AMAR SHAHEED BABA AJIT SINGH JUJHAR SINGH MEMORIAL COLLEGE BELA ROPAR PUNJAB

DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** MATHEMATICS

NAME OF THE PROGRAMME: M.Sc. 1st (sem1)

NAME OF COURSE : Algebra

NAME OF FACULTY : A.P Rajinder Kaur

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Compare and contrast about the fundamental theorem of finitely generated abelian groups, homomorphism between two cyclic groups.	Class Tests/ Class Assignments
CO-2	Increase the knowledge of groups, subgroups ,semi-group, monoid ,quasi groups	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Explain about the permutation group ,clan-equation, alternating group and their simplicity	Group discussion
CO-4	Define about Sylow's group, Sylow's theorem, Ideals, matrix ring and their ideals.	Authentic problem Solving/ Group Discussion
CO-5	Improve the Knowledge for normal Subgroup, cyclic groups and apply these results for on different examples.	Class Assignment/ Seminar/ Group Discussion
CO-6	Ability to understand a large class of commutative rings by regarding them as quotients of polynomial rings by suitable ideals.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** MATHEMATICS

NAME OF THE PROGRAMME: M.Sc. 1st (sem1)

NAME OF COURSE : Differential geometry

NAME OF FACULTY : A.P Sanjivani

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Explain the basic concept and results related to space curves ,tangents , normal and surfaces.	Class Tests/ Class Assignments
CO-2	Explain the geometry of different types of curves and space.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Enhance the knowledge how to solve the Gaussian and mean curvatures.	Group discussion
CO-4	Utilize geodesics it's all related properties and theorems.	Authentic problem Solving/ Group Discussion
CO-5	Determine principal directions of curvature, asymptotic lines and then apply their important theorems and results to study various properties of curves and surfaces.	Class Assignment/ Seminar/ Group Discussion
CO-6	Explain the codazzi –Mainardi equation and compact surface of constant Gaussian curvature.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** MATHEMATICS

NAME OF THE PROGRAMME: M.Sc. 1st (sem1)

NAME OF COURSE : Mathematical Analysis

NAME OF FACULTY : A.P Rupinder Kaur

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Apply the knowledge of concepts of mathematical analysis in order to theoretical development of differential mathematical techniques and their applications.	Class Tests/ Class Assignments
CO-2	State the nature of abstract mathematics and explore the concept in further solution.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Identify challenging problems in taylor's theorem and find their appropriate solution	Group discussion
CO-4	Deal with axiomatic structure of measurable spaces and generalised the properties of measure and lebesque measure.	Authentic problem Solving/ Group Discussion
CO-5	Use theory of vitali lemma and dini derivative in solving different problems.	Class Assignment/ Seminar/ Group Discussion
CO-6	Extend their knowledge of mathematical analysis for further exploration of the subject for going into research.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** MATHEMATICS

NAME OF THE PROGRAMME: M.Sc. 1st (sem1st)

NAME OF COURSE : Topology 1st

NAME OF FACULTY : A.P Raveena Saini

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Develop the concepts of topological space and basic definitions of open sets, neighbourhood, interior, exterior, closure and their axioms for defining topological space.	Class Tests/ Class Assignments
CO-2	Explain the concepts of base and sub base, create new topological space by using subspace.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Define the continuous map, restriction of domain and range, piecewise definition of map's and neighbourhood finite families.	Group discussion
CO-4	Analyse Row point of space are separated by open sets , housdroff spaces and their importance	Authentic problem Solving/ Group Discussion
CO-5	Compare and contrast the Cartesian product spaces and image of connected sets.	Class Assignment/ Seminar/ Group Discussion
CO-6	Apply Knowledge for solve the elementary concepts in product spaces and slices in Cartesian products.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** MATHEMATICS

NAME OF THE PROGRAMME: M.Sc. 1st (sem2nd)

NAME OF COURSE : Algebra II

NAME OF FACULTY : A.P Rajinder Kaur

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Utilize the polynomial rings UFD, Euclidean Domain, principal Ideal Domains to solve different related problem.	Class Tests/ Class Assignments
CO-2	Analyse different types of modules, sub modules, direct sum of sub modules.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Apply the Knowledge of Algebra to attain a good mathematical maturity and enables to build mathematical thinking and reasoning.	Group discussion
CO-4	Design, analyse of and implement the concepts of artinian modules, noetherian modules and artinian implies noetherian in rings.	Authentic problem Solving/ Group Discussion
CO-5	Create, select and apply appropriate algebraic structures such as Hilbert basis theorem, composition series of a module.	Class Assignment/ Seminar/ Group Discussion
CO-6	Get the information about the Cohen theorem , radical ideal , nil radical , Jacobson Radical and Radical of an artinian ring	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** MATHEMATICS

NAME OF THE PROGRAMME: M.Sc. 1st (sem2nd)

NAME OF COURSE : Complex Analysis

NAME OF FACULTY : A.P Sanjivani

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Know the fundamental concept of complex analysis.	Class Tests/ Class Assignments
CO-2	Explain the concept of complex integrals and apply Cauchy integral theorem and formula.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Evaluate limits and checking the continuity of complete function and apply the concept of analyticity and the Cauchy-Riemann equation. .	Group discussion
CO-4	Solve the problems using Taylor's theorem, Laurent series in an annulus.	Authentic problem Solving/ Group Discussion
CO-5	Apply the knowledge of complex to find the general definition of analytic function and analytic continuation by power series method.	Class Assignment/ Seminar/ Group Discussion
CO-6	Define the information about the Harmonic function on a disc and Schwarz reflection principle	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** MATHEMATICS

NAME OF THE PROGRAMME:M.Sc. 1st (Sem 2)

NAME OF COURSE :Functional Analysis

NAME OF FACULTY : A.P Kirandeep Kaur

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Explain the fundamental concept of functional analysis and their role in modern mathematics	Class Tests/ Class Assignments
CO-2	Analyse the concept of functional analysis for example continuous and bounded operators, normed spaces and Hahn –branch theorem in linear spaces.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Apply the Hahn –branch theorem in normed linear space and its applications, the open multiplying theorem projections on Branch –spaces, closed graph theorem.	Group discussion
CO-4	Explain the concepts of orthogonality, orthonormal sets and Bessel's inequality.	Authentic problem Solving/ Group Discussion
CO-5	Design the conjugate space of a Hilbert spaces and develop the information about the ad joint operators, self –ad joint operators, normal and unitary operators.	Class Assignment/ Seminar/ Group Discussion
CO-6	Demonstration the nature of Brower's fixed point theorem, schauder fixed point theorem and Picard's theorem.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEAPRTMENT**:** MATHEMATICS

NAME OF THE PROGRAMME:M.Sc. 1st (sem2nd)

NAME OF COURSE : Topology II

NAME OF FACULTY : A.P Raveena Saini

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Deduce the knowledge of higher separation Axioms for example Regular , completely Regular, normal and completely normal space	Class Tests/ Class Assignments
CO-2	Explain the metric spaces or completely , normal T2 spaces , urysohans lemma and fietze extension theorem	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Analyse about embedding of tichonou space into parallel tope and stone cech compactification.	Group discussion
CO-4	Apply knowledge for solve identification topology identification map, subspace, general theorem	Authentic problem Solving/ Group Discussion
CO-5	Compare and contract about the categories and fun tars.	Class Assignment/ Seminar/ Group Discussion
CO-6	Define about the category h top, homotopy equivalence, null homotopy and invariance of path components under homotopy type.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** MATHEMATICS

NAME OF THE PROGRAMME: M.Sc. 1st (sem2nd)

NAME OF COURSE : Differential equation 1

NAME OF FACULTY : A.P Rajinder kaur

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Explain about the existence of solution of ordinary differential equation of first order, initial value problem, as coli lemma.	Class Tests/ Class Assignments
CO-2	Deduce the information about Cauchy peano existence theorem and method of successive approximations	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Analyse about system of differential equations, nth order differential equation and existence and uniqueness of solutions.	Group discussion
CO-4	Define linear system of equation both homogenous and non-homogenous.	Authentic problem Solving/ Group Discussion
CO-5	Evaluate the able liouville formula and floquet theory	Class Assignment/ Seminar/ Group Discussion
CO-6	Demonstrate the orthogonality of characteristic functions and expansion of a function a series of orthonormal functions.	Class Assignment/ Group Discussion/ Authentic problem solving

AMAR SHAHEED BABA AJIT SINGH JUJHAR SINGH MEMORIAL COLLEGE BELA ROPAR PUNJAB

DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** Department of computer science

NAME OF THE PROGRAMME: M.Sc. Mathematics-1st(sem1st)

NAME OF COURSE : Introduction to computers and c language

NAME OF FACULTY : AP Taranjeet Kaur

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Describe the basic concepts and the applications of computer systems	MST, CLASS TEST, GD
CO-2	Demonstrate the concept of input and output devices of Computers	MST, ASSIGNMENT, PPT
CO-3	Define the anatomy related to networks, operating system and problem solving	MST, PPT, CLASS TEST, ASSIGNMENT
CO-4	Discuss about the logic building used in programming	MST, ASSIGNMENT, CLASS TEST, LAB WORK
CO-5	Generate algorithms writing skills for solving various real-life problems	MST, LAB WORK, PPT, VIVA
CO-6	Convert the algorithms into computer programs using C language.	MST, LAB WORK, CLASS TEST

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** Mathematics

NAME OF THE PROGRAMME: M.Sc. II (SEM-3)

NAME OF COURSE : Fuzzy sets and applications

NAME OF FACULTY : AP Rajinder Kaur

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Explain Fuzzy numbers, Linguistic variables and Fuzzy equations.	Tests/ Class Assignments Class
CO-2	State crisp and Fuzzy applications.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Deduce the compatibility and odering relations.	Group discussion
CO-4	Compute Possibility theory.	Authentic problem Solving/ Group Discussion
CO-5	Analyse the uncertainty and Non specificity of fuzzy.	Class Assignment/ Seminar/ Group Discussion
CO-6	Acquire the applications of fuzziness of fuzzy sets and fuzzy logic.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** Mathematics

NAME OF THE PROGRAMME: M.Sc.II

NAME OF COURSE : Category theory –I (SEM-3)

NAME OF FACULTY : AP Kirandeep Kaur

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Explain definations of Category theory and tge category of Modules.	Tests/ Class Assignments Class
CO-2	Compute the product of two categories, Dual categories and Arrow Category.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Write the uniqueness upto isomorphism, examples of products viz. Hom- sets, Covarient functors.	Group discussion
CO-4	Deduce the duality principle and coproduct of monoids of abelian groups.	Authentic problem Solving/ Group Discussion
CO-5	Explore tge properties of pull back and direct limit of groups.	Class Assignment/ Seminar/ Group Discussion
CO-6	State the concept of cartesian closed categories, stone duality and ultra filter in Boolean Algebra.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** Mathematics

NAME OF THE PROGRAMME: M.Sc. II (SEM-4)

NAME OF COURSE : Mathematical Methods

NAME OF FACULTY : AP Sanjivani

C.O. No.	Description of Course Outcome	Methods of Assessment
CO-1	Explain the linear Integral equation of first and second kind.	Tests/ Class Assignments Class
CO-2	Derive the relation between linear differential equation and Volterra's equation.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Deduce volterra's equation and Volterra's solution of fredholm equation.	Group discussion
CO-4	Explore the properties of Simple variational problems.	Authentic problem Solving/ Group Discussion
CO-5	the concept of Euler's equation and invarience of euler's equation.	Class Assignment/ Seminar/ Group Discussion
CO-6	Compute fixed end point problem for unknown functions.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** Mathematics

NAME OF THE PROGRAMME: M.Sc. II (SEM-4)

NAME OF COURSE : Optimization Techniques-II

NAME OF FACULTY : AP Rupinder Kaur

C.O. No.	Description of Course Outcome	Method/s of Assessment
CO-1	Compute Wolfe's modified simplex method, Beale's method and Convex programming.	Tests/ Class Assignments Class
CO-2	Solve problems related to lemke's complementary pivoting algorithm, Seperable programming algorithm.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Introduce the components of decision theory.	Group discussion
CO-4	Solve the geometric programming problem.	Authentic problem Solving/ Group Discussion
CO-5	Explore the properties of simulation and its advantages and disadvantages.	Class Assignment/ Seminar/ Group Discussion
CO-6	Analyse the problems of Goal programming.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** Mathematics

NAME OF THE PROGRAMME: M.Sc. II (SEM-4)

NAME OF COURSE : Category theory -II

NAME OF FACULTY : AP Kirandeep Kaur

C.O. No.	Description of Course Outcome	Method/s of Assessment
CO-1	Define functor category and natural isomorphism	Tests/ Class Assignments Class
CO-2	Compute Bifunctor lemma, Fubtor categories and Eauivalences.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Deduce the pointer set and partial maps, slice categories and indexed families.	Group discussion
CO-4	State the Yoneda embedding, Yoneda Lemma and applications.	Authentic problem Solving/ Group Discussion
CO-5	Explain Adjunction between categories, left and right adjoints.	Class Assignment/ Seminar/ Group Discussion
CO-6	Use the triangle identities, Monads and Algebras for monads.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** Mathematics

NAME OF THE PROGRAMME: M.Sc. II (SEM-4)

NAME OF COURSE : Non-linear programming

NAME OF FACULTY : AP Rajinder Kaur

C.O. No.	Description of Course Outcome	Method/s of Assessment
CO-1	Define Non -linear programming and its examples.	Tests/ Class Assignments Class
CO-2	Derive Constraind and unconstrained problems with equality and inquality constraint.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Deduce Fibonacci search, Golden section and Rosen brock search method .	Group discussion
CO-4	Compute Newton Raphson, Quadratic and Cubic Interpolation method.	Authentic problem Solving/ Group Discussion
CO-5	Explore the properties of Constrained optimization problem.	Class Assignment/ Seminar/ Group Discussion
CO-6	Solve Marquardt's method, parten method.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** Mathematics

NAME OF THE PROGRAMME: M.Sc. II (SEM-4)

NAME OF COURSE : Analytic Number Theory

NAME OF FACULTY : AP Raveena Saini

C.O. No.	Description of Course Outcome	Method/s of Assessment
CO-1	Explain Arithmetic functions, Euler's totient function.	Tests/ Class Assignments Class
CO-2	Deduce big oh notation, Asymptotic equality function.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Compute partial sum of drichlet product.	Group discussion
CO-4	State Shapiro's Tauberian theorem.	Authentic problem Solving/ Group Discussion
CO-5	Explore the elementry properties of groups.	Class Assignment/ Seminar/ Group Discussion
CO-6	Analyse Asymptotic formula for partial sums.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** Mathematics

NAME OF THE PROGRAMME: M.Sc. II (SEM-3)

NAME OF COURSE : Differential Manifolds

NAME OF FACULTY : AP Rupinder Kaur

C.O. No.	Description of Course Outcome	Method/s of Assessment
CO-1	Define Differentiable Manifolds and its examples.	Tests/ Class Assignments Class
CO-2	Compute the differentiable map on manifolds.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Explore the properties of Lie bracket of vector fields and Integral curves.	Group discussion
CO-4	State the concept of torsion tensor and curvature tensor of a connection.	Authentic problem Solving/ Group Discussion
CO-5	Discuss the Binachi's identities and christoffel Symbols.	Class Assignment/ Seminar/ Group Discussion
CO-6	Acquire the knowledge of Gauss wringarten formulae and their applications.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** Mathematics

NAME OF THE PROGRAMME: M.Sc. II (SEM-3)

NAME OF COURSE : Field Theory

NAME OF FACULTY : AP Sanjivani

C.O. No.	Description of Course Outcome	Method/s of Assessment
CO-1	Define Field and examples of fields.	Tests/ Class Assignments Class
CO-2	Explain the concept of Einstein criterion and Krnoker's theorem.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Discuss Lagrange's theorem on primitive elements.	Group discussion
CO-4	Analise the fixed fields and Automorphism groups.	Authentic problem Solving/ Group Discussion
CO-5	Explore the properties of radicals and fixed fields.	Class Assignment/ Seminar/ Group Discussion
CO-6	Explain Ruler and compass construction.	Class Assignment/ Group Discussion/ Authentic problem solving

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DESCRIPTION OF COURSE OUTCOMES

NAME OF THE DEPARTMENT**:** Mathematics

NAME OF THE PROGRAMME: M.Sc. II (SEM-3)

NAME OF COURSE : Optimization Technique-I

NAME OF FACULTY : AP Raveena Saini

C.O. No.	Description of Course Outcome	Method/s of Assessment
CO-1	Explore the properties of LPP and Properties of duality by using suitable theorems.	Tests/ Class Assignments Class
CO-2	Use the strategies for game theory for maximum minimum principle concept of dominace.	Class Assignment/ Home Assignment/Authentic problem solving
CO-3	Demonstrate the methods to understand the complimentary slackness theorem and duality theorems.	Group discussion
CO-4	Deduce suitable theory to understand initial basic feasible solution using North West Corner and Least Cost Method.	Authentic problem Solving/ Group Discussion
CO-5	Compute Mathematical formulation of Assignment problem, unbalanced problem and Salesman Problem.	Class Assignment/ Seminar/ Group Discussion
CO-6	State Discrete changes in the cost vector, Requirement vector and coefficient matrix, Deletion of variable and addition of variable.	Class Assignment/ Group Discussion/ Authentic problem solving