J.J. College of Arts and Science (Autonomous), Pudukkottai

Department of Mathematics

Course Outcomes – 2022 - 2023

M.Sc. Mathematics – PSMA

Course Name - Algebraic Structures	**Course Code - P1R3MACC1**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	Recall basic counting principle, define class equations to solve problems, explain Sylow's theorems and apply the theorem to find number of Sylow subgroups	K1
CO2	Define Solvable groups, define direct products, examine the properties of finite Abelian groups, define modules	K2
CO3	Define similar Transformations, define invariant subspace, explore the properties of triangular matrix,to find the index of nilpotence to decompose a space into invariant subspaces, to find invariants of linear transformation, to explore the properties of nilpotent transformation relating nilpotence with invariants.	K2
CO4	Define Jordan, canonical form, Jordan blocks, define rational canonical form, define companion matrix of polynomial, find the elementary devices of transformation, apply the concepts to find characteristic polynomial of linear transformation.	K2
CO5	Understand the concept of solvability by trace, Symmetric etc	K2

Course Name – Real Analysis – I	**Course Code – P1R3MACC2**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	Analyze and evaluate functions of bounded variation and Rectifiable Curves	K4
CO2	Describe the concept of Riemann-Stieltjes integral and its properties	K2
CO3	Demonstrate the concept of step function, upper function, Lebesgue function and their integrals	K2
CO4	Construct various mathematical proofs using the properties of Lebesgue integrals and establish the Levi monotone convergence theorem.	K6
CO5	Formulate the concept and properties of inner products, norms and measurable functions	K5

Course Name - Ordinary Differential Equations	**Course Code - P1R3MACC3**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	Use the method of variation of parameters to find particular solutions of second order, linear homogeneous equations	K3

CO2	Use the method of undetermined co-efficient to solve 2nd order linearhomogeneous equations.	K3
CO3	Learn about Legendre Polynomials, Bessels function and Gamma functions	K2
CO4	Acquire the knowledge to solve the equations using Lipschitz condition	K2
CO5	Use the method of successive approximation Picards theorem	K3

Course Name - Advanced Algebra	**Course Code – P2R3MACC4**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	Prove theorems applying algebraic ways of thinking	K3
CO2	Connect groups with graphs and understanding about Hamiltonian graphs	K2
CO3	Compose clear and accurate proofs using the concepts of Galois Theory	K3
CO4	Bring out insight into Abstract Algebra with focus on axiomatic theories	K5
CO5	Demonstrate knowledge and understanding of fundamental concepts including extension fields, Algebraic extensions, Finite fields, Class equations and Sylow's theorem.	K2

Course Name - Real Analysis – II	**Course Code - P2R3MACC5**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	Understand and describe the basic concepts of Fourier series and Fourier integrals with respect to orthogonal system.	K2
CO2	Analyze the representation and convergence problems of Fourier series	K4
CO3	Analyze and evaluate the difference between transforms of various functions	K4
CO4	Formulate and evaluate complex contour integrals directly and by the fundamental theorem	K2
CO5	Apply the Cauchy integral theorem in its various versions to compute contour integration	K3

Course Name – Partial Differential Equations	**Course Code – P2R3MACC6**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	To understand and classify second order equations and find general solutions	K6
CO2	To analyse and solve wave equations in different polar coordinates	K1
CO3	To solve Vibrating string problem, Heat conduction problem, to identify and solve Laplace and beam equations	K3
CO4	To apply maximum and minimum principle's and solve Dirichlet, Neumann problems for various boundary conditions	K2
CO5	To apply Green's function and solve Dirichlet, Laplace problems, to apply Helmholtz operation and to solve Higher dimensional problem	K4

Course Name - Number Theory and Cryptography	Course Code - P1R3MADSE1:1	Knowledge Level
After completion of this course, students would be able to		
CO1	Know the basic concepts of analytic number theory	K1
CO2	Understand better the distribution of prime numbers	K2
CO3	Understand the proof of Dirichlet's theorem	K2
CO4	Know the Euler-Maclaurin formula	K1
CO5	Analyze the basic theory of Cryptography	K4

Course Name - Graph Theory and Applications	Course Code – P1R3MADSE1:2	Knowledge Level
After completion of this course, students would be able to		
CO1	Understand matching and coverings	K6
CO2	Acquire the knowledge of edge coloring and Ramsey's Theorem	K2
CO3	Know about chromatic number and chromatic polynomials	K3
CO4	Characterize planar graphs and solve problems related to trees	K2
CO5	Have a deep knowledge of Dominating and its applications	K4

Course Name – Formal Languages and Automata Theory	Course Code - P1R3MADSE1:3	Knowledge Level
After completion of this course, students would be able to		
CO1	Apply Automata concepts and techniques in designing systems that address real world problems	K6
CO2	Understand the connection between language and computation	K1
CO3	Analyze the computational strengths and weakness of these machines	K3
CO4	Demonstrate an in-depth understanding of theories, concepts and techniques in automata and their link to computation	K4
CO5	The conversion of regular expression to finite automata – scanning	K2

Course Name – Programming in C++and Numerical Methods	Course Code – P1R3MADSE1:4P	Knowledge Level
After completion of this course, students would be able to		
CO1	Understand and apply the C++ structure, tokens, expressions, control structures	**K2,K3**
CO2	Ability to declare various prototyping, friend and virtual functions	**K3**
CO3	Create Classes, objects, arrays of objects, constructors, and Destructors.	**K3,K4**
CO4	Analyze over loading operators and inheritance.	**K4**
CO5	Deliberate files, pointers and templates. Create, design and develop quality programs in C++.	**K4,K5**

Course Name - Lie Groups and Lie Algebras	Course Code - P1R3MADSE2:1	Knowledge Level
After completion of this course, students would be able to		
CO1	Understand that the subject combines ideas from analysis, geometry, topology and algebra	K3
CO2	Know how to design and execute proofs of theorems in this area	K2
CO3	Have a working knowledge of the basic tools of the exponential map and how it connects analytic properties with algebraic properties	K3
CO4	Have knowledge of how to combine tools and techniques from many different areas of mathematics in order to prove new results and obtain a heightened level of understanding	K4
CO5	Display a high level of knowledge of mathematical concepts	K5

Course Name – Mathematical Programming	Course Code – P1R3MADSE2:2	Knowledge Level
After completion of this course, students would be able to		
CO1	Understand the different methods of I.P.P method and mixed integer LPP.	K2
CO2	Acquire knowledge about Dynamic programming.	K2
CO3	Study about Inventor with price breaks.	K4
CO4	Understand the concepts of Queuing system – Poisson Queuing system.	K2
CO5	Discuss Branch and Bound Techniques.	K4

Course Name - Fuzzy Sets and their Applications	Course Code - P1R3MADSE2:3	Knowledge Level
After completion of this course, students would be able to		
CO1	Discuss the types of operations on fuzzy sets, t- norms and fuzzy Arithmetic	K4
CO2	Study knowledge of fuzzy equivalence relations.	K4
CO3	Identify fuzzy relations, binary fuzzy relations and fuzzyequivalence relations	K5
CO4	Gain the knowledge of constructing fuzzy sets and operations on fuzzy sets	K2
CO5	Apply the fuzzy models to natural science and technical fields.	K3

Course Name – Discrete Mathematics	Course Code – P1R3MACC2:4	Knowledge Level
After completion of this course, students would be able to		
CO1	Understand the ideas of relations and functions.	K2
CO2	Acquire knowledge about logical arguments and logical constructs.	K2
CO3	Discuss semi groups and normal subgroups.	K4

CO4	Have a deep knowledge of lattices and its applications	K2
CO5	Know about recurrence relations and generating functions.	K2

Course Name –Algebraic Topology	**Course Code – P2R3MADSE3:1**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	Explain the fundamental concepts of Algebraic topology.	K5
CO2	Demonstrate accurate and efficient use of Algebraic topology techniques.	K5
CO3	Demonstrate capacity for Mathematical Reasoning through analyzing, proving and explaining concepts from Algebraic topology.	K5
CO4	Applying problem solving using algebraic topology techniques.	K3
CO5	Acquire roles in modern mathematics and applied contexts	K2

Course Name - Mathematical Statistics	**Course Code – P2R3MADSE3:2**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	Acquire the knowledge of multiple and partial correlation	K2
CO2	Analyze the Theory of Estimation and methods of estimating a parameterthrough sampling and test their Goodness.	K4
CO3	Study the advantages and drawbacks of Non – parametric method and test forrandomness	K3
CO4	Demonstrate the ability to use the methods of statistical process control	K5
CO5	Know about analysis of one way and two way classifications.	K4

Course Name – Statistics Data Analysis using R Programming	**Course Code - P2R3MADSE3:3P**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	Show the installation of R Programming Environment	K5
CO2	Utilize and R Data types for developing programs	K3
CO3	Make use of different R Data Structures.	K3
CO4	Develop programming logic using R Packages.	K6
CO5	Analyze the datasets using R programming capabilities.	K4

Course Name – Tensor Analysis and Relativity	**Course Code – P2R3MADSE3:4**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	Do computations with tensors, both in coordinates and in a coordinate-free form	K2,k3
CO2	Know the mathematical language needed to formulate the Maxwell	K3

	equations for electromagnetism	
CO3	Demonstrate the ability to linear elasticity equations and other field equations.	K2
CO4	Be able to define curved spaces and be able to compute the curvature tensor for simple geometries.	K4
CO5	Important Approach is to Line arise the Field Equations	K5

Course Name - Wavelets	**Course Code - P2R3MADSE4:1**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	Presents a mathematical introduction to the wavelet theory: Continuous and discrete wavelet transform	K2
CO2	Applications related for example to signal analysis, image processing, numerical analysis	K3
CO3	Handle problems and conduct researches related to theoretical and applied problems related to wavelet theory	K5
CO4	In particular techniques connected with signal and image processing, data banks should be studied	K4
CO5	Participate in scientific discussions and conduct researches on high international level in wavelet theory	K4

Course Name – Modeling and Simulation	**Course Code – P2R3MADSE4:2**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	Describe the roll of important elements of discrete event simulation and modelling paradigm.	K2
CO2	Conceptualize real world situations related to systems development decisions from source of requirements.	K2
CO3	Interpret the model and apply the results to resolve critical issues in a real world environment.	K6
CO4	Apply random number variates to develop simulation models	K4
CO5	Analyze output data produced by a model and test validity of the model.	K4

Course Name - Machine Learning and Artificial Intelligence	**Course Code – P2R3MADSE4:3**	**Knowledge Level**
After completion of this course, students would be able to		
CO1	Use appropriate search algorithms for problem solving	K2
CO2	Apply reasoning under uncertainty	K3
CO3	Build supervised learning models	K4
CO4	Build ensembling and unsupervised models	K4
CO5	Build deep learning neural network models	K4

Course Name - Neural Networks	Course Code - P2R3MADSE4:4	Knowledge Level
After completion of this course, students would be able to		
CO1	To study the Mobius Inverssion formula	K2
CO2	Acquire the knowledge of phi – function.	K5
CO3	Learn about primitive roots and indices.	K3
CO4	Acquire the knowledge of number of special form	K2
CO5	Demonstrate an in – depth understanding of Fibonacci sequences and Srinivasa Ramanujan finite continued frsactipons.	K5

Course Name - Neural Networks	Course Code - P2R3MADSE4:4	Knowledge Level
After completion of this course, students would be able to		
CO1	To study the Mobius Inverssion formula	K2
CO2	Acquire the knowledge of phi – function.	K5
CO3	Learn about primitive roots and indices.	K3
CO4	Acquire the knowledge of number of special form	K2
CO5	Demonstrate an in – depth understanding of Fibonacci sequences and Srinivasa Ramanujan finite continued frsactipons.	K5

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