# FATIMA MATA NATIONAL COLLEGE

## AUTONOMOUS

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

PER MATREM PRO PATRIA

**OUTCOME MAPPING**

**IQAC** INTERNAL QUALITY ASSURANCE CELL

# BSc MATHEMATICS

# 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 Mathematics, Fatima Mata National College (Autonomous), Kollam, offers Three Year (comprising 6 semesters) Undergraduate Programme in Mathematics with objective of empowering students to acquire all-inclusive understanding of Mathematics as an academic discipline. Upon completion of B. Sc. Mathematics Degree Programme successfully with English as First language, Malayalam/Hindi/French as additional language and Physics and Chemistry as Complementary Courses spreading over the first four semesters of the program, the student shall acquire the following skills and 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 | Explain fundamental concepts and theories in Mathematics. |
| PS0 4 | Apply mathematical skills to develop computing and programming skills. |
| PS0 5 | Analyse physical problems using mathematical tools. |
| PS0 6 | Use pragmatic tools for assessing the statistical claims utilising R-Programming. |
| PS0 7 | Describe basic theories and applications of Physics aided by mathematical tools. |

# PSO – PO MAPPING

| PSOs | POs | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | * | * | | * | | | |
| 2 | * | * | | * | | | |
| 3 | | | | | * | | |
| 4 | | * | | * | * | | * |
| 5 | | | | | * | * | * |
| 6 | * | * | | | * | * | * |
| 7 | | | | | * | | |

# 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:    19UMM141**

**Core Course I – METHODS OF MATHEMATICS**

| Upon completion of this course, the student will be able to: | PSO |
|---|---|
| CO 1 | Explain the concepts of limits, continuity and differentiability of functions. | 3 |
| CO 2 | Apply the various techniques of differentiation in problem solving. | 4 |
| CO 3 | Analyse integrals by applying the various techniques of integration. | 4 |

**Course Code:    19UST131.1**

**Complementary Course I – DESCRIPTIVE STATISTICS**

| | Upon completion of this course, the student will be able to: | PSO |
|---|---|---|
| CO 1 | Explain concepts of official statistical system of India, Census reports of India, gender statistics and environmental statistics | 6 |
| CO 2 | Organize, summarize data, create and interpret simple graphs and compute appropriate summary statistics. | 6 |
| CO 3 | Explain different methods of sampling techniques and the concepts correlation and regression. | 6 |
| CO 4 | Analyse data using R-programming. | 6 |

**Course Code:    19UPH131.1**

**Complementary Course II – MECHANICS AND PROPERTIES OF MATTER**

| | Upon completion of this course, the student will be able to: | PSO |
|---|---|---|
| CO 1 | Solve the dynamics of rotation of rigid bodies and analyze the rigidity, twist and bending of solid materials. | 7 |
| CO 2 | Illustrate viscosity and surface tension in liquids. | 7 |
| CO 3 | Explain the science of oscillation and waves – propagation of waves in gases and solids, energy density of waves. | 7 |

# 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:    19UMM221**

**Foundation Course II – FOUNDATIONS OF MATHEMATICS**

| | Upon completion of this course, the student will be able to: | PSO |
|---|---|---|
| CO 1 | Understand the various techniques in writing proofs of theorems. | 3,4 |
| CO 2 | Apply the concepts of sets, relations and functions in problem solving. | 4 |
| CO 3 | Analyse and differentiate between different types of conics. | 4 |
| CO 4 | Analyse different coordinate systems and vector calculus. | 3,4 |

**Course Code:    19UST231.1**

**Complementary Course III – PROBABILITY AND INTRODUCTION TO RANDOM VARIABLES**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Explain the basic concepts of probability and random variables. | 6 |
| CO 2 | Solve the problems related to probability density function (p.d.f), distribution function, mathematical expectation, joint p.d.f, conditional mean and conditional variance. | 6 |
| CO 3 | Examine data using R-programming. | 6 |

**Course Code:    19UPH231.1**

**Complementary Course IV – HEAT AND THERMODYNAMICS**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Describe different mechanisms of heat transfer and thermodynamic properties. | 6 |
| CO 2 | Demonstrate skill to solve problems related to thermodynamic systems. | 6 |
| CO 3 | Explain concepts of statistical physics in relation to thermodynamics. | 6 |

# 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:    19UMM341**

**Core Course II – ELEMENTARY NUMBER THEORY AND CALCULUS**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Explain the fundamentals of elementary number theory. | 3 |
| CO 2 | Compute limits and understand the basics of continuity, differentiability, integrability of vector valued functions and its applications. | 3,4 |
| CO 3 | Compare single variable & multivariable functions and their properties. | 4 |

**Course Code:    19UST331.1**

**Complementary Course V – PROBABILITY DISTRIBUTION AND THEORY OF ESTIMATION**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Compute standard probability distributions, sampling distributions and theory of estimation. | 6 |
| CO 2 | Apply law of large sample theory and to identify distribution of a given statistics. | 6 |
| CO 3 | Analyse data using R-programming | 6 |

**Course Code:** **19UPH331.1**

**Complementary Course VI – OPTICS, MAGNETISM AND ELECTRICITY**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Interpret interference, diffraction and polarization. | 7 |
| CO 2 | Describe the principles and operations of laser and fibre optics. | 7 |
| CO 3 | Explain magnetic materials, their properties, various electrical circuits including inductor, capacitor, resistor and their combinations | 7 |

# 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:    19UMM441**

**Core Course III – ELEMENTARY NUMBER THEORY, CALCULUS AND ENVIRONMENTAL STUDIES**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Apply the concept of congruence relations in integers. | 3 |
| CO 2 | Compute the value of multiple integrals and grasp the fundamentals of Integration of vector valued functions. | 4 |
| CO 3 | Explain the relation of Mathematics to Environment through Fibonacci numbers. | 5 |

**Course Code:    19UST431.1**

**Complementary Course VII – TESTING OF HYPOTHESES ANDANALYSIS OF VARIANCE**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Explain the procedure of testing the significance of statistical hypotheses. | 6 |
| CO 2 | Use  the normal, chi-square, t and F-distributions for testing hypothesis   about means, variance(s)  and proportions and to   understand  various   design  of experiments. | 6 |
| CO 3 | Solve statistical problems using R-programming. | 6 |

**Course Code:   19UST432.1**

**Complementary Course IX – PRACTICAL USING COMPUTER**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Use statistical tools available in R-programming and for data analysis. | 6 |

**Course Code:   19UPH431.1**

**Complementary Course VIII – MODERN PHYSICS AND ELECTRONICS**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Discuss atomic models with different scientific approaches with the errors and the correction to improvise and overcome the drawback of each model. | 7 |
| CO 2 | Describe the need of quantum mechanics, show an understanding of quantization. | 7 |
| CO 3 | Explain semiconductor devices like diodes, transistors etc, their characteristics and types of biasing. | 7 |

# SEMESTER V

**Course Code:    19UMM541**

**Core Course IV – REAL ANALYSIS - I**

| Upon completion of this course, the student will be able to: | PSO |
|---|---|
| CO 1 | Illustrate the properties of real numbers. | 3 |
| CO 2 | Compare sequences and series. | 4 |
| CO 3 | Evaluate limits of functions. | 4 |

**Course Code:    19UMM542**

**Core Course V – COMPLEX ANALYSIS - I**

| Upon completion of this course, the student will be able to: | PSO |
|---|---|
| CO 1 | Define Complex numbers and study analyticity of functions of complex variables. | 3 |
| CO 2 | Explain  the properties of elementary functions. | 4 |
| CO 3 | Solve integration of functions of a complex variable. | 4 |

**Course Code:    19UMM543**

**Core Course VI – ABSTRACT ALGEBRA – GROUP THEORY**

| Upon completion of this course, the student will be able to: | PSO |
|---|---|
| CO 1 | Describe the concepts and theorems in groups and cyclic groups. | 3 |
| CO 2 | Apply the theory of permutations, homomorphism and isomorphism in proving theorems. | 4 |
| CO 3 | Analyse and apply Lagrange's theorem. | 4 |

**Course Code:     19UMM544**

**Core Course VII – DIFFERENTIAL EQUATIONS**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Apply real life situations into problems in differential equations of first and second order. | 4 |
| CO 2 | Compare different types of first and second order ODE and solve them. | 4 |

**Course Code:     19UMM545**

**Core Course VIII – MATHEMATICS SOFTWARE**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Demonstrate typesetting skills in Latex. | 4 |
| CO 2 | Solve different mathematical problems using SageMath. | 4 |

**Course Code:     19UMM551.1**

**Open Course – OPERATIONS RESEARCH**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Formulate linear programming problems and solve them using graphical method and simplex method. | 4 |
| CO 2 | Identify transportation and assignment problems and formulate their solutions. | 4 |
| CO 3 | Explain the basics of project management and network analysis. | 3 |

# SEMESTER VI

**Course Code:    19UMM641**

**Core Course IX – REAL ANALYSIS - II**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Describe the idea of continuity of functions; monotone & inverse functions. | 3 |
| CO 2 | Analyse the concepts of derivatives and their properties. | 4 |
| CO 3 | Apply Riemann integrable functions and their properties. | 4 |

**Course Code:    19UMM642**

**Core Course X – COMPLEX ANALYSIS - II**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Describe analytic functions, differentiate between sequence and series. | 4 |
| CO 2 | Evaluate singularities of a function, apply residue theorem in problem-solving. | 4 |
| CO 3 | Describe the concepts of conformal mapping & Mobius transformation. | 3 |

**Course Code:    19UMM643**

**Core Course XI – ABSTRACT ALGEBRA – RING THEORY**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Explain different algebraic systems- rings, integral domains, fields, ideals and their characteristics. | 4 |
| CO 2 | Describe properties of polynomial rings; PID's; reducibility of polynomials. | 4 |
| CO 3 | Analyse the properties of unique factorization domain and Euclidean domain. | 3,4 |

**Course Code:    19UMM644**

**Core Course XII – LINEAR ALGEBRA**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Describe linear equations and their geometry, Gaussian elimination and applications. | 3 |
| CO 2 | Apply properties of vector spaces, rank of matrices; linear transformations and their properties. | 4 |
| CO 3 | Evaluate determinants and study their applications. | 4 |
| CO 4 | Validate Eigen values and diagonalise matrices. | 4 |

**Course Code:    19UMM645**

**Core Course XIII – INTEGRAL TRANSFORMS**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Explain Laplace transforms, convolution, differentiation and integration of transforms. | 3 |
| CO 2 | Describe systems of Ordinary Differential Equations. | 4 |
| CO 3 | Illustrate applications of Fourier series, integrals and transforms. | 4 |

**Course Code:    19UMM661.1**

**ELECTIVE COURSE – GRAPH THEORY**

| Upon completion of this course, the student will be able to: | | PSO |
|---|---|---|
| CO 1 | Explain the concept of graphs, trees, connectivity and their properties. | 3 |
| CO 2 | Formulate graphs as mathematical models. | 4 |
| CO 3 | Analyse the properties of Euler graphs, Hamiltonian graphs, Planar graphs and understand their characteristics. | 4 |

**Course Code:    19UMM646**

**PROJECT**

| Upon completion of this course, the student will be able to: | PSO |
|---|---|
| CO 1 | Choose topics on their own and chalk out a project. | 5 |
| CO 2 | Foster spirit of harmony and team work. | 4 |
| CO 3 | Make good presentations, prepare reports, develop mind set for pursuing research. | 5 |