FATIMA MATA NATIONAL COLLEGE

AUTONOMOUS

(Reaccredited with 'A' Grade by NAAC)
Affiliated to University of Kerala

OUTCOME MAPPING

IQAC INTERNAL QUALITY ASSURANCE CELL

BSc PHYSICS

PROGRAMME OUTCOMES (POs)

PO 1	**Nationalistic Outlook and Contribution to National development:** Understand the distinct features of nationalistic outlook as enshrined in our Constitution and apply them towards national development, and nurture respect and love for the motherland, showing no discrimination based on gender, caste and creed.
PO 2	**Fostering Global Competencies, and Technical and Intellectual proficiency:** Apply intellectual and technical skill to compete in a global setting and demonstrate proficiency in creating and applying appropriate technique, resources and modern IT tools for ensuring greater personal growth and global outlook.
PO 3	**Values and Social Commitment:** Demonstrate the essence of human values through acts of social commitment, develop professional ethics and responsibilities; function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings; show respect for fellow beings by fair treatment, caring and concern; listen responsively, recognize the contributions of others, and engage in reflective practice; imbibe spirit of selfless service.
PO 4	**Affective Skills and Integrity of Character:** Receive affective skills and organize activities displaying integrity of character, foster qualities such as emotional self-awareness, emotional reasoning and emotional self-management for addressing workplace challenges, and develop personal integrity and character.
PO 5	**Critical Thinking, Problem Solving and Research-related Skills:** Develop critical thinking, and psycho-motor skills, create a sense of inquiry and research skills and take an analytical approach to learning for cutting edge areas.
PO 6	**Environment and Sustainability:** Design measures which meet the global agenda of environment protection and sustainable development, develop consciousness to preserve the earth's finite resources, and wisdom, to balance human needs and the environment, and to instill an environmental consciousness.
PO 7	**Quest for Excellence:** Receive skills towards holistic development and quest for excellence, recognize the need for, and have the preparation and ability to engage in an independent and life-long learning in the broadest context of technological change, develop healthy competition and setting parameters for excellence.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The Department of Physics, Fatima Mata National College (Autonomous), Kollam, offers Three Year (comprising 6 semesters) Undergraduate Programme in Physics with the primary objective of empowering students to acquire comprehensive knowledge of Physics as an academic discipline. Upon completion of B. Sc. Physics Degree Programme successfully with (i) English as First language (ii) Malayalam/Hindi/French as additional language and (iii) Mathematics and Chemistry as Complementary Courses spreading over the first four semesters of the program, the student shall acquire the following knowledge and skills/competencies.

PSO 1	Develop linguistic skills and literary sensibility, and demonstrate an awareness on environment, disaster management and its associated problems.
PS0 2	Develop language proficiency, literary sensibility, values and critical thinking.
PS0 3	Understand basic theoretical concepts and their applications in physics.
PS0 4	Apply scientific ideas to interpret natural physical phenomena.
PS0 5	Solve problems in physics and to implement projects and other activities useful for the society.
PS0 6	Communicate effectively through oral, written and graphical forms.
PS0 7	Illustrate physical concepts with the help of mathematical theories.
PSO 8	Explain atomic and molecular systems and interactions.

PSO – PO MAPPING

COURSE OUTCOMES (COs)

SEMESTER I

Course Code: 19UEN111.1

English I – LANGUAGE SKILLS

Upon completion of this course, the student will be able to:		PSO
CO 1	Understand the basics of Phonetics	1
CO 2	Apply language skills in daily life situations.	1
CO 3	Demonstrate sophisticated writing skills	1
CO 4	Analyze and evaluate English literature	1

Course Code: 19UFR/HN/ML 111.1

Additional Language I

19UFR111.1 - COMMUNICATION SKILLS IN FRENCH

Upon completion of this course, the student will be able to:		PSO
CO 1	Demonstrate a good comprehension of simple conversational French.	2
CO 2	Use basic French expressions in daily communication.	2
CO 3	Develop short and intelligible texts in French on simple topics.	2

19UHN111.1 - PROSE AND ONE ACT PLAYS

Upon completion of this course, the student will be able to:		PSO
CO 1	Acquire knowledge about various forms of prose genres.	2
CO 2	Develop an awareness of theatre and stagecraft.	2
CO 3	Understand social values and social relationships.	2

19UML 111.1 - MALAYALA KAVITHA

Upon completion of this course, the student will be able to:		PSO
CO 1	Identify and illustrate the features of Ancient Literature.	2
CO 2	Understand Ancient Vocabulary.	2
CO 3	Categorize different Poetic Styles.	2

Course Code: 19UEN121

Foundation Course I – WRITINGS ON CONTEMPORARY ISSUES

Upon completion of this course, the student will be able to:		PSO
CO 1	Analyze issues of human rights in the society.	1
CO 2	Understand and evaluate grave issues of society.	1
CO 3	Analyze and address gender issues.	1
CO 4	Discuss the effects of substance abuse.	1

Course Code: 19UPH141

Core Course I – BASICS MECHANICS AND PROPERTIES OF MATTER

Upon completion of this course, the student will be able to:		PSO
CO 1	Explain and determine moments of inertia of regular rigid objects.	1
CO 2	Compute elastic properties of matter and assess their mechanical properties.	1
CO 3	Analyse hydro and aerodynamic principles in real world examples.	1

Course Code: 19UMM131.1

Complementary Course I – CALCULUS WITH APPLICATIONS IN PHYSICS - I

Upon completion of this course, the student will be able to:		PSO
CO 1	Understand basics of differentiation, integration and their applications.	
CO 2	Analyse infinite series, their summation and properties.	
CO 3	Justify the basics of vector algebra.	

Course Code: 19UCH131.1

Complementary Course II – THEORETICAL CHEMISTRY

Upon completion of this course, the student will be able to:		PSO
CO 1	To impart a concrete idea of the structure of atoms.	
CO 2	To get an understanding of the basics of bonding in molecules.	
CO 3	To inculcate an overview of radioactivity.	
CO 4	To impart knowledge on the principles of analytical chemistry	
CO 5	To study the applications of radioactivity and biological hazards of radiation	

SEMESTER II

Course Code: 19UEN211

English II – ENVIRONMENTAL STUDIES

Upon completion of this course, the student will be able to:		PSO
CO 1	Define the scope of Environmental Science and identify the different types of natural resources.	1
CO 2	Define and identify the ecosystems and biodiversity around us.	1
CO 3	Analyze and assess the types of pollutions and social issues around us.	1
CO 4	Understand the impact of population on environment.	1

Course Code: 19UEN212.1

English III – ENGLISH GRAMMAR AND COMPOSITION

Upon completion of this course, the student will be able to:		PSO
CO 1	Define and identity the basis of grammar.	1
CO 2	Identify and explain the different types of sentences.	1
CO 3	Apply the rules of grammar in all situations of communication.	1
CO 4	Design written discourse.	1

Course Code: 19UFR/HN/ML 211.1

Additional Language II

19UFR211.1 - TRANSLATION & COMMUNICATION IN FRENCH

Upon completion of this course, the student will be able to:		PSO
CO 1	Analyze translated texts.	2
CO 2	Apply fine translation skills in the target language.	2
CO 3	Demonstrate better language proficiency with the assistance of translation.	2

19UHN211.1 - FICTION, SHORT STORY & NOVEL

Upon completion of this course, the student will be able to:		PSO
CO 1	Analyse various issues of Nationalistic outlook, Women empowerment and Dalit Chetana discussed in Hindi Novels & Short Stories.	2
CO 2	Develop essential skills of vocabulary enhancement & sentence structure.	2
CO 3	Realise human values as documented in literary texts.	2

19UML 211.1 - GADHYAM :RACHANAYUM PADAVUM

Upon completion of this course, the student will be able to:		PSO
CO 1	Understand different phases of Malayalam Prose.	2
CO 2	Demonstrate critical skills.	2
CO 3	Analyze the relation between Heritage and Culture.	2

Course Code: 19UPH241

Core Course II – HEAT AND THERMODYNAMICS

Upon completion of this course, the student will be able to:		PSO
CO 1	Interpret basic concepts of heat transfer, thermodynamics and entropy.	
CO 2	Analyse the thermal behaviour of substances.	
CO 3	Justify thermodynamic laws and principles in real world examples.	

Course Code: 19UMM231.1

Complementary Course III – CALCULUS WITH APPLICATIONS IN PHYSICS -II

Upon completion of this course, the student will be able to:		PSO
CO 1	Describe complex numbers and hyperbolic functions.	
CO 2	Analyse the concepts of partial differentiation, properties and applications.	
CO 3	Compute multiple integrals and their applications.	
CO 4	Understand vector differentiation and its applications.	

Course Code: 19UCH231.1

Complementary Course IV – PHYSICAL CHEMISTRY - I

Upon completion of this course, the student will be able to:		PSO
CO 1	Understand the laws of thermodynamics.	
CO 2	Apply the basics of heat changes in chemical reaction.	
CO 3	Interpret the characteristics of chemical equilibria.	
CO 4	Demonstrate the characteristics of acid and base.	

SEMESTER III

Course Code: 19UEN311.1

English IV – READINGS IN LITERATURE I

Upon completion of this course, the student will be able to:		PSO
CO 1	Understand the various forms of Literature.	1
CO 2	Analyze the prose pieces of Indian authors.	1
CO 3	Evaluate the poems by Indian authors.	1
CO 4	Appraise short stories in English by Indian authors.	1

Course Code: 19UFR/HN/ML 311.1

Additional Language III

19UFR311.1 – LITERATURE IN FRENCH

Upon completion of this course, the student will be able to:		PSO
CO 1	Demonstrate knowledge of French and Francophone literature.	2
CO 2	Develop literary sensibility in French and Francophone literature.	2
CO 3	Interpret simple literary texts in French and thereby enrich one's vocabulary.	2

19UHN311.1 - POETRY AND GRAMMAR

Upon completion of this course, the student will be able to:		PSO
CO 1	Interpret the ideology of different Poets.	2
CO 2	Demonstrate positive approach towards nature & society.	2
CO 3	Analyse the features of Ancient, Medieval & Modern Poems.	2
CO 4	Apply the rules of grammar in all situations of communication.	2

19UML311.1 - DRISHYAKALA SAHITHYAM-BHAGAM 1

Upon completion of this course, the student will be able to:		PSO
CO 1	Develop critical view and creativity.	2
CO 2	Understand racial, gender and environmental issues.	2
CO 3	Analyze how language becomes a medium of culture.	2

Course Code: 19UPH341

Core Course III – ELECTRODYNAMICS

Upon completion of this course, the student will be able to:		PSO
CO 1	Interpret principles of static and dynamic phenomena of electromagnetism.	
CO 2	Illustrate mathematical description of electromagnetic phenomena.	
CO 3	Appraise problems in electrodynamics related the real world situations.	

Course Code: 19UMM331.1

Complementary Course V – CALCULUS AND LINEAR ALGEBRA

Upon completion of this course, the student will be able to:		PSO
CO 1	Illustrate different types of first and higher order ODE and find solutions.	
CO 2	Describe vector integration and its applications	
CO 3	Analyse Fourier series and Fourier transforms	
CO 4	Appraise theorems and equation of linear algebra	

Course Code: 19UCH331.1

Complementary Course VI – PHYSICAL CHEMISTRY - II

Upon completion of this course, the student will be able to:		PSO
CO 1	Describe gaseous and crystalline state.	
CO 2	Demonstrate conductometric titration and electrochemistry.	
CO 3	Analyse photochemical reactions and rate of chemical reactions.	
CO 4	Illustrate fuel cells.	
CO 5	Interpret basics of group theory.	

SEMESTER IV

Course Code: 19UEN411.1

English V – READINGS IN LITERATURE II

Upon completion of this course, the student will be able to:		PSO
CO 1	Critically analyze poetry in English.	1
CO 2	Understand and demonstrate the dynamics of theatre.	1
CO 3	Analyze prose pieces in English.	1
CO 4	Evaluate literature in the global context.	1

Course Code: 19UFR/HN/ML 411.1

Additional Language IV

19UFR411.1 – CULTURE AND CIVILIZATION

Upon completion of this course, the student will be able to:		PSO
CO 1	Identify the distinct features of French culture and civilization.	2
CO 2	Appraise role of cultural knowledge in learning a foreign language.	2
CO 3	Compare cultural practices as they relate to French and one's own culture.	2

19UHN411.1 - DRAMA, TRANSLATION & COMMUNICATIVE HINDI

Upon completion of this course, the student will be able to:		PSO
CO 1	Evaluate literary texts against the corresponding social backgrounds.	2
CO 2	Understand theory & practice of Translation.	2
CO 3	Develop skills of writing letters in official language Hindi.	2
CO 4	Develop communication skills in Hindi.	2

19UML411.1 - DRISHYAKALA SAHITHYAM- BHAGAM 2

Upon completion of this course, the student will be able to:		PSO
CO 1	Develop creative and critical skill.	2
CO 2	Analyze racial, gender and environmental Issues.	2
CO 3	Analyze Language as a medium of culture.	2

Course Code: 19UPH441

Core Course IV – CLASSICAL AND RELATIVISTIC MECHANICS

Upon completion of this course, the student will be able to:		PSO
CO 1	Analyse many body systems using the Lagrangian and Hamiltonian Principles.	
CO 2	Appraise simple and complex systems using the principles of constraints.	
CO 3	Solve problems of the particles and bodies in relativistic mechanics.	

Course Code: 19UPH442

Core Course V – MECHANICS, PROPERTIES OF MATTER, ERROR MEASUREMENTS, HEAT AND ACOUSTICS

Upon completion of this course, the student will be able to:		PSO
CO 1	Validate theories and relations in mechanics, properties of matter, heat & acoustics.	
CO 2	Compile experiments and analyses of results, error.	
CO 3	Organise and use scientific tools in a group with good interpersonal skills	

Course Code: 19UMM431.1

Complementary Course VII – COMPLEX ANALYSIS, SPECIAL FUNCTIONS AND PROBABILITY THEORY

Upon completion of this course, the student will be able to:		PSO
CO 1	Analyse complex variables, analytic functions and their properties.	
CO 2	Illustrate residues, residue theorem and applications; conformal Mapping and its applications.	
CO 3	Understand characteristics of special functions –Factorial function, Beta and Gamma functions.	
CO 4	Inspect probability of events, analyse different types of distributions.	

Course Code: 19UCH431.1

Complementary Course VIII – SPECTROSCOPY AND MATERIAL CHEMISTRY

Upon completion of this course, the student will be able to:		PSO
CO 1	Explain electromagnetic radiation.	
CO 2	Describe different spectroscopic techniques.	
CO 3	Apply theories of co-ordination chemistry.	
CO 4	Demonstrate extraction of metals from ores.	
CO 5	Describe theories of nanoscience, conducting polymers and applications.	

Course Code: 19UCH432.1

Complementary Course IX – PRACTICAL

Upon completion of this course, the student will be able to:	PSO

CO 1	Demonstrate the reactions of cations.	
CO 2	Examine cations in solutions.	
CO 3	Arrange and manipulate glass wares skillfully in the laboratory.	
CO 4	Carry out volumetric analysis.	
CO 5	Validate concentration of solution accurately and precisely.	

SEMESTER V

Course Code: 19UPH541

Core Course VI – QUANTUM MECHANICS

Upon completion of this course, the student will be able to:		PSO
CO 1	Apply the Planck's quantum concept of radiation to explain Black body spectrum, Photoelectric Effect, Compton Effect, Stability of atom.	
CO 2	Explain the concept of wave-particle duality and establish it through experiments. Apply the concept of wave function, probability interpretation and Operators to obtain expectation values of various observables.	
CO 3	Appraise Schrodinger's equation in one and three-dimensional box, Simple harmonic oscillator, Tunnelling. etc. Apply Schrodinger equation to obtain the radial, azimuthal and polar solutions for hydrogen atom.	

Course Code: 19UPH542

Core Course VII – STATISTICAL PHYSICS, RESEARCH METHODOLOGY AND DISASTER MANAGEMENT

Upon completion of this course, the student will be able to:		PSO
CO 1	Analyse properties of micro particles in statistical physics as logical consequences of the postulates of statistical mechanics and apply the methods of statistical mechanics to develop the statistics for Maxwell Boltzmann, Bose-Einstein and Fermi-Dirac distributions.	
CO 2	Apply the major facts of research and its methodologies , identify appropriate research topics , develop and classify appropriate research problems and its parameters , prepare a project proposal, research report and thesis; organize and conduct research in a more appropriate manner , and also to estimate and report various types of errors in measurement.	
CO 3	Analyze and communicate the processes of disaster management including disaster risk reduction, response, recovery and also to design and perform research on the different aspects of the emergencies and disaster events.	

Course Code: 19UPH543

Core Course VIII – ELECTRONICS

Upon completion of this course, the student will be able to:		PSO
CO 1	Explain basic analog circuits such as rectifiers, amplifiers and oscillators using active and passive devices.	
CO 2	Demonstrate familiarity with basic electronic components and use them to design simple ecteronic circuits.	
CO 3	Design and analyze of electronic circuits	

Course Code: 19UPH544

Core Course IX – ATOMIC AND MOLECULAR PHYSICS

Upon completion of this course, the student will be able to:		PSO
CO 1	Explain the basics of each atomic model will insight the students with different scientific approaches with the errors and the correction to improvise and overcome the drawback of each model.	
CO 2	Describe electron spin and nuclear magnetic resonance spectroscopy and their applications. Demonstrate familiarity with basic electronic components and use them to design simple electronic circuits.	
CO 3	Justify the application purpose of different spectrometers.	

Course Code: 19UPH551

Open Course – ENERGY PHYSICS

Upon completion of this course, the student will be able to:		PSO
CO 1	Explain wide range of energy sources in nature.	
CO 2	Categories of conventional and non-conventional energy sources and their uses.	
CO 3	Examine modern methods and technologies of green and sustainable energy sources.	

SEMESTER VI

Course Code: 19UPH641

Core Course X – SOLID STATE PHYSICS

Upon completion of this course, the student will be able to:		PSO
CO 1	Define crystal lattice, unit cell and lattice parameters and Compute the crystal structures of SC, BCC, FCC and HCP, Explore the concepts of reciprocal lattice and Braggs' law to crystal diffraction.	
CO 2	Explain the basic concepts of free electron theory and band theory of solids, semiconductor, hall effect. Analyse the theories related to dielectric polarizability and magnetic properties of materials.	
CO 3	Solve problems related to coherence length, penetration depth, isotopic mass, in superconductivity.	

Course Code: 19UPH642

Core Course XI – NUCLEAR AND PARTICLE PHYSICS

Upon completion of this course, the student will be able to:		PSO
CO 1	Explain basic properties of nucleus and nuclear models.	
CO 2	Appraise fission and fusion processes and apply the concepts to power generation.	
CO 3	Compare particle detectors & particle accelerators and to categorize particles.	

Course Code: 19UPH643

Core Course XII – CLASSICAL AND MODERN OPTICS

Upon completion of this course, the student will be able to:		PSO
CO 1	Interpret interference, diffraction and dispersion; and skill to solve problems.	
CO 2	Examine different lasers, optical fibers, holography and its applications.	
CO 3	Analyze the intensity variation of light due to polarization.	

Course Code: 19UPH644

Core Course XIII – DIGITAL ELECTRONICS AND COMPUTER SCIENCE

Upon completion of this course, the student will be able to:		PSO
CO 1	Analyze and evaluate problems on number systems, Boolean algebra, logic gates, arithmetic circuits, and sequential circuits.	
CO 2	Explain the basics of computers, memory systems and programming in C++.	
CO 3	Describe the basic concepts of microprocessors and microcontrollers.	

Course Code: 19UPH645

Core Course XIV – OPTICS, ELECRTICITY AND MAGNETISM

Upon completion of this course, the student will be able to:		PSO
CO 1	Carry out experiments related to Optics, electricity and magnetism.	
CO 2	Manipulate instruments sensitively to make observations and analyse the results.	
CO 3	Handle tools in a group with good interpersonal skills and to think critically.	

Course Code: 19UPH646

Core Course XV – ELECTRONICS AND COMPUTER SCIENCE

Upon completion of this course, the student will be able to:		PSO
CO 1	Design electronic circuits and study their performance, write, compile and execute programs in C.	
CO 2	Assemble pre-designed electronic circuits with great care and skill, check, trouble shoot, observe and analyse the output of the circuit.	
CO 3	Participate in a group with good interpersonal skills.	

Course Code: 19UPH661.1

ELECTIVE COURSE – ELECTRONIC INSTRUMENTATION

Upon completion of this course, the student will be able to:		PSO
CO 1	Elucidate the working of basic measurements voltmeter, ammeter, galvanometer and multimeter (both analog and digital).	
CO 2	Inspect electronic instruments used in advanced Physics Laboratory, namely CRO, Function generator and spectrum analyzer.	
CO 3	Design amplifier, signal generators of different kind, analog and digital oscillators and switching circuits.	

Course Code: 19UPH647

PROJECT

Upon completion of this course, the student will be able to:		PSO
CO 1	Conceive scientific ideas, develop positive attitude and to consolidate in the form of a feasible project of scientific value.	
CO 2	Adapt to work in inter-disciplinary subject, good interpersonal skills.	
CO 3	Develop critical thinking, to transfer ideas strongly.	

COURSE – PSO MAPPING

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO 9
COURSE CODE									