ISLAMIAH WOMEN'S ARTS AND SCIENCE COLLEGE
Permanently Affiliated to Thiruvalluvar University
Recognized by UGC u/s 2 (f) and 12 (B) of the UGC Act 1956
Accredited by NAAC with "B++" Grade
Approved by the Government of Tamil Nadu
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DEPARTMENT OF MATHEMATICS WITH COMPUTER APPLICATIONS

POs, PSOs AND COs (2023-2024)

B.Sc. MATHEMATICS WITH COMPUTER APPLICATIONS

PROGRAM OUTCOMES (PO's)

PO1: Disciplinary Knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

PO2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

PO3: Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO4: Problem solving: Capacity to extrapolate from what one has learned and apply theicompetencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

PO5: Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

PO6: Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation

PO7: Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team

PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

PO9: Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.

PO10 Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

PO 11 Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

PO 12 Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

PO 13: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.

PO 14: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.

PO 15: Lifelong learning: Ability to acquire knowledge and skills, including „learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of Mathematics.

PSO2: Identify the application of Mathematics in other discipline and society to solve real life problems.

PSO3: Explore and apply technical knowledge in diverse areas of Computer Applications and Mathematics is conducive in cultivating skills for successful career, entrepreneurship.

COURSE OUTCOMES

SEMESTER I

COURSE: ALGEBRA AND TRIGONOMETRY (CORE PAPER) CREDIT:5

CLO 1: Classify and solve reciprocal equations.
CLO 2: Calculate the sum of binomial, exponential and logarithmic series.
CLO 3: Estimate Eigen values, Eigen vectors, verify Cayley – Hamilton theorem and Diagonalize the given matrix
CLO 4: Expand the powers and multiples of trigonometric functions in terms of sine and cosine**.**
CLO5: Determine relationship between circular and hyperbolic functions and the summation of trigonometric series.

COURSE: CALCULUS (CORE PAPER) CREDIT:5

CLO 1: Evaluate the nth derivative using Leibnitz Rule
CLO 2: Compute Radius and circle of curvature, Evolute and Maxima – Minima of two variables.
CLO 3: Evaluate integral values by appropriate reduction formula.
CLO 4: Identify the multiple integral techniques and evaluate.
CLO 5: Evaluate the indefinite integrals using the properties of Beta and Gamma functions.

COURSE: WEB DESIGNING WITH HTML (ELECTIVE) CREDIT:3

CLO 1: Understand the basic concept in HTML. Concept of resources in HTML
CLO 2: Create the Meta Data, Design concept & save the files.
CLO 3: Understand page formatting and the concept of list.
CLO 4: Creating Links and understand the concept of creating link to email address
CLO 5: Create concepts by adding images. Understand the table creation.

COURSE: MATHEMATICS FOR COMPETITIVE EXAMINATIONS I (ELECTIVE)

CREDIT:2

CLO1: Solve Mathematical Problems using Mathematical formulae
CLO2: Understand the knowledge of application of Mathematics
CLO3: Understand the concepts of simplification.
CLO4: Calculate the square root and cube root.
CLO5: Solve the problems on age.

COURSE: BRIDGE MATHEMATICS (FOUNDATION 1) **CREDIT:2**

CLO 1: Prove the binomial theorem and apply it to find the expansions of any $(x + y)n$ and also, solve the related problems
CLO 2: Find the various sequences and series and solve the problems related to them. Explain the principle of counting.
CLO 3: Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations
CLO 4: Explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and submultiple angles, etc. Also, they can solve the problems using the transformations.
CLO 5: Find the limit and derivative of a function at a point, the definite and indefinite integral of a function. Find the points of min/max of a function.

SEMESTER II

COURSE: ANALYTICAL GEOMETRY &VECTOR ANALYSIS **CREDIT:5**

CLO 1: Solve problems in the system of Planes
CLO 2: Estimate the angle between the line and plane, coplanar lines and shortest distance between skew lines.
CLO 3: Understand the concept of equation of sphere and its applications.
CLO 4: Calculate Directional Derivative, Divergence and Curl.
CLO 5: Apply Green's theorem, Gauss-Divergence theorem, Stoke's theorem to evaluate Area and Volume

COURSE: DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS **CREDIT:5**

CLO 1: Determine solutions of homogeneous equations, non-homogeneous equations of degree one in two variables, solve Bernoulli's equations and exact differential equations.
CLO 2: Find the solutions of equations of first order but not of higher degree and to Determine particular integrals of algebraic, exponential, trigonometric functions and their products
CLO 3: Find solutions of simultaneous linear differential equations, linear equations of second order and to find solutions using the method of variations of parameters.
CLO 4: Form a PDE by eliminating arbitrary constants and arbitrary functions, find complete, singular and general integrals, to solve Lagrange's equations.
CLO 5: Explain standard forms and Solve Differential equations using Charpit's method

COURSE: PROGRAMMING WITH PYTHON **CREDIT:3**

CLO1: Develop and execute simple Python programs.
CLO2: Write simple Python programs using conditionals and looping for solving problems.
CLO3: Decompose a Python program into functions.
CLO4: Represent compound data using Python lists, tuples, dictionaries etc.
CLO5: Read and write data from/to files in Python programs.

COURSE: MATHEMATICS FOR COMPETIVE EXAMINATIONS-II **CREDIT:2**

CLO 1: Determine the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae
CLO 2: Evaluate double and triple integrals and problems using change of order of integration
CLO 3: Solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution
CLO 4: Explain beta and gamma functions and to use them in solving problems of integration
CLO5: Explain Geometric and Physical applications of integral calculus.

COURSE: **OFFICEAUTOMATION** **CREDIT:2**

CLO 1 : Understand the basics of computer systems and its components.
CLO 2: Understand and apply the basic concepts of a word processing package.
CLO 3: Understand and apply the basic concepts of electronic spreadsheet software.
CLO 4: Understand and apply the basic concepts of database management system.
CLO 5: Understand and create a presentation using PowerPoint tool.

SEMESTER III

COURSE: FOURIER SERIES AND INTEGRAL TRANSFORM **CREDIT:5**

CLO 1: Study the expansion of periodic functions using Fourier Series.
CLO 2: Analyse Laplace transform and the conditions of existence of Laplace transform.
CLO 3: Implement the Laplace transform technique to solve differential equations.
CLO 4: Demonstrate the Fourier transform and its properties.
CLO 5: Apply Z transform for difference equations.

COURSE: JAVA AND DATA STRUCTURES **CREDIT:5**

CLO1: Explain the basic concepts of object oriented programming and enable students to understand about introduction of Java programming.
CLO2: Discuss about decision making statements like if, if-else, elseif ladder etc. Use the concept of Decision making and looping, classes, objects, methods, and strings to develop programs.
CLO3: Analyze and to understand the concepts of interfaces inheritance and packages. Explain and develop programs in applet Programming, Managing errors and Exceptions.

CLO4: Identify the data and apply the suitable concepts of data structure in programming.

CLO5: Demonstrate linked list and its operations for programming.

COURSE: NUMERICAL METHODS **CREDIT:3**

CLO 1: Applying the Methods of interpolation to compute the missing value in real life problems.

CLO 2: Compute the missing values for unequal intervals using Divided differences and Lagrange Method

CLO 3: Apply Numerical Methods to evaluate numerical solution of algebraic and transcendental equations.

CLO 4: Compute definite integral for different combinations of integrands using various methods and analyze their accuracy.

CLO 5: Evaluate the solution of first order differential equation using Euler, Picard's and Runge - Kutta Methods .

COURSE: ADVANCED EXCEL **CREDIT:2**

CLO 1: Work with big data tools and its analysis techniques.

CLO 2: Analyze data by utilizing clustering and classification algorithms.

CLO 3: Learn and apply different mining algorithms and recommendation

CLO 4: systems for large volumes of data. Perform analytics on data streams.

CLO 5: Learn NoSQL databases and management.

SEMESTER IV

COURSE: WEB TECHNOLOGY **CREDIT:5**

CLO 1: Apply the concept simple control statements of PHP for Web development.
CLO 2: Analyze the strings and numeric functions to work with Arrays.
CLO 3: Apply the knowledge of creating classes as done in OOP.
CLO 4: Formulate the file management in PHP.
CLO 5: Analyze data and understand the basic developing concepts in PHP.

COURSE: NUMBER THEORY **CREDIT:5**

CLO 1: Understand the fundamental concepts of Mathematical Induction.
CLO 2: Evaluate the Greatest common Divisor and Least common multiple using the algorithms.
CLO 3: Determine and understand the Diophantine equations for three or more unknowns.
CLO 4: Demonstrate the quadratic residues, elementary Properties
CLO 5: Evaluate and analyze the perfect numbers using the Mersenne and Fermat Numbers

COURSE: MATHEMATICAL STATISTICS **CREDIT:3**

CLO 1: Apply binomial, Poisson and normal distribution properties to solve real life problems.
CLO 2: Study the relationship between two or more variables.
CLO 3: Understand the uses of Large Samples.
CLO 4: Apply the concept of small sample test to solve real life problems.
CLO 5: Apply and examine chi-square test and analysis the principles of designs of experiments to yield valid conclusions.

COURSE: STATISTICS WITH R PROGRAMMING **CREDIT:2**

CLO 1	Explain practical implications of expectation and variance and how they predict the shapes of distribution and density (mass) functions of a random variable
CLO 2	Demonstrate capability to write programming codes for plotting different distributions.
CLO 3	Evaluate the independence of attributes and design of experiments.
CLO 4	Describe and apply probability distribution function and different types of distributive functions through R Language.
CLO 5	Know and understand about Tests of Hypothesis through R.

SEMESTER V:

COURSE: MODERN ALGEBRA **CREDIT:4**

CLO 1: Demonstrate the importance of algebraic properties and definitions.
CLO2: Explain the equivalence relation between sets and equivalence classes to form a normal subgroup and quotient group.
CLO 3: Demonstrate the embedding of any group in to a group of permutations.
CLO 4: Identify the rings and analyze the basic theoretical proofs.
CLO 5: Formulate any given integer as either prime or product of primes in a unique way.

COURSE: REAL ANALYSIS **CREDIT:4**

CLO 1: Understand the fundamental properties of real analysis and their uses in sequences, Series & derivatives.
CLO 2: Identify the given series as whether convergent or divergent.
CLO 3: Apply the abstract ideas and rigorous methods of mathematical analysis to practical problems.
CLO 4: Construct mathematical proofs for basic results of real analysis.
CLO 5: Identifying the sets of measure zero and Riemann Integral.

COURSE: MECHANICS **CREDIT:4**

CLO 1: Discuss the fundamental concept of forces and apply the concept of Lami's theorem to determine the equilibrium of a particle under three or more forces.

CLO 2: Explain different forces acting on a rigid body

CLO 3: Understand the concepts of velocity, acceleration and composition of S.H.M in two directions

CLO 4: Solve problems relating to the motion of a projectile Understand impulsive forces and analyze loss of K.E due to direct and oblique impact.

CLO 5: Able to derive basic or bit equations and its relationship to the conic Sections.

COURSE: OPERATIONS RESEARCH – I **CREDIT:3**

CLO 1: Analyze and study the concepts in linear programming problems to optimize the solution.

CLO 2: Examine, Analyze, formulate and evaluate the optimal solutions using various methods in linear programming.

CLO 3: Evaluate the optimal solution for various industry-oriented problems using quantitative and qualitative tools like Modi's method

CLO 4: Compute the optimal solution by using Hungarian method to minimize the cost.

CLO 5: Analyze the application of game theory in various fields and obtain the best solution to optimize the function.

SEMESTER VI:

COURSE: LINEAR ALGEBRA **CREDIT:4**

CLO 1: Identify the vector spaces and its subspaces.

CLO 2: Find the dimension of vector space and distinguish the linear dependent and independent vectors

CLO 3: Evaluate the length &distance of vectors and to construct ortho normal sets of vectors in understanding the few concepts of mechanics.

CLO 4: Able to characterize the linear transformation as one-one, onto transformations and their role in carrying a basis of vector space to another vector space.

CLO5: Express linear transformation in matrix form to make the calculation or representation easier, for analyzing the given data.

COURSE: COMPLEX ANALYSIS **CREDIT:4**

CLO 1: Derive Cauchy Riemann equation and identify analytic functions.

CLO 2: Discuss Bilinear transformation and various standard transformations.

CLO 3: Evaluate the value of the function using Cauchy's integral theorem.

CLO 4: Represent the given function in a series form, valid in a domain and classify zeros and singularities of an analytic functions.

CLO 5: Evaluate different types of contour integrals using residue theorem.

COURSE: DISCRETE MATHEMATICS AND GRAPH THEORY **CREDIT:4**

CLO 1: Prepare Mathematical concepts in terms of predicates, quantifiers, and logical connectives.
CLO 2: Analyze and identify the knowledge of lattices and its properties.
CLO 3: Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
CLO 4: Learn to understand, analyse and develop a strong back ground in graph
CLO 5: Identify the knowledge of Eulerian and Hamiltonian theorem using terminology of graphs.

COURSE: OPERATIONS RESEARCH – II **CREDIT:3**

CLO 1: Study and analyse the concepts of various inventory models to minimize the cost
CLO 2: Analyze and evaluate the profit using inventory models.
CLO 3: Analyze the various queueing models and evaluate the various system performance measures of Queueing to maximize the profit.
CLO 4: Analyze and ensure optimum utilization of human and other resources.
CLO 5: Estimate optimum solution for sequencing problems.

COURSE:DATA SCIENCE **CREDIT:3**

CLO1: Knows the basic concept of Data Science
CLO2: Knowledge on Data Science process
CLO3: Understand the Modeling procedure.
CLO4: Know the basic concept of Hadoop.
CLO5: Understand the Data Science using Case study.