**Sree Ayyappa College for Women, Chunkankadai.**

**Department of Mathematics**

**B.Sc. MATHEMATICS**

**(Even Semester 2019-2020)**

# PROGRAMME OUTCOMES OF B.SC.

# Apply the broaden and in-depth knowledge of science and computing to analyse, think creatively and generate solutions to face the global challenges.

# Foster intellectual curiosity, critical thinking and logical reasoning.

# Adapt to different roles and responsibilities and develop leadership qualities in multicultural working environment by relating to diversity and ethical practices.

# Update the techniques and acquire skills to develop systems and methods to solve current problems.

# PROGRAMME SPECIFIC OUTCOMES (PSO)

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| **PSOs** | Upon completion of B.Sc. Mathematics, the graduates will be able to : |
| **PSO - 1** | Acquire a strong foundation in various branches of mathematics. |
| **PSO - 2** | Develop problem solving skills cultivating logical thinking. |
| **PSO - 3** | Solve problems involving numerical ability and also problems in interdisciplinary areas which would widen the scope of career prospects. |
| **PSO - 4** | Apply the skills and knowledge gained through the study of mathematics to real life situations and face competitive examinations with confidence. |
| **PSO - 5** | Pursue higher studies which in turn will offer them job opportunities in government and public sector undertakings, banks, central government institutes etc. |

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| **Semester**  **Name of the Course** | **: II**  **: Differential Equations** | **Major Core I** |
| **Subject code** | **: SMMA22** |  |

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| **No. of hours per week** | **Credits** | **Total No. of hours** | **Marks** |
| 5 | 4 | 75 | 100(75+25) |

**Course Outcomes**

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| **CO No**. | **Upon completion of this course, students will be able to** | **POs/PSOs addressed** | **CL** |
| CO-1 | Recall the idea of Differential Equations types of Differential Equations, Types of Solutions learning about four types of equations which are soivable for p,x,y,Clairauts Equations. Also we have to find out the Method of solving simultaneous differential equations. | PSO-1 |  |
| CO-2 | Learn the concept of Second Order Liner Differential equations with constant coefficients. Method of finding complementary functions and particular integral of the form . | PSO-1,2,3 |  |
| CO-3 | Learn the concept of Second Order Liner Differential equations with variable coefficients apply the concept to solve the problems. Also study Homogenous Equations and reduce equations to homogenous equations. | PSO-2,3 |  |
| CO-4 | To understand the concept of partial differential equations and its solutions, standard form of equations. Also study the concept of Lagaranges differential equations | PSO-1,3 |  |
| CO-5 | Acquire the knowledge about the application of differential equations categorise the differential equations in the field of Physical science, chemical science etc. | PSO-1,4 |  |

**Teaching Plan**

**Total contact hours: 90 (Including lectures, assignments and tests)**

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| **Unit** | **Module** | | **Topics** | **Lecture hours** | | **Learning outcomes** | **Pedagogy** | **Assessment/ evaluation** |
| **I** | **First Order Higher Degree Differential Equations** | | | | | | |  |
|  | 1. | Introduction of Differential Equations. | | 4 | Recall the idea of differential equations, examples order and degree and formation of differential equations. | | Lecture Method | Home Work and Test. |
|  | 2. | Discussion about Types of Differential Equations. | | 6 | To understand the concept of equations solvable for p,x,y and Clairauts form. | | Lecture Method with suitable examples | Discussion, Home Work and Test. |
|  | 3. | Simaltaneous Differential Equations | | 5 | To Practice various problems related to simultaneous differential equations. | | Lecture Method | Test |
| **II** | **Ordinary Differential Equations** | | | | | | | |
|  | 1. | Second Order Liner Differential equations with constant coefficients-method of finding complementary functions. | | 4 | Apply the rule of finding complementary functions in various problems. | | Lecture Method with suitable examples | Home Work and Test. |
|  | 2. | Second order Liner Diff.equns with constant coefficients-method of finding particular integrals. | | 5 | To Practice various problems related to the concept. | | Lecture Method with suitable examples | Home Work and Test. |
|  | 3. | Particular Integrals of the form | | 6 | Categorise problems to the given methods and solve the corresponding problems. | | Lecture Method with suitable examples | Home Work and Test. |
| **III** | **Ordinary Differential Equations ( continued…)** | | | | | | | |
|  | 1. | Second Order Liner Diff.eqn with variable coefficients. | | 6 | To practice various problems related to the concept. | | Lecture Method with suitable examples | Home Work and Test. |
|  | 2. | Homogenous equations | | 4 | To understand the definion of Homogenous equations and learnt the concept | | Lecture Method with suitable examples | Home Work and Test. |
|  | 3. | Equations reduced to Homogenous equations | | 6 | To identify the Homogenous equations and practice various problems in Homogenous equations. | | Lecture Method with suitable examples | Home Work and Test. |

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| **IV** | **Partial Differential Equations** | | | | | |
|  | 1. | Formation of equations by elimination of arbitrary constants and functions, types of solutions | 4 | To understand the definition of P.D.E and forming the P.D.E by the elimination of arbitrary constant and function learn about types of solutions. | Lecture Method with suitable examples | Home Work and Test. |
|  | 2. | Standard forms of partial Diff.equns . | 4 | To solve the diff.equns of the form | Lecture Method with suitable examples | Home Work and Test. |
|  | 3. | Lagrange’s Diff.equns | 7 | To understand the concept of Lagrange’s Diff.equns and solve the equn using the given rules. | Lecture Method with suitable examples | Home Work and Test. |
| **V** | **Applications of Differential Equations.** | | | | | |
|  | 1. | Introduction of Growth and Decay problems. | 4 | Categories Diff.equns in various problems. | Lecture method. | Discussions and test. |
|  | 2. | Chemical reactions, Newtons law of cooling, problems. | 5 | Applications of Diff.equn in Chemical and Physical problems. | Lecture method. | Discussions and test. |
|  | 3. | Simple electric Circuit, Brachistochrome Problem. | 6 | Applications of Diff.equn in Chemical and Physical problems. Discussing various Problems relating to this. | Lecture method. | Discussions and test. |

Course Instructor : Dr.S.S.Sandhya HOD : Dr.K.R.Jayasree

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| **Semester**  **Name of the Course** | **: IV**  **: Abstract Algebra I** |  |
| **Subject code** | **: SMMA 41** |  |

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| **No. of hours per week** | **Credits** | **Total No. of hours** | **Marks** |
| 6 | 5 | 90 | 100(75+25) |

# Course Outcomes

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| **CO** | **Upon completion of this course the students will be able to :** | **PSO**  **addressed** | **CL** |
| **CO- 1** | Explain the basic concept of group theory | PSO-1 |  |

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| **CO- 2** | Definition of Cyclic groups, generators, cosets , Discuss Lagrange’s theorem, Fermat’s theorem and euler’s theorem | PSO-1,2 |  |
| **CO- 3** | Learn the concept of normal subgroup, quotient group and apply the concept to solve the problems. Recall the idea of homomorphism, isomorphism and permutation of groups. Learn about Cayley’s theorem. | PSO-1,2 |  |
| **CO -4** | Acquire the knowledge about ring Theory and analyse the importants of integral domain, field and ideals etc. | PSO-1,2 |  |
| **CO- 5** | Analyse the importants of homomorphism and isomorphism and distinguish between their properties learn about field of quotients polynomial rings and division algorithm. | PSO-1,2,3 |  |

**Teaching Plan**

**Total contact hours: 90 (Including lectures, assignments and tests)**

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| **Unit** | **Module** | | **Topics** | **Lecture hours** | | **Learning outcome** | **Pedagogy** | **Assessment/ Evaluation** |
| **I** | **Group Theory** | | | | | |  |  |
|  | 1. | Introducing Group, Subgroup with suitable examples. | | 6 | Explain the primary concepts of groups and subgroups. Stusy their properties with suitable examples. | | Lecture method. | Test and Discussion. |
|  | 2. | Normalizer and Centralizer and realred problems | | 6 | To understand the concept of Normaliser and Centraliser and learn to solve the problems | | Lecture method | Test and Discussion |
|  | 3. | Product of two subgroups, order of HK, intersection and union of subgroups. | | 6 | Understand the concept of product groups and properties of subgroups. | | Lecture method | Test and Discussion |
| **II** | **Group Theory (Continued)** | | | | | |  |  |
|  | 1 | Cyclic Groups, generator of a cyclic group. | | 5 | Understand the concept of cyclic groups. | | Lecture method | Test and Discussion |
|  | 2 | Cosets, partitioning of a froup by cosets. | | 5 | Solve the problem based on cosets. | | Lecture method | Test and Discussion |

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|  | 3 | Lagrange’s theorem, Euler’s theorem, Fermat’s theorem | 6 | Learn the theory of Lagrange’s theorem, Euler’s theorem, Fermat’s theorem | Lecture method | Test and Discussion |
| **III** | **Group Theory (Continued)** | | | |  |  |
|  | 1 | Normal subgroup, quotient group,group homomorphism,canonical homomorphism. | 8 | Understand the basic definitions and fundamental concepts of Normal subgroup, quotient group,group homomorphism. | Lecture method. | Test and Discussion |
|  | 2 | Kernel of a homomorphism, isomorphism property, Automorphism and inner automorphism. | 8 | Distinguish between isomorphism and automorphism of groups and understand the concept of automophism, inner automorphism etc. | Lecture method | Test and Discussion |
|  | 3 | Permutation groups and Cayley’s theorem. | 4 | Learn the theory of Cayley’s theorem and understand the concept of Permutation groups. | Lecture method | Test and Discussion |
| **IV** | **Ring Theory** | | | |  |  |
|  | 1 | Introduction of rings, example, properties. Subring. | 5 | Learn the basic concept of ring theory. | Lecture method | Test and Discussion |
|  | 2 | Integral domain,fiels,subfield and ideals | 4 | Understand the given concepts and solve the problems related to this concept. | Lecture method | Test and Discussion |
|  | 3 | Ideal-Principal ideal, maximal and prime ideal, quotient ring, characteristic of a ring, PID and UFD | 9 | Distinguish between prime and maximal ideals understand the concept of characteristic of a ring. Learn the theory of PID and UFD | Lecture method | Test and Discussion |
| **V** | **Ring Theory (Continued)** | | | |  |  |
|  | 1 | Homomorphism of Rings, Isomorphism property, kernel of a homomorphism | 6 | Understand the concept of homomorphism and isomorphism | Lecture method | Test and Discussion |
|  | 2 | Fundamental theorem of homomorphism, field of quotients of an integral domain. | 6 | Learn the theory of fundamental theorem of homomorphism. | Lecture method | Test and Discussion |
|  | 3 | Polynomial rings, Division algorithm. | 6 | Understand various theorems and examples related to the concept. | Lecture method | Test and Discussion |

Course Instructors : Dr.S.S.Sandhya HOD : Dr.K.R.Jayasree

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| **Semester**  **Name of the Course** | **: VI**  **: Complex Analysis** |  |
| **Subject code** | **: SMMA61** |  |

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| No. of hours per week | Credits | Total No. of hours | Marks |
| 5 | 4 | 75 | 100(75+25) |

# Course Outcomes

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| **CO** | **Upon completion of this course the students will be able to:** | **PSO addressed** | **CL** |
| CO -1 | Analytic functions, functions of complex variables, derivatives, C.R. equations, polar form, analytic functions, harmonic functions. | PSO-1 |  |
| CO -2 | Definite integrals, contous, Cauchy Coursat theorem, antiderivative and Independent of path, Cauchy integral formula, Moraras theorem. | PSO-1,2 |  |
| CO -3 | Taylor’s series, converges, Laurent’s series, zeros of Analytic functions, residues, residue theorem, principal part of functions, residue at poles. | PSO-1,2 |  |
| CO -4 | Evaluation of Integrals, Evaluation of improper real integrals, improper integrals involving sines and cosines, definite integrals involving sines and cosines. | PSO-1,2 |  |
| CO -5 | Transformations, conformal, mapping, basic properties, Bilinear maps, fixed points, applications. | PSO-1,2,3 |  |

**Teaching Plan**

**Total contact hours: 75 (Including lectures, assignments and tests)**

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| **Unit** | **Module** | | **Topics** | **Lecture hours** | **Learning outcomes** | | **Pedagogy** | **Assessment/ev aluation** |
| **I** | **Analytic functions** | | | | | | | |
|  | 1. | Analytic functions of a complex variables, Derivatives | | 5 | | Understand the basics of analytic functions of complex variables. | Lecture method | Test and Discussion |
|  | 2. | C.R.Equations, sufficient conditions, polar form | | 4 | | Learn the C.Requations and polar form. | Lecture method | Test and Discussion |
|  | 3. | Analytic functions, Harmonic functions | | 4 | | Understand the concept of Harmonic functions. | Lecture method | Test and Discussion |
| **II** | **Integrals** | | | | | | | |
|  | 1. | Definite Integrals, contous. | | 5 | | Explain the primary concept of definite integrals. | Lecture method | Test and Discussion |
|  | 2. | Cauchy coursat theorem, anti derivative and independent of path | | 6 | | Learn the theory of Cauchy coursat. | Lecture method | Test and Discussion |
|  | 3. | Cauchy Integral formula, Moreras theorem | | 6 | | Understand the concept of Cauchy Integral formula. | Lecture method | Test and Discussion |

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| **III** | **Series** | | | | | |
|  | 1. | Taylor series, converges. | 5 | To understand the concept of Taylor’s series. | Lecture method | Test and Discussion |
|  | 2. | Laurent’s series, zeros of analytic functions, Residues. | 6 | Learn Laurent’s series and residues. | Lecture method | Test and Discussion |
|  | 3. | Residue theorem, principal part of functions, Residue at poles. | 5 | Learn the theory of residue and residue at poles. | Lecture method | Test and Discussion |
| **IV** | **Evaluation of Integrals** | | | | | |
|  | 1. | Evaluation of Integrals, Evaluation of improper real integrals. | 5 | Understand the Evaluation of Integrals. | Lecture method | Test and Discussion |
|  | 2. | Improper integrals involving sines and cosines. | 5 | Discuss Improper Integrals in sines and cosines. | Lecture method | Test and Discussion |
|  | 3. | Definite integrals involving sines and cosines. | 4 | To understand definte integrals in sines and cosines. | Lecture method | Test and Discussion |
| **V** | **Transformations** | | | | | |
|  | 1. | Transformations, conformal, mappings | 6 | To understand Transformations and mapping. | Lecture method | Test and Discussion |
|  | 2. | Basic Properties of Bilinear transformation. | 4 | Study the basic properties of bilinear transformation. | Lecture method | Test and Discussion |
|  | 3. | Bilinear maps, fixed points, Applications. | 5 | Understand bilinear maps and fixed points. | Lecture method | Test and Discussion |

Course Instructor : Dr.S.S.Sandhya HOD : Dr.K.R.Jayasree

# Semester : V

# Name of the course : Real Analysis

**Course Code : SMMA52**

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| **No. of hours per week** | **Credits** | **Total No. of hours** | **Marks** |
| 5 | 4 | 75 | 100(75+25) |

**Objectives:**

1.To introduce Metric spaces and the concepts of completeness, continuity, connectedness, compactness and

uniform convergence.

2. To use these concepts in higher studies.

**Course Outcomes**

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| **CO** | **Upon completion of this course the students will be able to :** | **PSO**  **addressed** | **CL** |
| **CO- 1** | Understands the concepts of completeness, continuity and discontinuity of metric spaces | PSO- 1 |  |
| **CO- 2** | Apply the metric space theorems to real life situations | PSO- 4 |  |
| **CO- 3** | Distinguish between continuous functions and uniform continuous functions | PSO- 9 |  |
| **CO- 4** | Use the basic concepts in the development of real analysis  results. | PSO- 1 |  |
| **CO- 5** | Understand the concepts of countable and uncountable sets, metric space, connectedness, compactness of metric spaces | PSO- 7 |  |
| **CO- 6** | Develop the ability to reflect on problems that are quite significant in the field of real analysis | PSO- 8 |  |

**Teaching Plan**

**Total contact hours: 75 (Including lectures, assignments and tests)**

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| **Unit** | **Module** | | **Topics** | **Lecture hours** | | **Learning outcomes** | **Pedagogy** | **Assessment/ev aluation** |
| **I** | **Metric Spaces** | | | | | | | |
|  | 1 | Introduction to real analysis. Definitions, examples and theorems on Countable and Uncountable Sets | | 3 | To determine countable and uncountable sets | | Lecture | Quiz |
|  | 2 | Metric spaces definitions, problems and theorems | |  | To explain about metric spaces | | Lecture, Group discussion | Test |
|  | 3 | Bounded sets definitions and problems | |  | To find out a set is bounded or unbounded | | Lecture | Quiz |
|  | 4 | Open ball, open sets definitions, examples, problems and theorems | |  | To solve problems on open sets | | Lecture | Assignment |
|  | 5 | Equivalent metrics, Subspace | |  | To analyse about equivalent metrics | | Lecture | Quiz |
| **II** | **Closed Sets** | | | | | | | |

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|  | 1 | Interior of a set definitions, examples, problems and theorems |  | To analyse about interior of a set | Lecture with group discussion | Assignment |
|  | 2 | Closed sets, closure definitions, examples, problems and theorems. |  | To determine the closed sets and closure of the subsets | Lecture | Test |
|  | 3 | Limit point definitions, examples, problems and theorems, Dense sets definitions, examples, and theorems |  | To find the limit point | Lecture | Test and discussion |
|  | 4 | Complete metric space definitions, examples, problems and theorems |  | To analyse about complete metric space | Lecture | Test and discussion |
|  | 5 | Cantor’s intersection theorem, Baire’s Category theorem |  | To explain the theorems | Lecture | Test and discussion |
| **III** | **Continouus functions** | | | | | |
|  | 1 | Continuity of functions definitions, examples, problems and theorems |  | To determine the continuity of a function | Lecture | Test |
|  | 2 | Composition of continuous functions problems |  | To analyse about composition of continuous functions problems | Lecture | Test and discussion |
|  | 3 | Homeomorphism examples |  | To learn to prove homeomorphism | Lecture | Test and discussion |
|  | 4 | Uniform continuity definitions, examples, problems and theorems |  | To determine the uniformly continuous functions | Lecture | Test |
|  | 5 | Discontinuous functions definitions, examples, problems and theorems |  | To test the discontinuity of a function | Lecture | Test |
| **IV** | **Connectedness and Compactness** | | | | | |
|  | 1 | Connectedness definitions, examples, problems and theorems. |  | To learn to prove the connectedness of the subsets. | Lecture | Test and discussion |
|  | 2 | Connected subsets of R problems and theorems. Connectedness and continuity problems and theorems |  | To determine the connected subsets. To compare connectedness and continuity | Lecture | Test and discussion |
|  | 3 | Compactness definitions, examples, and theorems. Compact subsets of R theorems |  | To explain the concept compactness and to prove the theorems. | Lecture | Test and discussion |

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|  | 4 | | Equivalent characterisations for compactness problems and theorems. Heine Borel theorem. |  | To compare compactness and continuity. | Lecture | Test and discussion |
| **V** | **Riemann Integral** | | | | | | |
|  | 1 | Sets of measure zero, Existence of the Riemann integral. | | 5 | To study the existence of Riemann Integral. |  | Test |
|  | 2 | Derivatives, Rolle’s theorem, Fundamental theorem of calculus. | | 5 |  |  | Test and discussion |
|  | 3 | Mean Value theorem, cauchy’s mean value theorem, Taylor’s theorem | | 5 |  |  | Test |

**Course Instructor : Dr.S.S.Sandhya HOD : Dr.K.R.Jayasree**

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| **Semester**  **Name of the Course** | **: III**  **: Vector Calculus** |
| **Subject code** | **: SMMA3A** |

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| **No. of hours per week** | **Credits** | **Total No. of hours** | **Marks** |
| 4 | 4 | 60 | 100(75+25) |

# Objectives :

# To provide basic knowledge of vector differentiation and vector integration

# To solve problems related to that.

**Course Outcomes**

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| **CO** | **Upon completion of this course the students will be able to :** | **PSO**  **addressed** | **CL** |
| **CO- 1** | Recall and define vector point funtions and scalar point functions. | PSO -1 |  |
| **CO- 2** | Use the basic concepts of divergence, curl, solenoidal and Laplacian operator. | PSO -1 |  |
| **CO- 3** | Determine the concepts of Integration of point functions, line and surface integral. | PSO -1 |  |
| **CO- 4** | Volume integral, Gauss divergence theorems and problems | PSO -2 |  |
| **CO- 5** | Solve the problems using Greens theorem and Stoke’s theorem | PSO -3 |  |

**Teaching Plan**

**Total contact hours: 60 (Including lectures, assignments and tests)**

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| **Unit** | **Module** | **Topics** | **Lecture hours** | **Learning Outcome** | **Pedagogy** | **Assessment/**  **Evaluation** |
| **I** | **Vector point functions** | | | | | |
| 1 | Vector and scalar point functions and derivative of a vector | 4 | To understand the vector point functions. | Lecture with Illustration | Test |
| 2 | Derivative of sum of vectors. | 3 | To understand solving techniques derivative of sum of vectors | Lecture with Illustration | Quiz and Test |
| 3 | Derivative of product of scalar and vector point function | 3 | To understand derivative of product of scalar and vector point function. | Lecture with Illustration | Test |
| 4 | Vector operators del and Gradient. | 3 | To solve problems using vector operators. | Lecture with Illustration | Test |
| **II** | **Divergence** | | | | | |
| 1 | Divergence and curl | 4 | Learn divergence and curl | Lecture | Test |
| 2 | Solenoidal , irrotational vectors | 4 | To understand Solenoidal , irrotational vectors. | Lecture | Test |
| 3 | Laplacian operators | 4 | Learn the Laplacian operators | Lecture with Illustration | Test |
| **III** | **Integration of point functions** | | | | | |
| 1 | Integration of point functions. | 4 | To understand integration of point functions. | Lecture with Illustration | Test |
| 2 | Line integral | 4 | To understand the concept of line integral | Lecture with Illustration | Test |
| 3 | Surface integral | 4 | Learn to solve Surface integrals | Lecture with Illustration | Test |
| **IV** | **Volume integral** | | | | | |
| 1 | Volume integral | 6 | Learn the concept of volume integral | Lecture | Test |
| 2 | Gauss divergence theorem | 6 | To solve the problems of Gauss divergence theorem | Lecture | Test |

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| **V** | **Green’s theorem** | | | | | |
| 1 | Green’s theorem | 4 | Learn the concept of Green’s theorem | Lecture with Illustration | Test |
| 2 | Stoke’s theorem | 3 | To solve the problems of Stoke’s theorem | Lecture with Illustration | Test |

**Course Instructor : Dr.S.S.Sandhya HOD : Dr.K.R.Jayasree**

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| **Semester**  **Name of the Course** | **: I**  **: Calculus** |  |
| **Subject code** | **: SMMA11** |  |

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| **No. of hours per week** | **Credits** | **Total No. of hours** | **Marks** |
| 5 | 4 | 75 | 100(75+25) |

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# Course Outcomes

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| **CO No**. | **Upon completion of this course, students will be able to** | **POs/PSOs addressed** | **CL** |
| CO-1 | Recall the idea of derivative, rules of differentiation and  understand the concept of p-r equation | PSO-1 |  |
| CO-2 | Learn the concepts of curvature, circle of curvature, evolute and apply the concepts to solve problems. | PSO-1  PSO-2, PSO-3 |  |
| CO-3 | Recognize the rules of identifying asymptotes and employ  the same to different curves | PSO-2,  PSO-3 |  |
| CO-4 | Acquire the knowledge about hyperbolic functions and  compare it with circular functions, trigonometric functions , inverse trigonometric functions and their properties. | PSO-1 |  |
| CO-5 | Categorize the methods of finding the sum of trigonometric series | PSO-2, PSO-3 | An |

**Teaching Plan**

**Total contact hours: 75 (Including lectures, assignments and tests)**

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| **Unit** | **Module** | | **Topics** | **Lecture hours** | | **Learning outcomes** | **Pedagogy** | **Assessment/ evaluation** |
| **I** | **Curvature** | | | | | | |  |
|  | 1. | Introduction and definition of pedal equation | | 2 | Recall the idea of derivative, rules of differentiation and  understand the concept of p- r equation | | Lecture | Test |
|  | 2. | Problems related to p-r  equations | | 6 | Apply the concept of p-r  equation in problems | | Lecture with  illustrations | Test |
|  | 3. | Introduction, definition and theorems based on  of curvature | | 3 | To understand the definition of curvature and learn the  theorems | | Lecture | Test |
|  | 4. | Radius of curvature in different forms | | 2 | To understand the definitions of closed sets and  limit points with examples and theorems | | Lecture | Test |
|  | 5. | Problems related to Radius of curvature | | 2 | To identify Hausdorff spaces and practice various  theorems | | Lecture with illustrations | Group discussion |
| **II** | **Centre of curvature, Evolute** | | | | | | | |
|  | 1. | Definition and problems based on centre of curvature of  the curve | | 5 | To understand the definition of centre of curvature of the curve | | Lecture | Test |
|  | 2. | Definition and  problems related to evolute of the curve | | 5 | To understand the definition  of evolute of the curve and practice problems | | Lecture | Q&A |
|  | 3. | Definition and problems on circle of  curvature | | 5 | To practice various problems related to circle of curvature | | Lecture | Formative Assessment  Test |
| **III** | **Asymptotes** | | | | | | | |
|  | 1. | Definition and methods of finding asymptotes for the curve y=f(x)  and f(x,y)=0 | | 3 | To understand the methods of finding asymptotes | | Lecture | Quiz |
|  | 2. | Working rule to find  the inclined asymptotes | | 2 | Recognize the rules of  identifying asymptotes | | Lecture with  illustration | Test |
|  | 3. | Problems on linear  asymptotes and intersection of curves | | 5 | To apply the rules to different curves | | Lecture with  group discussion | Brain stoming |
|  | 4. | Problems based on  inclined asymptotes | | 5 | To apply the rules to  different curves | | Lecture | Assignment |

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| **IV** | **Hyperbolic functions, Logarithm of Complex numbers** | | | | | |
|  | 1. | Introduction and definition of  Hyperbolic functions | 2 | Acquire the knowledge about hyperbolic functions | Lecture with illustration | Quiz |
|  | 2. | Problems based on  hyperbolic functions | 4 | To compare with circular  functions, | Lecture | Q&A |
|  | 3. | Definitions and Problems based on inverse hyperbolic  functions | 4 | Acquire the knowledge about inverse hyperbolic functions | Lecture | Slip Test |
|  | 4. | Separate into real and imaginary parts of hyperbolic and inverse hyperbolic functions | 5 | To distinguish various hyperbolic functions, trigonometric functions , inverse trigonometric  functions | Lecture | Formative Assessment Test |
| **V** | **Summation of Trigonometric Series** | | | | | |
|  | 1. | Introduction and Illustrations based on  method of difference | 4 | To analyze the methods of finding the sum of  trigonometric series | Lecture with illustration | Quiz |
|  | 2. | Theorem and problems on sum of sines and  cosines of n angles in A.P | 7 | To categorize problems on sum of sines and cosines of n angles in A.P | Lecture | Test |
|  | 3. | Introduction of C+iS  method | 1 | To know C+iS method | Lecture | Slip Test |
|  | 4. | Problems related to C+iS method | 3 | To apply C+iS method to find the sum of  trigonometric series | Lecture | Assignment |

**Course Instructor : Dr.S.S.Sandhya HOD : Dr.K.R.Jayasree**

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| **Semester**  **Name of the Course** | **: V**  **: Statics** |  |
| **Subject code** | **: SMMA53** |  |

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| **No. of hours per week** | **Credits** | **Total No. of hours** | **Marks** |
| 5 | 4 | 75 | 100(75+25) |

# Objectives :

# 

# 1. To provide the basic knowledge of equibrium of a particle.

# 2. To develop a working knowledge to handle practical problems.

# 

# Course Outcomes

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| **CO No**. | **Upon completion of this course, students will be able to** | **POs/PSOs addressed** | **CL** |
| CO-1 | Recall the idea of forces acting at a point, parallelogram and triangle of forces, Lami’s theorem | PSO-1 |  |
| CO-2 | Learn the concepts of parallel forces and moments, Varignon’s theorem and problems | PSO-1  PSO-2, PSO-3 |  |
| CO-3 | Recognize equilibrium of three forces acting on a rigid body and three coplanar forces theorem | PSO-2,  PSO-3 |  |
| CO-4 | Acquire the knowledge about friction, angle of friction and equilibrium of a particle | PSO-1 |  |
| CO-5 | Categorize the equilibrium of strings and Geometrical properties of common catenary | PSO-2, PSO-3 |  |

**Teaching Plan**

**Total contact hours: 75 (Including lectures, assignments and tests)**

|  |  |  |  |  |  |  |  |  |  |  |
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| **Unit** | **Module** | | **Topics** | **Lecture**  **hours** | | **Learning outcomes** | | **Pedagogy** | **Assessment/e**  **Valuation** | |
| **I** | **Triangle of forces** | | | | | | | |  | |
| 1 | Forces acting at a point and parallelogram law of forces | | 6 | Understand the basic concept of forces acting at a point and parallelogram law of forces | | Lecture with illustration | | Test | |
| 2 | Triangle of forces | | 4 | Learn the concept of Triangle of forces | | Lecture | | Test | |
| 3 | Lami’s theorem | | 6 | To study and solve the problems using Lami’s theorem | | Lecture with Group Discussion | | Test | |
| **II** | **Varignon’s theorem** | | | | | | | | | |
| 1 | | Parallel forces and moments | 5 | Understand the definitions of p  arallel forces and moments | | Lecture | | Test | |
| 2 | | Resultant of two parallel and two unlike unequal parallel forces | 4 | Understand the concept of resultant of two parallel and two unlike unequal parallel forces | | Lecture | | Test | |
| 3 | | Varignon’s theorem | 5 | To solve the problems using Varignon’s theorem | | Lecture | | Test | |
| **III** | **Three coplanar forces theorem** | | | | | | | | | |
| 1 | | Equilibrium of three forces acting on a rigid body | 6 | Understand the concept of Equilibrium of three forces acting on a rigid body | | Lecture with illustration | | | Test |
| 2 | | Three coplanar forces theorem | 6 | Understand the concept of three coplanar forces theorem | | Lecture | | | Test |
| 3 | | Problems | 4 | To solve the problems using above theorems | | Lecture | | | Test |
| **IV** | **Friction** | | | | | | | | | |
| 1 | | Friction, law of friction and angle of friction | 5 | Discuss the concept of friction | | Lecture with  illustration | | Test | |
| 2 | | Equilibrium of a particle i) On a rough inclined plane | 4 | Learn to find the Equilibrium of a particle on a rough inclined plane | | Lecture | | Test | |
| 3 | | ii) Under a force parallel to the plane  iii) under any force | 5 | To practice various Theorems | | Lecture | | Test | |
| **V** | **Geometrical properties of common catenary** | | | | | | | | | |
| 1 | | Equilibrium of strings | 5 | Recall equilibrium of strings. | | Lecture | | Test | |
| 2 | | Equation of common catenary, tension at any point | 4 | Understand the Equation of common catenary and tension at any point | | Lecture with  illustration | | Test | |
|  | 3 | | Geometrical properties of common catenary | 4 | Solve the problems using Geometrical properties of common catenary | | Lecture | | Test | |

**Course Instructor : Dr.K.R.Jayasree HOD : Dr.K.R.Jayasree**

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| **Semester**  **Name of the Course** | **: V**  **: Abstract Algebra II** |  |
| **Subject code** | **: SMMA51** |  |

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| **No. of hours per week** | **Credits** | **Total No. of hours** | **Marks** |
| 5 | 4 | 75 | 100(75+25) |

# Objectives :

# (i)To introduce the algebraic system of Vector Spaces and the related study of various physical applications.

# (ii)To equip students with the ideas of vector space, basis, inner product spaces, linear transformations to pursue their higher studies.

# Course Outcomes

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| **CO** | **Upon completion of this course the students will be able to :** | **PSO**  **addressed** | **CL** |
| **CO- 1** | Recall and define Groups ,Fields and their properties | PSO -1 |  |
| **CO- 2** | Cite examples of vector spaces ,subspaces and linear transformations | PSO -1 |  |

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| **CO- 3** | Determine the concepts of linear independence, linear dependence , basis and dimension of vector spaces | PSO -1 |  |
| **CO -4** | Correlate rank and nullity ,Linear transformation and matrix of a Linear transformation | PSO -2 |  |
| **CO- 5** | Examine whether a given space is an inner product space and the orthonormality of sets | PSO -3 |  |

**Teaching Plan**

**Total contact hours: 75 (Including lectures, assignments and tests)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Unit** | **Module** | **Topics** | **Lecture**  **hours** | **Learning outcomes** | **Pedagogy** | **Assessment/e**  **valuation** |
| **I** | **Vector Spaces** | | | | |  |
| 1 | Vector spaces, Definition and Examples | 3 | Understand the basic definitions and fundamental concepts  of Vector spaces | Lecture with illustration | Test |
| 2 | Sub spaces | 4 | Identify the difference between Vector spaces  and subspaces | Lecture | Test |
| 3 | Sub spaces solved problems | 4 | Learn to solve the  problems based on sub Spaces. | Lecture with  Group Discussion | Test |
| 4 | Linear Transformation | 4 | Understand the concept of Linear Transformation | Lecture | Test |

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| **II** | **Span of a set** | | | | | | | |
| 1 | Span of a Set | 4 | Understand the definitions and basic concepts of span of a  set | Lecture | | Test | |
| 2 | Linear Independence | 4 | Identify the difference between Linear Independence  and dependence. | Lecture with illustration | | Test | |
| 3 | Basis | 3 | Understand the  concept of Basis | Lecture | | Test | |
| 4 | Dimension | 4 | Solve the problems  based on Basis and dimension. | Lecture with video | | Test | |
| **III** | **Rank and Nullity** | | | | | | | |
| 1 | Rank and Nullity | 3 | Understand the concept  of Rank and Nullity | | Lecture | | Quiz |
| 2 | Matrix of a linear transformation | 3 | Determine the concepts of Matrix of a linear transformation | | Lecture with illustration | | Test |
| 3 | Inner Product Spaces-Definition and Examples | 3 | Understand the definition and examples of Inner  Product Spaces | | Lecture with PPT | | Slip Test |
| 4 | Orthogonality | 3 | Learn the theory of  Cayley –Hamilton theorem. | | Blended Learning | | Assignment |
| 5 | Orthogonal Complement | 3 | Solve the problems  based on eigen Values and eigen vectors. | | Lecture | | Test |
| **IV** | **Matrices** | | | | | | | |
| 1 | Elementary transformation. Inverse, Rank | 5 | Understand the elementary transformations. | | Lecture with illustration | Test | |
| 2 | Cayley –Hamilton theorem. | 5 | Study the theory of Cayley Hamilton. | | Lecture , | Test | |
| 3 | Applications of Cayley Hamilton theorem. | 5 | Study Applications of Cayley Hamilton theorem | | Lecture | Test | |
| **V** | **Bilinear form** | | | | | | | |
| 1 | Eigen Values and eigen vectors, Properties and problems | 5 | Solve the problems  based on eigen Values and eigen vectors. | | Lecture | Test | |
| 2 | Bilinear forms | 5 | Understand the definition of Bilinear forms | | Lecture | Test | |
| 3 | Quadratic forms | 5 | Distinguish between | | Lecture | Test | |
|  |  |  | Bilinear forms and | |  |  | |
|  |  |  | Quadratic forms | |  |  | |
| 4 | Reduction of a | 5 | To practice various | | Lecture |  | |
|  | quadratic form to |  | Problems based on | |  | Test | |
|  | the Diagonal form |  | Reduction of a | |  |  | |
|  |  |  | quadratic form to the | |  |  | |
|  |  |  | Diagonal form | |  |  | |

**Course Instructor : Dr.K.R.Jayasree HOD : Dr.K.R.Jayasree**

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| **Semester**  **Name of the Course** | **: VI**  **: Graph Theory** |  |
| **Subject code** | **: SMMA 63** |  |

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| **No. of hours per week** | **Credits** | **Total No. of hours** | **Marks** |
| 6 | 5 | 75 | 100  (75+25) |

**Objectives:**

1. To introduce the notation of graph theory and its applications.
2. To learn the techniques of combinatorics and graph theory.

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| **CO** | **Course Outcomes**  **Upon completion of this course the students will be able to:** | **PSO**  **addressed** | **CL** |
| CO - 1 | Understand the basic definitions to write the proofs of simple  Theorems. | PSO - 1 |  |
| CO - 2 | Employ the definitions to write the proofs of simple theorems. | PSO - 2 |  |
| CO - 3 | Relate real life situations with mathematical graphs. | PSO - 3 |  |
| CO - 4 | Develop the ability to solve problems in graph theory. | PSO - 4 |  |
| CO - 5 | Analyze real life problems using graph theory both  quantitatively and qualitatively. | PSO - 4 |  |

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| **Unit** | **Module** | | **Topics** | **Lecture**  **hours** | | **Learning outcomes** | | **Pedagogy** | **Assessment/e**  **Valuation** | |
| **I** | **Graphs and Sub graphs** | | | | | | | |  | |
| 1 | Graphs and Sub graphs - Definition and Examples - Degrees,  Sub graphs, Isomorphism | | 4 | Understand the basic definitions and fundamental concepts of graph theory | | Lecture with illustration | | Test | |
| 2 | Ramsey Numbers - Independent sets and coverings - Intersection graphs and line graphs | | 5 | Identify the difference between Independent sets and coverings and understand the concept of Intersection graphs and  line graphs | | Lecture | | Test | |
| 3 | Matrices - Operations on graphs | | 4 | Learn to form adjacency and incidence matrices of a graph and learn different types of  operations on graphs | | Lecture with Group Discussion | | Assignment Method | |
|  | 4 | Degree Sequences - Graphic Sequences. | | 5 | Understand the concept of Degree Sequences and Graphic Sequences. | | Lecture | | Test | |
| **II** | **Connectedness** | | | | | | | | | |
| 1 | | Connectedness - Walks, Trails and Paths | 6 | Understand the definitions and distinguish among walks,  trails and paths | | Lecture | | Test | |
| 2 | | Connectedness and Components | 6 | Understand the definitions of cut point and bridge of a graph and analyse the  connectedness of a graph | | Lecture | | Test | |
| 3 | | Blocks -Connectivity | 5 | Understand the concept of blocks and learn to find the connectivity of  different graphs | | Lecture | | Test | |
| **III** | **Trees** | | | | | | | | | |
| 1 | | Eulerian Graphs - Hamiltonian Graphs | 5 | Understand the concept of Eulerian graphs and Hamiltonian graphs | | Lecture with illustration | | | Test |
| 2 | | Trees - Characterisation of  trees - Centre of a tree | 5 | Understand the concept of trees | | Lecture with PPT | | | Test |
| 3 | | Matchings - Matchings in bipartite graphs. | 5 | Understand the concept of Matchings and to practice various  Theorems | | Blended learning | | | Test |
| **IV** | **Planarity** | | | | | | | | | |
| 1 | | Definition and properties | 4 | Cite examples of planar and non-planar graphs | | Lecture with  illustration | | Test | |
| 2 | | Colourability - Chromatic number and  chromatic index | 5 | Learn to find the chromatic number of  different graphs | | Blended learning | | Test | |
| 3 | | The Five Colour Theorem | 4 | To practice various Theorems | | Lecture | | Test | |
| **V** | **Directed Graphs** | | | | | | | | | |
| 1 | | Chromatic polynomials | 5 | Learn to write the chromatic polynomial of different graphs. | | Lecture | | Test | |
| 2 | | Directed Graphs - Definition and Basic  Properties | 4 | Understand the definition of digraphs. | | Lecture with  illustration | | Test | |
|  | 3 | | Paths and connectedness in digraphs | 4 | Learn connectedness of digraphs. | | Lecture | | Test | |

**Course Instructor : Dr. K. R. Jayasree HOD : Dr.K. R. Jayasree**

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| **Semester**  **Name of the Course** | **: VI**  **: Numerical Methods** |  |
| **Subject code** | **: SMMA 65** |  |

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| **No. of hours per week** | **Credits** | **Total No. of hours** | **Marks** |
| 5 | 4 | 60 | 100 (75+25) |

**Objectives: 1.** To study Numerical differentiation and Numerical integration using different formulae.

**2.** To solve numerical problems by different methods.

**Course Outcome**

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| **CO** | **Upon completion of this course the students will be able to:** | **PSO**  **addressed** | **CL** |
| CO - 1 | Understand the basic definitions and meaning of interpolation. | PSO - 1 |  |
| CO - 2 | Select appropriate numerical methods and apply the same to various types of problems. | PSO - 1 |  |
| CO - 3 | Apply numerical methods to obtain approximate solutions to  mathematical problems. | PSO - 3 |  |
| CO - 4 | Employ different methods of constructing a polynomial using  various methods. | PSO - 2 |  |
| CO - 5 | Compare the rate of convergence of different numerical  Formula. | PSO - 4 |  |
| CO - 6 | Distinguish the advantages and disadvantages of various  numerical methods. | PSO - 4 |  |

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| **Unit** | **Module** | **Topics** | **Lecture hours** | **Learning Outcome** | **Pedagogy** | **Assessment/**  **Evaluation** |
| **I** | **Solutions of algebraic and transcendental equations.** | | | | | |
| 1 | Iteration method and problems | 3 | To understand the non-linear algebraic equations - Iteration method | Lecture with Illustration | Evaluation through test |
| 2 | Bisection method | 2 | To understand solving techniques of Bisection method | Lecture with Illustration | Quiz and Test |
| 3 | Newton Raphson method and problems | 2 | To understand the non-linear algebraic equations - Newton Raphson method | Lecture with Illustration | Test |
| 4 | Regula false method, Gauss Elimination | 2 | To solve problems using Regula false method | Lecture with Illustration | Test |
| 5 | Gauss Jacobbi, Gauss Seidal method | 3 | Learn Gauss Jacobbi and Gauss Seidal method | Lecture | Test |
| **II** | **Finite Difference** | | | | | |
| 1 | First and higher order diffrences. | 4 | Recall first and higher order diffrences. | Lecture | Test |
| 2 | Forward and Backward differences and Properties of operators | 4 | To understand Forward and Backward differences and study the properties of operators. | Lecture | Test |
| 3 | Differences of a polynomial and factorial Polynomial. | 3 | Learn the factorial Polynomial | Lecture with Illustration | Test |

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| **III** | **Interpolation.** | | | | | |
| 1 | Newton’s Interpolation formulae, Gauss forward, backward Interpolation formulae | 3 | To understand interpolation formulae of Newton’s and Gauss. | Lecture with Illustration | Test |
| 2 | Bessel’s formulae and divided diffrences. | 3 | To solve the problems using Bessel’s formulae. | Lecture | Test |
| 3 | Newton’s divided diffrences formulae. | 3 | Learn Newton’s divided diffrences formulae. | Lecture with Illustration | Test |
| 4 | Lagrange’s interpolation formulae. | 2 | To solve the problems using Lagrange’s interpolation formulae. | Lecture | Test |

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| **IV** | **Numerical Differentiation and Integration.** | | | | | |
| 1 | Newton’s forward and backward difference for differentiation. | 4 | To learn the Newton’s forward and backward difference formula. | Lecture with Illustration | Test |
| 2 | Derivatives using Bessel’s formula and Trapezoidal rule | 4 | To learn the derivation Bessel’s rule and Trapezoidal rule. To solve the problems usingTrapezoidal rule. | Lecture | Test |
| 3 | Numerical integration by Simpson’s (1/3)rdrule  Simpson’s (3/8)th rule | 5 | To learn the derivation of Simpson’s (1/3)rd rule,  Simpson’s (3/8)th rule and to solve the problems using  the rules. | Lecture with Illustration | Test |
| **V** | **Difference equations.** | | | | | |
| 1 | Definition, order and degree of difference equations | 4 | To understand order and degree of difference equations | Lecture with Illustration | Test |
| 2 | Linear difference equations | 4 | To solve the Linear difference equations | Lecture | Test |
| 3 | Complementary functions, Particular Integral and simple applications | 4 | Learn to finding Complementary functions and Particular Integral and to solve simple applications | Lecture | Quiz |

**Course Instructor : Dr. K. R. Jayasree HOD : Dr.K. R. Jayasree**