School: Science	Programme:M. Sc.(Mathematics)
Year : First Year	Semester - I
Course: Advanced Calculus	Course Code: PMT101
Theory: 4 Hrs/Week	Max. University Theory Examination:50 Marks
Max. Time for Theory Exam.:3 Hrs	Continuous Internal Assessment: 50 Marks

Objectives	
1	To study Reimann- Stieltjes integral
2	To study sequences and series of functions
3	To study calculus of functions of several variables
4	To study Lebesgue measure and measurable functions
5	To study Lebesgue integration theory.

Unit Number	Details	Hours
1	Riemann-Stieltjes integral: Definition and existence of the integral, Properties of the integral, Integration and differentiation, Integration of vector valued functions, Rectifiable curves.	12 Hrs
2	Sequences and series of functions: Uniform convergence, Uniform convergence and continuity, Uniform convergence and integration, Uniform convergence and differentiation, Equicontinuous families of functions, The Stone-Weierstrass theorem.	12 Hrs
3	Functions of several variables: Linear transformations, Differentiation, The contraction principle, The inverse function theorem, The implicit function theorem, Determinants, Derivatives of higher order, Differentiation of integrals.	12 Hrs
4	Lebesgue measure: Set functions, Construction of the Lebesgue measure, Measurable spaces, Measurable functions, Simple functions.	12 Hrs
5	Lebesgue integral: Integration, Comparison with the Riemann Integral, Integration of complex functions, Functions of class $\mathcal{C}^2$.	12 Hrs
	Total	60 Hrs

Course Outcomes	
Students will be able to	
CO1	Understand Riemann-Stieltjes integral and their properties
CO2	Learn and check the convergence of sequences and series of functions.
CO3	Gain knowledge of function of several variables.
CO4	Understand new notion of Lebesgue theory

Resources	
Recommended Books	Walter Rudin, Principles of Mathematical Analysis, 3rd Edition, McGraw-Hill International Editions, Singapore (1976).
Reference Books	1. H. L. Royden, Real Analysis, Macmillan, New York (1988). 2. A. W. Knapp, Basic Real Analysis, Birkhauser, Boston (2005).

School: Science	Programme:M. Sc.(Mathematics)
Year : First Year	Semester - I
Course: Abstract Algebra	Course Code: PMT 102
Theory: 4 Hrs/Week	Max. University Theory Examination:50 Marks
Max. Time for Theory Exam.:3 Hrs	Continuous Internal Assessment: 50 Marks

Objectives	
1	To revise groups, cyclic groups, permutation groups, group homomorphism
2	To study important theorems like Lagrange's theorem, Sylow theorem
3	To revise rings, Ideals, Integral Domains, ring homomorphism
4	To study polynomial rings, Irreducibility, Tests for irreducibility in detail
5	To study basic concepts of field

Unit Number	Details	Hours
1	Prerequisites: Group, subgroup, elementary results, cyclic groups, permutation groups, alternating groups, normal subgroups, group homomorphism, Isomorphism, automorphism	12 Hrs
2	Cosets and Lagrange's theorem, orbits and stabilizer, class equation, external direct product, normal subgroups and factor groups, internal direct product, finite abelian groups(fundamental theorem), Sylow theorems.	12 Hrs
3	Prerequisites: Rings, Ideals, Integral Domains, ring homomorphism, Prime and Maximal Ideals	12 Hrs
4	Polynomial rings, Irreducibility(Eisenstein's criterion), factorization of polynomials, PID, UFD, ED, polynomials over UFD	12 Hrs
5	Introduction to Fields: Definition of field, Algebraic & transcendental elements, Extension field, the degree of field extension, finite extension, algebraic extension, splitting field, properties of algebraic extension, definition of finite fields and elementary results	12 Hrs
	Total	60 Hrs

Course Outcomes	
Students will be able to	
CO1	Understand basic knowledge of groups and their properties.
CO2	Understand basic knowledge of ring and their properties.
CO3	Understand basic knowledge of field and their properties
CO4	Learn the concept of homomorphism and isomorphism of group and ring.

Resources	
Recommended Books	1. P.B.Bhattacharya, S.K.Jain,S.R.Nagpaul, Basic Abstract Algebra , Second Edition-Cambridge Publication
Reference Books	1. Joseph A. Gallian , Contemporary Abstract Algebra , Fourth Edition- Narosa Publication 2. I.N.Herstein , Topics In Algebra , Second Edition , Wiley Publication 3. David S. Dummit , Richard M. Foote , Abstract Algebra , Third Edition-Wiley Publication

School: Science	Programme:M. Sc.(Mathematics)
Year : First Year	Semester - I
Course: Ordinary Differential Equations	Course Code: PMT103
Theory: 4 Hrs/Week	Max. University Theory Examination:50 Marks
Max. Time for Theory Exam.:3 Hrs	Continuous Internal Assessment: 50 Marks

Objectives	
1	To solve ordinary differential equations using different methods
2	To study Sturm separation theorem., Sturm's comparison theorem
3	To find power series solution of differential equations
4	To find solution of nonlinear differential equations
5	To learn the methods to find extremal of functional

Unit Number	Details	Hours
1	Second order linear equations: The general solution of the homogeneous equations, Use of a known solution to find another solution, Homogeneous equations with constant coefficients. The method of undetermined coefficients. The method of variation of parameters.	12 Hrs
2	Qualitative Properties of solutions of ordinary differential equations of order two: Sturm separation theorem. Normal form, Standard form, Sturm's comparison theorem	12 Hrs
3	Power Series solutions: Review of power series, Series solutions of first order equations, Second order linear equations, Ordinary points, Regular singular points, Indicial equations, Gauss's Hypergeometric equation, The point at infinity. Linear systems, Homogenous linear systems with constant coefficient. Non-linear systems, Volterra's Prey-Predator equations	12 Hrs
4	Non-linear equations: Autonomous systems, Critical points, Stability, Liapunov's direct method, Nonlinear mechanics, Conservative systems. The existence and uniqueness of solutions. The method of successive approximations, Picard's theorem, Systems, The second order linear equations	12 Hrs
5	Calculus of variations: Euler's Differential equation with an extremal, isoperimetric problems.	12 Hrs
	Total	60 Hrs

Course Outcomes	
Students will be able to	
CO1	Find solution of ordinary differential equation of higher order by using various methods.
CO2	Provide the existence and uniqueness of solution of ODE.
CO3	Understand the concept of stability and methods of successive approximation.
CO4	Learn how to extremized functional and apply the concept to various problems.

Resources	
Recommended Books	G.F. Simmons : Differential equations with applications and Historical Notes, Second Edition (Mc-Graw Hill)
Reference Books	1. G. Birkhoff and G.C. Rota : Ordinary differential equations. (John Wiley and Sons) 2. E. A. Coddington : Ordinary differential equations. Prentice Hall of India. 3. S. G. Deo, V. Lakshmikantham, V. Raghvendra. Text book of Ordinary Differential Equations. Second edition.Tata Mc-Graw Hill.

School: Science	Programme: M. Sc.(Mathematics)
Year : Second Year	Semester - I
Course: Number Theory	Course Code: PMT104
Theory: 4 Hrs/Week	Max. University Theory Examination:50 Marks
Max. Time for Theory Exam.:3Hrs	Continuous Internal Assessment: 50 Marks

Objectives	
1	To learn about division algorithm
2	To have knowledge about fundamental Theorems of arithmetic and linear congruence
3	To have knowledge in Mobius inversion formula and Euler's Theorem
4	To understand random greatest integer function
5	To learn the Euler's phi function and its properties

Unit Number	Details	Hours
1	The Division Algorithm – The g.c.d. – The Euclidean Algorithm – The Diophantine Equation ax + by = c.	12 Hrs
2	The Fundamental theorem of arithmetic , The sieve of Eratesthenes – The Goldbach conjecture – basic properties of congruence	12 Hrs
3	Special Divisibility tests – Linear congruence – The Little Fermat's theorem –Wilson's theorm.	12 Hrs
4	The random functions – The Mobius inversion formula – The greatest integer function	12 Hrs
5	Euler's Phi – function – Euler's theorem – Some properties of the Phi – function	12 Hrs
	Total	60 Hrs

Course Outcomes	
Students will be able to	
CO1	Use division algorithm to find gcd of integers
CO2	Solve Diophantine equation
CO3	Understand fundamental theorem of arithmetic and congruence
CO4	Solve examples involving Fermat's theorem, Wilson's theorem
CO5	Solve examples involving Euler's phi function

Resources	
Recommended Books	David M. Burton, Elementary Number Theory, Universal Book Stall, 2001
Reference Books	1. T.M. Apostol, Introduction to Analytic Number Theory, Springer Valley, 1976. 2. Kennath & Rosen, Elementary number theory & its applications, Addison Wesley Publishing Co. Ltd., 1968. 3. George E, Andrea, Number Theory, Hindustan Publishing, 1989.

School: Science	Programme: M.Sc.(Mathematics)
Year : First Year	Semester - I
Course: C Language	Course Code: PMT105
Theory: 4 Hrs/Week	Max. University Theory Examination: 50 Marks
Max. Time for Theory Exam.: 3 Hrs	Continuous Internal Assessment: 50Marks

Objectives	
1	To learn and acquire art of programming
2	To learn basics of C programming.
3	To use decision making & looping statements in the programs.
4	To be able to write programs using functions.
5	To be able to write programs using pointers and programs using file handling.

Unit Number	Details	Hours
1.	**Basics of C Programming:** Programming languages: Machine language, Assembly language, High level languages, Compilers and Interpreters Introduction to C: History, Structure of a C program, Functions as building blocks, Application Areas, C Program development life cycle. C Preprocessor: Format of Preprocessor directive, File Inclusion directive, Macro substitution, nested macro, argumented macro, Conditional compilation. C Tokens: Keywords, Identifiers, Variables, Constants – character, integer, float, string, escape sequences, Data types – built-in and user defined , Operators and Expressions Operator types (arithmetic, relational, logical, assignment, bitwise, conditional , other operators) , precedence and associativity rules.	12 Hrs
2	**Input and Output & Control Structures**: Input and Output: Character input and output, String input and output, Formatted input and output. Control Structures: Decision making structures, If, if-else, switch, Loop Control structures, While, do-while, for Nested structures, switch, break, continue.	12 Hrs
3	**Functions & Arrays in C:** Functions in C: What is a function? Advantages of Functions, Standard library functions, User defined functions, Declaration, definition, function call, parameter passing (by value), return keyword, Scope of variables, storage classes, Recursion. Arrays: 7.1 Array declaration, initialization, Types – one, two and multidimensional, Passing arrays to functions. Structures and Unions: Creating structures, Accessing structure members (dot Operator), Array of structures, Passing structures to functions, Nested structures, Pointers and structures, Unions, Difference between structures and unions	12 Hrs
4	**Pointers & strings in C Language**: Pointers : Pointer declaration, initialization, Dereferencing pointers, Pointer arithmetic, Pointer to pointer, Arrays and pointers, Functions and pointers – passing pointers to functions, function returning pointers, pointer to function. Dynamic memory allocation. Strings: Declaration and initialization, Standard library functions, Strings and pointers, Array of strings.	12 Hrs
5	**File Handling:** File Handling, Streams, Types of Files, Operations on files, Random access to files: Command Line Arguments, Accessing command line arguments.	12 Hrs
	Total	60 Hrs

Course Outcomes	
Students will be able to	
CO1	Understand difference between machine language and assembly language
CO2	Understand different components of C language
CO3	Understand functions used in C language
CO4	Write simple programmes in C language

Resources	
Recommended Books	Balagurusamy, E. -Programming in ANSI C, TATA McGraw Hill
Reference Books	1. Brain W. Kernighan & Dennis M. Ritchie -The C Programme Language 2ndEdi, ANSI features) Prentice Hall. 2. Byrons, Gottfried.-Programming in C Schaum's Series. 3. Forouzan and Gilberg : Structured Programming approach using C, Thomson learning publications 4. Herbert Schildt : Complete C Reference

School: Science	Programme: M.Sc.(Mathematics)
Year: First Year	Semester - I
Course: C Language Lab – I	Course Code: PMT111
Practical: 02 Hrs Batch (10 Students)	Practical Examination: 50 Marks
	Term Work: 50Marks

Objective	
1	To learn & acquire knowledge of C programming
2	To learn basics of C programming
3	To write programs using pointers
4	To write programs using functions
5	To write programs using pointers

Sr. No.	Description
1	Write a program in C language to find Transpose of Given Square Matrix
2	Write a program in C language to find addition of Lower Triangular Elements in C Programming
3	Write a program in C language for addition of two matrices in C for addition of two matrices
4	Write a program in C language for addition of two matrices in C for addition of two matrices
5	Write a program in C language to find Inverse of 3 x 3 Matrix in 10 Lines
6	Write a program in C language to Multiply Two 3 X 3 Matrices
7	Write a program in C language to copy the contents of one file into another using fputc
8	Write a program in C language to Copy Text From One File to Other File
9	Write a program in C language to Find Length of the String using Pointer
10	Write a program in C language to sort the list of Strings
11	Write a program in C language to implement Newton Raphson method
12	Write a program in C language to implement Runge Kutta method

Course Outcomes	
Students will be able to	
CO1	Write a program in C language to find Transpose of Given Square Matrix
CO2	Write a program in C language to find addition of Lower Triangular Elements in C Programming
CO3	Write a program in C language for addition of two matrices in C for addition of two matrices
CO4	Write a program in C language to find Inverse of 3 x 3 Matrix in 10 Lines

Practical/Oral/Presentation:
Practical/Oral/Presentation shall be conducted and assessed jointly by internal and external examiners. The performance in the Practical/Oral/Presentation examination shall be assessed by at least a pair of examiners appointed as examiners by the University. The examiners will prepare the mark/grade sheet in the format as specified by the University, authenticate and seal it. Sealed envelope shall be submitted to the head of the department or authorized person.