T	III Year / Semester VI: Project	2hrs/ Week	4	30 Hrs
Total			42	

PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

PEO 1	Graduates will develop the skill to pursue PG and Integrated Ph.D.
PEO 2	Graduates are provided with domain knowledge to get employed in IT industries, Scientific & Research organizations and relevant fields.
PEO 3	Graduates are trained to demonstrate creativity, develop innovative ideas equipped with Collaborative working Skills.
PEO 4	Graduates will develop positive attitude, skills which will enable them to become a multi facet personality, growing in any chosen field with sense of Social Responsibility and environmental consciousness.

PROGRAMME OUTCOMES (POs)

PO 1	Acquire basic knowledge in Science subjects such as Mathematics, Physics and Computer Science with a thrust on fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life.
PO 2	Graduates are provided with practical training, hands-on and project experience to meet the industrial needs.
PO 3	To boost critical thinking skills to identify, analyze and solve problems of their core areas.
PO 4	Ability to think creatively to design, develop algorithms and provide solutions using Modern tools, simulations & software's.
PO5	To enhance arithmetic skills and Logical reasoning for better employability .
PO6	To train the students as lifelong learners with interdisciplinary approach towards sustainable development .
PO7	To impart life skills to express ideas and views clearly and effectively.
PO8	To imbibe ethical, moral and social values in personal and social life leading to highly cultured and civilized personality

Knowledge (Factual & Conceptual Knowledge)	Disciplinary Knowledge
Skills (Procedural Knowledge)	<ul style="list-style-type: none"> ● Communication Skills ● Critical Skills ● Problem Solving ● Analytical Reasoning ● Research – related skills ● Reflective thinking ● Information / Digital Literacy ● Self-directed Learning
Attitude (Meta cognitive Knowledge)	<ul style="list-style-type: none"> ● Cooperation ● Scientific Reasoning ● Multicultural Competence ● Moral and Ethical Awareness / Reasoning ● Leadership Readiness / Qualities ● Lifelong Learning ● Hands on experience

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1	Students develop problem solving skills and learn various concepts which help in developing logical tools and models used to solve various real life problems.
PSO 2	Students acquire knowledge of traditional and modern techniques of solving algebraic, transcendental equations, differential and integral equations, which have applications in many disciplines.
PSO 3	The students acquire sound knowledge in physics areas like Mechanics, Thermal Physics, Waves and oscillations, optics, electromagnetism, modern physics, solid state physics for pursuing higher education and research in the field of physics.
PSO 4	Ability to design and develop software applications to address real world problems using Programming languages, Databases, Operating Systems , and Computer Network Concepts.
PSO5	To develop knowledge citizens with transferable skills and multi-disciplinary global competencies.
PSO6	To build life skills and through value-based education and service-oriented programs.

B. Sc (MPCs) I Year / Semester - I
Physics – 1 Mechanics & Oscillations (Theory)

Course Objectives:	
<p>1. The course aims to teach the concepts of mechanics like vector analysis, mechanics of particles and rigid bodies, central forces, gravitation and special theory of relativity.</p> <p>2. The course aims to teach the nature, causes and principles of oscillations and solve differential equations of vibrations.</p>	
Course Outcomes:	
CO1: To Apply and Analyze principles of vectors in solving Problems in Mechanics	BL4
CO2: To Apply Rigid body dynamics and relevant theories to solve Mechanics of particles	BL4
CO3: To Apply and Analyze the concepts of Central forces and special theory of relativity	BL4
CO4: To Analyze and apply the concepts of fundamental of vibrations like SHM, Damped and Forced oscillations	BL4

B. Sc (MPCs) I Year / Semester - II
Physics – 2 Thermal Physics (Theory)

Course Objectives:	
<p>1. The course aims to teach the nature and transmission of heat & thermo dynamical potentials, production of low temperatures, and theory of radiation, statistical mechanics and its applications.</p>	
Course Outcomes:	
CO1: To Apply Concepts of Laws of Thermodynamics ,Entropy and Analyze the Temperature -Entropy Diagrams	BL4
CO2: To Analyze concepts of Thermodynamic Potentials, Clausius-Clapeyron's equation and low temperature Physics	BL3
CO3: To Analyze the concepts of Weins, Stefans and Plancks quantum theory to study the temperature of distant stellar objects	BL4
CO4: To Apply and understand the concepts of Laws of statistical Mechanics	BL3

B. Sc (MPCs) II Year / Semester - III
Physics – 3 Electromagnetic Theory (Theory)

Course Objectives: Students aim to learn the concepts static and current electricity, magneto statics, electromagnetic Induction, alternating currents, Maxwell's equations and Electromagnetic waves to enhance antennas and wave propagation.	
Course Outcomes:	
CO1: To Analyze the Concept of Gauss law and apply this law in solving electric potential for spherical, Cylindrical and Infinite conducting sheet	BL4
CO2: To Analyze concepts of magneto static fields by applying Biot-Savart's law for solenoid, straight conductor and circular coil for measurements of field.	BL4
CO3: To Analyze the concepts of Faraday's law, Lenz's law, Electromagnetic Induction and Maxwell's electromagnetic waves to analyze the nature of wave propagation in a guided medium.	BL4
CO4: To Apply and understand the alternating currents, transient response of LR, CR, LCR circuits and network theorems to analyze various circuits & networks used in applications.	BL4

B. Sc (MPCs) II Year / Semester - IV
Physics – 4 Waves & Optics (Theory)

Course Objectives: The course aims to teach the nature, causes and principles of waves in bars and strings. Also emphasis on principles and concepts of interference, diffraction, polarization of light waves and their applications.	
Course Outcomes:	
CO1: To Analyze and apply transverse wave propagation along a stretched string as well as the longitudinal and transverse vibrations in bars, along with their general solutions, in order to effectively apply them in diverse applications.	BL4
CO2: Analyze and Apply the various methods of interference caused by dividing the wave front and amplitude, as well as their uses in the Lloyds mirror experiments, Michelson interferometer, Fresnel bi-prism, Newton rings, and wedge-shaped film.	BL4
CO3: To Analyze the ideas behind Fraunhofer diffraction and Fresnel's diffraction	BL4
CO4: Analyze and Apply the principles of polarization by reflection and Refraction, double refraction, Scattering of light, selective absorption to study Nicol prism, Babinets Compensator, the optical activity experiment of Laurent's half shade polarimeter	BL4

B. Sc (MPCs) III Year / Semester - V
Physics – 5A Modern Physics (Theory)

Course Objectives: This course aims to gain modern physics concepts of Atomic spectra, photoelectric effect, wave nature of matter with quantum mechanics and nuclear & particle physics to solve real world problems.	
Course Outcomes:	
CO1: Analyze and apply a range of theories, atomic models, and effects in the investigation of classical and quantum physics within the context of contemporary physics.	BL4
CO2: Analyze the concept of Quantum mechanics to interpret matter waves, uncertainty principle and Schrodinger wave equations.	BL4
CO3: To analyze and understand the various Nuclear models and alpha and beta decay processes, in order to effectively use in contemporary nuclear physics.	BL4
CO4: To Analyze and acquire knowledge on concepts and diffraction methods to study & analyze various crystal structures and their bonding.	BL4

B. Sc (MPCs) III Year / Semester - V
Physics – 5B Computational Physics (Theory)

Course Objectives: This course aims to gain computational techniques/methods for solving and analyzing various theoretical and experimental real world physics problems.	
Course Outcomes:	
CO1: To Apply and Analyze C programming skills to solve physics problems.	BL4
CO2: To analyze and apply numerical and interpolation methods to solve physics problems	BL4
CO3: To analyze and apply numerical solutions of ordinary differential equations to solve physics problems.	BL4
CO4: To analyze real world problems using Various algorithms and simulation techniques.	BL4

B. Sc (MPCs) III Year / Semester – V
Skill Enhancement Course
Physics – SEC 3A Basic Instrumentation (Theory)

Course Objectives: Aim to teach principal and working of instrumentation based on CRO, Signal Generators and transducers used to measure various physical quantities and applications.	
Course Outcomes:	
CO1: To Evaluate the electric devices like oscillators, function generators, CRO for measurement of various electrical quantities	BL3
CO2: To Apply and Analyze Various transducers and their applications	BL4

B. Sc (MPCs) III Year / Semester – V
Skill Enhancement Course
Physics – SEC 3B Experimental Methods and Error Analysis(Theory)

Course Objectives: To familiarize the students with different types of Errors and methods to solve them and statistical methods to analyze the errors.	
Course Outcomes:	
CO1: To apply and solve errors in different experimental techniques	BL4
CO2: To apply and analyze statistical errors using various distribution laws.	BL4

B. Sc (MPCs) III Year / Semester – V
Generic Elective (GE)
Physics – GE Paper 1 – Physics in Daily Life (Theory)

Course Objectives: To mentor the students of other streams to understand and apply basic physics principles in everyday life and to promote analytical and experimental skills.	
Course Outcomes:	
CO1: To analyze the basic principles of physics in sports.	BL3
CO2: To Understand and Analyze different technologies used in daily life	BL4
CO3: To understand the knowledge of energy and its applications in daily life based on physics principles	BL3
CO4: To Understand the importance of space technology and missions for human life.	BL2

B. Sc (MPCs) III Year / Semester – V
Generic Elective (GE)
Physics – GE Paper 2 – Renewable Energy Resources (Theory)

Course Objectives: The course aims to teach the various forms of non-conventional renewable energy resources and their uses as alternative energy resources.	
Course Outcomes:	
CO1: To Understand different types of Conventional Energy sources with advantages and disadvantages.	BL2
CO2: To Apply and understand the solar energy and its uses in daily life	BL4
CO3: To Apply and Understand Wind energy and Biomass energy with its applications	BL4
CO3: To Apply and Understand Geothermal and ocean energies with their applications	BL4

B. Sc (MPCs) III Year / Semester - VI
Physics – 6A Electronics (Theory)

Course Objectives: The Course aims to teach the semiconductors, its use in the construction of diodes, transistors, and other special devices, their working, characteristics, properties and applications along with the principles of digital electronics.	
Course Outcomes:	
CO1: To construct various applications using diodes	BL5
CO2: To Construct and design amplifiers, oscillators using transistors.	BL5
CO3: To Apply knowledge of the design construction in special electronic applications	BL4
CO4: To construct and design logical and digital circuit applications.	BL5

B. Sc (MPCs) III Year / Semester - VI
Physics – 6B Applied Optics (Theory)

Course Objectives: The aim of this course is to enable the students to learn and enhance the skills of applications of optics, Laser and Optical fiber communications.	
Course Outcomes:	
CO1: To apply and analyze the principles of Lasers to understand applications of Lasers	BL4
CO2: To Analyze the principles of optical fibers with their applications	BL4
CO3: To Analyze the principle of holography and its applications	BL4
CO4: To distinguish between Fourier and non-linear optics	BL3

B. Sc (MPCs) III Year / Semester – VI
Skill Enhancement Course
Physics – SEC 4A Energy Harvesting (Theory)

Course Objectives: The course aims to teach various non-conventional energy resources and its harvesting methods.	
Course Outcomes:	
CO1: To Characterize solar and wind energy sources in daily life	BL4
CO2: To Characterize ocean and piezoelectric energy in different ways and to use them in daily applications	BL4

B. Sc (MPCs) III Year / Semester – VI
Skill Enhancement Course
Physics – SEC 4B Nano Sciences (Theory)

Course Objectives: The course aims to teach nano materials, the Nanoscale system, its characterization and applications with magnetic quantum well structures and systems.	
Course Outcomes:	
CO1: To Analyze the Basics of NanoParticles ,Properties and applications of Nanomaterials	BL4
CO2: To Evaluate the synthesizing and Characterisation of Nanoparticles for Research	BL5

Non-CGPA Value Added Course – 1
(Certificate Course)

PC ASSEMBLY & MAINTENANCE

Course Objectives: This Certificate course will enable the students to understand the fundamentals of PC assembly and maintenance. This course would lay more emphasis on developing the practical skills of the student.

Course Outcomes: After the completion of the course, the students will be able to identify different Components inside the computer and understand troubleshooting of Computer.

Non-CGPA Value Added Course – 2
(Certificate Course)

Solar Power Installation, Operation and Maintenance

Course Objectives: To make the students familiar with the concept, installation procedure and maintenance aspect of SPV System

Course Outcomes: After the completion of the course, the students will be able to install, operate and maintain the solar power systems on their own.

