MK UNIVERSITY

PATAN, GUJARAT

ESTABLISHED BY THE GUJARAT GOVT.   RECOGNIZED BY UGC UNDER SECTION 2(f) OF UGC ACT,1956

MK University, Patan

Faculty of   Science

Department of Mathematics

Sr No.	Course Type	Course Code	Corse Name	Lecture (hrs.)	Practical (hrs.)	Credits	Examination		Total Marks
							Internal	External	
1	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA101UDSC	DIFFERENTIAL EQUATIONS	4	0	4	30	70	100
2	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA102UDSC	GENERAL TOPOLOGY	4	0	4	30	70	100
3	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA103UDSC	ABSTRACT ALGEBRA	4	0	4	30	70	100
4	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA104UDSC	NUMBER THEORY	4	0	4	30	70	100
5	SUBJECT ELECTIVE	MSCMA101USE	GRAPH THEORY	2	0	2	15	35	50
	TOTAL			18	6	24	185	465	650

M.Sc. (MATHEMATICS) Sem-I

MK UNIVERSITY

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Sr No	Course Type	Course Code	Corse Name	Lecture (hrs.)	Practical (hrs.)	Credits	Examination		Total Marks
							Internal	External	
				M.Sc. Sem-II					
1	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA201UDSC	PARTIAL DIFFERENTIAL EQUATION	4	0	4	30	70	100
2	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA202UDSC	DIFFERENTIAL GEOMETRY	4	0	4	30	70	100
3	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA203UDSC	COMPLEX ANALYSIS	4	0	4	30	70	100
4	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA204UDSC	OPERATION RESEARCH	4	0	4	30	70	100
5	SUBJECT ELECTIVE	MSCMA201USE	INTEGRAL TRANSFORMS	2	0	2	15	35	50
TOTAL				18	6	24	185	465	650

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M.Sc. Sem-III								
Sr No	Course Type	Course Code	Corse Name	Lecture (hrs.)	Practical (hrs.)	Credits	Examination		Total Marks
							Internal	External	
1	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA301UDSC	ALGEBRA−II(FIELD THEORY)	4	0	4	30	70	100
2	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA302UDSC	FUNCTIONALANALYSIS−1	4	0	4	30	70	100
3	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA303UDSC	ADVANCED LINEARALGEBRA	4	0	4	30	70	100
4	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA304UDSC	MATHEMATICAL STATISTICS−1	4	0	4	30	70	100
6	SUBJECT ELECTIVE	MSCMA301USE	INTEGRAL EQUATION	2	0	2	15	35	50
	TOTAL			18	6	24	185	465	650

Sr No	Course Type	Course Code	Corse Name	Lecture (hrs.)	Practical (hrs.)	Credits	Examination		Total Marks
							Internal	External	
1	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA401UDSC	REAL ANALYSIS	4	0	4	30	70	100
2	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA402UDSC	FUNCTION ALANALYSIS−2	4	0	4	30	70	100
3	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA403UDSC	NUMERIC ALANALYSIS	4	0	4	30	70	100
4	DISCIPLINE SPECIFIC COURSE (DSC)	MSCMA404UDSC	MATHEMATICAL STATISTICS−2	4	0	4	30	70	100
5	SUBJECT ELECTIVE	MSCMA401USE	RESEARCH METHODOLOGY	2	0	2	15	35	50
TOTAL				18	6	24	185	465	650

M.Sc. Sem-IV

SUBJECT: DIFFERENTIAL EQUATIONS

Course title :	DIFFERENTIAL EQUATIONS	Course code :	MSCMA-101
Year:	1st Year	Semester:	1st Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Contents	Hours	Weightage
1	Second order differential equations: the method of variation of Para meters, Ordinary and singular points , Series solution, Fresenius method: solution in series nears a regular singular points, point at infinity.	15	20%
2	Legendre equation , Legendre polynomial and it properties.	15	20%
3	Basel's equation, Bessel's function of first and second kind and their properties.	15	20%
4	Gauss hyper geo metric equation, Gauss hyper geometric function and Its properties, Picard's method of successive approximations.	15	20%
5	Review of simultaneous ordinary differential equations of first order, Pfaffi and inferential equation, partial differential equation of first order, compatible system of first order partial differential equations, Carpi and Jacobi's method, Cauchy problem.	15	20%

REFERENCE   BOOKS:

1. G.F. Simmons, Differential equations with applications and historical notes, Mc Grew- Hill International Editions, second edition.
2. Amaranths, T. ,Elementary Course in Partial Differential Equations, Nervosa Publ. House, New Delhi, 1997.
3. Sheldon, I. N., Elements of Partial Differential Equations, Mc Graw-Hill Publ. Co., 1957.
4. Rai singhania, M.D., Advanced Differential Equations, S. Chand & Co.,1995.

5. Grewal, B.S. and Grewal, J.S. ,Higher Engineering Mathematics, (36th Edition), Khanna Publ., New Delhi, 2000.
6. Soma sundaram, D., Ordinary Differential Equations: A First Course, Narosa Publ. House, New Delhi, 2002.

Suggested Readings:

1. Ordinary and partial differential equation.
2. Rai singhania, M.D., Advanced Differential Equations, S. Chand & Co., 1995

Online Resources:

1. https://youtube.be/F9118vka9rM
2. Khan Academy-Differential Equation

Practical/Activities:

1. MCQs Quiz
2. To prepare assignment on Carpit ,Jacobi's problems.

SUBJECT: GENERAL TOPOLOGY

Course title :	GENERAL TOPOLOGY	Course code :	MSCMA-102
Year:	1st Year	Semester:	1st Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Contents	Hours	Weightage
1	To pological Spaces: To pological spaces, basis and sub-basis for a topology (definitions and examples only), The order topology, the product space(for finitely many topological spaces).	15	20%
2	Sub space to pology, closed sets ,limit points, Continuous Functions: continuous functions, Homeomorphisms, the pasting lemma, Map into products, the metric topology.	15	20%
3	The sequence lemma, Uniform limit theorem, The quotient topology, Connectedness: connected spaces, path connected spaces, connected sets in the real line.	15	20%
4	Components and path-components, locally connected spaces and path connected spaces, Compactness: compact spaces, compact sets in the real line.	15	20%
5	Limit-point compactness, locally compact spaces, one-point compactification.	15	20%

REFERENCE BOOKS:

1. "Topology-A first course"-by J .R. Munkres ,Prentice HallofIndia,1992.
2. "General Topology"-byS.Willard,AddisonWesley,1970.
3. "Topology"- by J. Dugundji , Prentice –Hallo fIndia, 1975.
4. "AspectsofTopology"-byC.O.ChristonsonandW.I.Voxman,MarcelDekkerInc., 1977.
5. "General Topology"–by J.L .Kelley, D. Van Nostraml,1950.

Suggested Readings:

1. James Dugundji; Topology .All an and Bacon Inc .Boston
2. R. Engel king; General Topology .Holder Mann .

Online Resources:

1. https://www.youtube.com/watch?v=TSgbQn6rjps&list=PL8D5taFfp6Cw2F2WvQYTwWZoID5UAO8Mp

2. https://www.youtube.com/watch?v=tWIoUZNYj1g&list=PLnPAYsc3qZGdprzbgss3PeFTbib9dZwMy

Practical/Activities:

1. Online quiz
2. Present at ion main topics

SUBJECT: ABSTRACT ALGEBRA

Course title :	GENERAL TOPOLOGY	Course code :	MSCMA-103
Year:	1st Year	Semester:	1st Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Contents	Hours	Weightage
1	Group, Subgroup, Normal Subgroups, Quotient groups, Homomorphism of groups. Isomorphic groups, Permutation groups, Direct product of groups, Coyle's theorem, Conjugacy relation on a group and its applications, Solvable groups.	15	20%
2	Group action, Solow's theorem, Finite Aeolian groups, Simple groups.	15	20%
3	Ring, Sub rings, Ring homomorphism, Ideals and quotient rings, Prime and maximal ideals, Polynomial rings.	15	20%
4	Field of fractions of an integral domain, Divisibility in rings, Euclidean ring, Principal ideal rings.	15	20%
5	Polynomial ring over a rational field, irreducibility criteria, Polynomial ring over a commutative ring, Unique Factorization domain.	15	20%

REFERENCE BOOKS:

1. Her stein, I.N., Topic sin Algebra, Wiley EasternLtd.,NewDelhi,1975.

2. Artin , M., Algebra ,Prentice HallofIndia,1991.

3. Jacobson , N., Basic Algebra, Vol.II, HundastanPubl.Co.,Delhi,1984.

4. P.B.Bhattacharya, S.K.Jainand S.R.Nagpaul, Basic Abstract Algebra(2/e),Cambridge University Press, South Indian Edition 2002.

Suggested Readings:

1.Abstractal gebra: theory and application Thomas W.Judson,2021

Online Resources:

1. www.researchgate.net
2. www.math.usm.edu

Practical/Activities:

1.Online Quiz/ Assignment

SUBJECT: NUMBER THEORY

Course title :	NUMBER THEORY	Course code :	MSCMA-104
Year:	1ˢᵗ Year	Semester:	1ˢᵗ Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Contents	Hours	Weightage
1	Divisibility, G.C.D., Primes, the Fundamental the orem of arithmetic, the Euclidean algorithm, The greatest integer function, the Mobius function, the Euler's function, the divisor functions for integer, properties of these functions, multiplicative functions, Mobius inversion formula.	15	20%
2	Congruence, complete residue theorem ,Linear Congruence, Reduced residue systems, Euler – Fermat theorem, the Chinese remainder theorem, The exponents of a number mod, primitive roots.	15	20%
3	Quadratic residues, Legendre Symbol and its properties, Gauss, s Lemma ,The quadratic reciprocity law, the Jacobi Symbol.	15	20%
4	Diophantine Equations and its positive solutions the equation the equation and thee quation Su mob squares, the Fermat's Last theorem .	15	20%

5	Algebraic Number Theory Polynomials over a field, Divisibility properties of polynomials, Gauss's lemma, The Eisenstein's irreducibility criterion, Symmetric polynomials, Extensions of a field, Algebraic and transcendental numbers, Bases and finite extensions, Properties of finite extensions, Conjugates and discriminates, Algebraic integers in a quadratic field, Integral bases, Units and primes in a quadratic field, Ideals, Arithmetic of ideals in an algebraic number field, The norm of an ideal, Prime ideals.	15	20%

REFERENCE BOOKS:

1. David M. Burton "Elementary Number theory",2nd edition,Wm.C.BrownPublishers,1989.
2. Nivenand H .Zukerman "An introductiontothetheoryofNumbers"3rd edition ,Wiley Estern University Education, New Delhi, 1985.
3. T.M.Apostol,"IntroductiontoAnalyticNumbertheory",Springerstudtedition,1995.
4. S. Lang, Algebraic Number Theory,Addison–Wesley,1994.

5. Ian Stew artand D.O. Tall, Algebraic Number Theory, Chapmanand Hall,2001.

Suggested Readings:

1. Computational number theory.
2. Analytic number theory.
3. Basic number theory.

Online Resources:

1. https://youtu.be/pcwv7wc5pBI
2. http://youtu.be/35A8H966PhM.
3. http://youtu.be/GY6XUIX3uYi

Practical/Activities:

1. seminar
2. Online quiz

SUBJECT: GRAPH THEORY

Course title :	GRAPH THEORY	**Course code :**	**MSCMA-105**
Year:	1st Year	**Semester:**	1st Sem.
Course type :	Subject Elective	**Course credit :**	02

Content:

Unit	Contents	Hours	Weightage
1	Basic facts about graphs such as definition of a graph, tree, Euler graph, Cut-sets, fundamental circuits, matrix representation of graphs, isomorphic graphs and Hamiltonian cycles: necessary conditions, sufficient conditions. **Directed Graphs** : definitions and examples, vector degrees, some types of diagraphs. Directed path and connectedness, Euler diagraphs.	15	50%
2	Trees with directed edges, spanning out-trees/in-tree, fundamental Circuits in diagraphs, matrices A, B, C of diagraphs, and adjacency matrix of die-graph. Chromatic number, chromatic partitioning, chromatic polynomial, covering, Four-color Problem.	15	50%

REFERENCE BOOKS:

1. Narsingh Deo: Graph Theory with applications to Engg .And   Computer Sciences. Prentice-Hall of India Pvt. Ltd, New Delhi, 1999.

2. Douglas B. West: Introduction to Graph Theory.

3. John Clark and D.A. Holton: A First looks at graph theory Allied Publishing Ltd., 1991

4. Robin J. Wilson: Introduction to graph theory.

Suggested Readings:
1. Frank Harary: Harary Graph Theory
2. Raghvendra kumar: Graphtheory

Online Resources:

1. https://youtu.be/5eKDQmTzX2A
2. Dr. Gajendra Rajput

Practical/Activities:

1. MCQs Quiz

To prepare projects about graphs applications

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SUBJECT: PARTIAL DIFFERENTIAL EQUATION

Course title :	PARTIAL DIFFERENTIAL EQUATION	Course code :	MSCMA-201
Year:	1st Year	Semester:	2nd Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Content	Hours	Weightage
1	Origin of second order partial differential equations, linear second order partial differential equations with constant coefficients, solutions forf (x, y) to be polynomial, exponential, sin/cos functions, general method for homogeneous use quations.	15	20%
2	Second order partial differential equations with variable coefficients, method of changing variables for special type of equations, classification of equations and canonical form.	15	20%
3	Non-linear second or derpartial differentiable equations: solution By Mange's method, special case and general case	15	20%
4	Separation of variables: solution of three special equations, Laplace equation, Wave equation and diffusion equation by method of separation of variables, solution of these equations in different coordinate systems.	15	20%
5	Boundary value problems: Dirichlet boundary value problems, Neumann boundary value problems, maximum and minimum principles, Hayrack's theorem, Green's functions, Equipotential surfaces.	15	20%

REFERENCE BOOKS:
1. Amaranth, T., Elementary Course in Partial Differential Equations, Narosa Publ. House, New Delhi, 1997.
2. Sneddon, I.N., Elements of Partial Differential Equations, McGraw- Hill Publ. Co., 1957.
3. Grewal, B.S .and Grewal, J.S., Higher Engineering Mathematics (36th Edition), Khanna Publ., New Delhi, 2000.
4. Rai singhania, M.D.,AdvancedDifferentialEquations,S.Chand&Co.,1995.

5. Phool an Prasad and Ravindran ,R. ,Partial Differential Equations, Wiley Eastern.

Suggested Readings:

1. Partial Differential Equations of Applied Mathematics, E. Zauderer (copy available at the University of California library).
2. Partial Differential Equations of Mathematical Physics and Integral Equations, R.B. Guenther and J. W. Lee (copy available at the University of California library).

Online Resources:

1. http://www.scholarpedia.org/article/Partial_differential_equation
2. https://www.youtube.com/watch?v=JL5MP-ewE0c&list=PLhSp9OSVmeyJoNnAqghUK-Lit3qBgfa6o

Practical/Activities:

1. Online quiz
2. Presentation of main topics

SUBJECT: DIFFERENTIAL GEOMETRY

Course title :	DIFFERENTIAL GEOMETRY	Course code :	MSCMA-202
Year:	1st Year	Semester:	2nd Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Content	Hours	Weightage
1	Space curves, Planar curves, Parameterization, Curvature, Torsion, Signed curvature. Frenet-Serret equations. Fundamental theorem of curve theory.	15	20%
2	Is operimetric In equality, The Four Vertex Problem, Surfaces: smooth surfaces, Tangents, Normal"s and orient ability, One parameter family of surfaces: characteristics, Envelope, Edge of regression, Developable.	15	20%
3	Quadratic surfaces, Applications of in verse function theorem, first fundamental form, Is ometries of surfaces, Surface area.	15	20%
4	Second fundamental form, Normal and Principal curvature, Meunier" s theorem .Euler "stheorem, Gaussian and mean curvature, Gauss map.	15	20%
5	Gauss equation, Christ of fell symbols, Codazzi-Mainardiequations,Theorem Egregious , Geodesics, local Gauss Bonnet theorem.	15	20%

REFERENCE   BOOKS:
1. An drew Pressly, Elementary Differential Geometry,SUMSeries,2004.
2. Goetz A., Introduction to Differential Geometry ,Addison Wesley. Publ .Co..1970.
3. Weather burn,C.E.,DifferentialGeometryinThreeDimensions.CambridgeUniversityPress,1964.

Suggested Readings :

1. Weather burn, C.E., Differential Geometry in Three Dimensions. Cambridge University Press,1964.

Online Resources:
1. https://you.be/4fB0VfKZRXM

Practical/Activities:

a) Group discussion.
b) Practical on the shape of things.
c) MCQs quiz.

SUBJECT: COMPLEX ANALYSIS

Course title :	COMPLEX ANALYSIS	Course code :	MSCMA-203
Year:	1st Year	Semester:	2nd Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Content	Hours	Weightage
1	A quick over view of complex number system, polar representation and roots of complex Numbers, the extended plane and its spherical representation, elementary functions and properties.	15	20%
2	Continuity, derivatives, Cauchy-Riemann equations. C-R equation in polar coordinates and complex from, analytic functions, harmonic functions, power series, power series as an analytic function. Branch of logarithm its analyticity, Analytic functions as mappings.	15	20%
3	Contours: contour integrals, anti-derivative, zeros of analytic functions. Cauchy"s theorem. simply and multiply connected domains and Cauchy"s integral formula, Cauchy inequality, Principle of deformation of paths, Lowville"s theorem. Morera,,s theorem, Cauchy"s theorem and simple connectivity, Goursat"s theorem.	15	20%
4	Fundamental theorem of Algebra, Gauss mean value theorem, Maximum modulus principle. Taylor's theorem, Laurent series, absolute and uniform convergence of power series.	15	20%
5	Classification of singularities, residues, residues theorem, residues at poles. Evaluation of improper real integrals. Definite integrals with sine and cosine function, Schwarz"s refection principle, Mobius transformation.	15	20%

REFERENCE BOOKS:
1. Conway, J.B., Functions of One Complex Variable, (Second Edition) ,Narosa Publ. House, New Delhi, 1994.
2. Churchil , R.V., Brown, J. and Verle ,R., Complex Variables and Applications, Mc Graw Hill Publ.Co.,1974.
3. Ponnusamy ,S., Foundations of Complex Analysis, Narosa Publ.House,NewDelhi,1995.
4. Choudhary, B., the Elements of Complex Analysis,(Second Edition),Wiley Eastern.

Suggested Readings:

1. Fundamentals of complex analysis reference books.

Online Resources:

1. https://youtu.be/pcwv7wc5pBI
2. http://youtu.be/35A8H966PhM.
3. https://youtube.com/playlist?list=PLU6SqdYcYs3sh-ho_iitkCGsbvh_SW.

Practical/Activities:

1. Online Quiz
2. Assignment

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SUBJECT: OPERATION RESEARCH

Course title :	OPERATION RESEARCH	Course code :	MSCMA-204
Year:	1st Year	Semester:	2nd Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Content	Hours	Weightage
1	**TRANSPORTATION PROBLEM** : Formulation – Optimal solution, unbalanced transportation problem – Degeneracy – Maximization case. **ASSIGNMENT PROBLEM:** Formulation– Optimal solution – Variants of Assignment Problem.	**15**	20%
2	**THEORY OF GAMES**: Introduction – Mini max (maximin) – Criterion and optimal Strategy – Solution of game with saddle points – Rectangular games without saddle points – Dominance Principle-$m \times 2$ and $2 \times n$ games-graphical method.	**15**	20%
3	**PROJECTMANAGEMENT(CPM&PERT):**Network Concepts components-rules for network construction-Critical Path Method(CPM) - Project evaluation and Review Technique (PERT).	**15**	20%
4	Elementary queuing models. Steady-state solutions of Markovaan queuing models: M/M/1,M/M/1withlimitedwaiting space, M/M/C, M/M/C with limited waiting space, M/G/1.	**15**	20%
5	Inventory models :EOQ models with and without shortages, EOQ models with constraints, Replacement and Reliability models.	**15**	20%

REFERENCE BOOKS:

1. J.K .Sharma, "Operations Research–Theory and Application",4th Edition,

   Macmillan Publishers India Ltd

2. N.H. Shah ,Ravi Gor ,Hardik Soni," Operation Research",PHI.

3. Handy and Tania, Operation Research: an introduction,Prentice-Hall,1997.

4. Operation Research: Theory & Applications, J.K.Sharma, Third Eddition-2007.

5. Operation Research: Techniques for Management, V.K. Kapoor, S. Chand

Suggested Readings:

1. Gupta PK & Hira D.S,"Operation Research "Third Edition, S Chand & Company Ltd., New Delhi,2005

Online Resources:

1. https://www.bbau.ac.in
2. https://pubsonline.informs.org

Practical/Activities:

1. Online Quiz
2. Assignment

SUBJECT: INTEGRAL TRANSFORMS

Course title :	INTEGRAL TRANSFORMS	Course code :	MSCMA-205
Year:	1st Year	Semester:	2nd Sem.
Course type :	Subject Elective	Course credit :	02

Content:

Unit	Content	Hours	Weightage
1	Laplace transforms: - Definition of the Laplace transform, Inversely place trans form, Linearity, Shifting theorem. Laplace transforms of derivatives and integrals. Unit step function ,Dirac"s delta function. Properties of inversely a place transform. Convolution Theorem. Complex inversion formula. Application of the Laplace transform to solve ordinary differential equations, partial differential equations, Initial and Boundary value problems, Integral equations, Evaluation of definite Integrals Difference and differential - difference equations.	15	50%
2	Fourier Series: Periodic function, Trigonometric series, Fourier series, Functions of any period, Even and odd functions, Half range Expansion. Separation of Variables. Use of Fourier Series .D' Alembert's Solution of the Wave Equations. Heat Equation: Solution by Fourier Series.eat Equation: Solution by Fourier Integrals and Transforms. Fourier transform: Definition and properties of Fourier sine ,cosine and complex transforms: Convolution the orem. Inversion the orems. Fourier transform of derivatives.	15	50%

REFERENCE BOOKS:
1. "Advanced Engineering Mathematics (8th Edition)" ,by E .Kreyszig, Wiley-India(2007).
2. "Higher Engineering Mathematics "BV Ramana, Tata Mc Graw-Hill.
3. Fouriertrans for mandits applications ,by Ronald Brace well.
4. The Laplace transform :Theory and applications ,by JoelL .Schiff.
5. **Jain, Iyenger**: Advanced Engineering mathematics, Wiley India.
6. Ian Sneddon :Theuse of Integral Transform.TMIH,1979

Suggested Readings:

1. Advanced Engineering Mathematics (4th Edition)",by Ravish R. Singh and Mukul Bhatt, McGrawHill Publication,2018

Online Resources:

1. www.researchgate.net
2. www.math.usm.edu

Practical/Activities:

1. Online Quiz
2. Assignment

SUBJECT: ALGEBRA–II(FIELD THEORY)

Course title :	ALGEBRA–II(FIELD THEORY)	Course code :	MSCMA-301
Year:	2nd Year	Semester:	3rd Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Contents	Credit	Weightage
1	Extensions of field ,Finite ,algebraic and simple field of a Polynomial lover a field, construction and transcendental numbers.	1	20%
2	Roots of polynomials ,the splitting field of a polynomial lovera Field ,construction with straight edge and compass.	1	20%
3	The fixed field of a group of auto morphisms, the theorem on Symmetric polynomial ,normal field extension,	1	20%
4	The Galois group of a polynomial. The fundamental theorem of Galois hairy.	1	20%
5	Sol ability by radicals ,Galois group over the rationals ,finite fields.	1	20%

Reference   Books:

1. Herstein ,I .N. ,Topicsin Algebra, Wiley EasternLtd.,NewDelhi,1975.
2. Artin , M., Algebra,PrenticeHallofIndia,1991.
3. Jacobson ,N.,Basic Algebra ,Vol.I & II, Hindustan Publ.Co.,Delhi,1984.
4. P.B. Bhattacharya ,S.K . Jainand S.R. Nagpaul, Basic Abstract Algebra(2/e),Cambridge University Press, South Indian Edition 1995.
5. S. Luther and I.B.S .Passi: Algebra Vol.III & Vol .IV ,Narosa Publishing House

SUBJECT: FUNCTION ALANALYSIS–1

Course title :	FUNCTION ALANALYSIS–1	Course code :	MSC MA-302
Year:	2ⁿᵈ Year	**Semester:**	3ʳᵈ Sem.
Course type :	Discipline Specific Course	**Course credit :**	05

Content:

Unit	Contents	Credit	Weightage
1	**Nor med line airspace:** definition and examples, continuous Line arrant formations, space$BL(X,Y),BL(X)$and $BL(X,X),l^p\&L^p$ $(for 0\le p\le\aleph)$Banach spaces	1	20%
2	Hann –Banach the oremandit s applications ,open mapping theorem,dualnormd space ,natur a limbed dingo formed space into double dual space of normed space.	1	20%
3	Closed graph theorem ,uniform bounded ness principal ,conjugate Of an operator, bounded inverse mapping theore m**.**	1	20%
4	Hilbert space :definition and examples ,orthogonal complement, Ortho normal set,	1	20%
5	Bessel's in equality, projection theorem, R misrepresentation theorem.	1	20%

REFERENCES:

1. G.F.Simmons: Introduction to Topology and Modern Analysis, Mc. Graw- HillInte rnational Book Company, 1963.
2. Erwin Kreyszig: Introduction to Functional Analysis with Applications, John Wiley&Sons,1978.
3. Balmohan V .Limaye: Functional Analysis ,New Age International Limited.
4. P.K.Jain,O.PAhujaFunctionalAnalysis,NewAgeInternational(P)Ltd.Publishers,&Khalil Ahmed: 1995.
5. K. Chanrashekhra Rao:Functional Analysis,Narosa,2002
6. D. Somasundram: A First Course in Functional Analysis,Narosa,2006

Suggested Readings:

3. Introduction to Functional data analysis.
4. Fundamentals of Mathematical analysis.

Online Resources:

3. https://youtu.be/pcwv7wc5pBI
4. http://youtu.be/35A8H966PhM.
5. http://youtu.be/GY6XUIX3uYi

Practical/Activities:

3.Seminar
4.Online quiz

SUBJECT: ADVANCED LINE ARALGEBRA

Course title :	ADVANCED LINE ARALGEBRA	Course code :	MSCMA-303
Year:	2nd Year	Semester:	3rd Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Contents	Credit	Weightage
1	Vector space ,sub space ,bases and dimensions, dual space, Algebra of matrices ,rank and determinants of matrices ,linear equations; Eigen values and eigenvectors ,Cayley –Hamilton theorem.	1	20%
2	Line arrant formations: Algebra ofline artrans formations, characteristic roots, Matrix representation of linear transformations, change of basis,	1	20%
3	Triangular canonical form, diagonal form, nilpotent linear transformations.	1	20%
4	Trace and transpose, a decomposition theorem ,Jordan Canonical forms, Rational canonical forms.	1	20%
5	Inner product spaces ,Pythagoras an Theorem, Cauchy–Schwarz Inequality, Triangle Inequality, ortho normalbasis; Quadratic forms, reduction and classification of quadratic forms.	1	20%

Reference Books:
1. Herstein, I.N.,"Topics in Algebra"2nd edition, John Wiley & Sons, Student Edition ,New York(2004).
2. P.B.Bhattacharya ,S.K.Jainand S.R.Nagpaul: "First Course in Linear A lgebra" ,Cambridge, New Age International Ltd Publishers, New Delhi (2008)

Suggested Readings:

1. I.H.Sheth, 'Advance Linear Algebra '1st edition, Nirav Prakashan(2016)

Online Resources:

1. Linear Algebra–khan Academy
2. http://ulaff.net

Practical/Activities:

1. Using MATLAB Students prepare assignment online aralgebra.

2. Online Quiz/Assignment

SUBJECT: MATHEMATICAL STATISTICS–1

Course title :	MATHEMATICAL STATISTICS–1	Course code :	MSCMA-304
Year:	2nd Year	Semester:	3rd Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Contents	Credit	Weightage
1	Measures of central tendency and dispersion, moments ,Measures of Skewness and kurtosis, Classical and axiomatic approach of the theory Of probability, additive and multiplicativeelaw of probability, conditional probability and Bayes theorem.	1	20%
2	Randomv ariable, probability mass function ,probability density Function ,cumulative distribution function, To wandhigher dimensional random variables, joint distribution, marginal and conditional distributions, Stochastic independence, function of random variables and their probability density function.	1	20%
3	Mathematical expectations and moments, moment generating function and its properties, Chebyshev's identity and its applications, Stochastic convergence, central limit (Laplace theorem, Linder berg, Levy's theorem)	1	20%
4	**Discrete probability Distributions:** Uniform hypergeometric, Binomial, Poisson, Geometric, Hyper geometric, Multinomial. **Continuous probability Distributions:** Uniform, Exponential, Gamma, Beta, Normal distributions. Normal approximation of Binomial, Poisson distribution etc.	1	20%
5	Leastsquareprincipal,correlationandlinearregressionanalysisforbi – variate data, partial and multiple correlation coefficients, correlation ratio, association of attributes.	1	20%

Reference Books:

1. Gupta and Kapoor :Fundamentals of Mathematical Statistics.
2. S.P.Gupta: Statistical Methods, Sultan Chand &Sons.
3. Harold J,Larson :Introduction to probability.Theory and Statistical Inference.Wiley1982.
4. V.K.Rohatgi: An introduction toprobability theory and mathematical Statistics.John Wiley&Sons,1976.

Suggested Readings:

1. Fundamental of mathematical statistics .S.C. GUPTA and V.K .kapoor.

Online Resources:

1. https://youtu.be/CiL659LvS-o

2. RM Academy KOTA

Practical/Activities:

1. MCQs Quiz based on probabilities.
2. To prepare assignment discrete probability Distributions and Continuous probability Distributions.

SUBJECT: INTEGRAL EQUATION

Course title :	INTEGRAL EQUATION	Course code :	MSCMA-305
Year:	2nd Year	Semester:	3rd Sem.
Course type :	Subject Elective	Course credit :	02

Content:

Unit	Contents	Credit	Weightage
1	Linear Integral Equations-Definition and classification, conversion of initial and boundary value problems to an integral equation; Eigen values and Eigen functions; solution of homogenous; Freedom integral equations second kind with separa blekernels; Solution of general Feedhole mintegral equation of second kind with separa blekernels; Solution of Volterraintegral equations of second kind with convolution type, kernels by Laplace transform, Solution of singular integral equations by Fourier transform	1	50%
2	Solution of Feedhole and Valera integral equations of second kind by methods of successive substitutions and successive approximations ;Resolve kernels and its results; Conditions of uniform convergence and uniqueness of series solution; Integral equations with symmetric kernels -orthogonal system of functions ;Fundamental properties of Eigen values and Eigen functions and bilinear form, Hilbert-Schmidt theorem, solution of Feedhole integral equation of second kind by using Hilbert Schmidt theorem. Classical Feedhole theory - Feedhole theorems, solution of Feedhole integral equation of second kind by using Feedhole first theorem.	1	50%

Reference Books:
1. M. K rasnov,A .Kislev,G.Makarenko ,Problems and Exercises in Integral Equations(1971).
2. S .Swarup, Integral Equations(2008)
3. Courant, R. and Hilber D.,Methods of Mathematical Physics,Vol .I, Interscience Press,1953.
4. Cordumenau ,C. ,Integral Equation sand Applications, Cambridge UniversityPress,1991
5. Kanwal ,R.P.,Linear Integral Equations,Theory and Techniques ,Birkhauser,1997

Suggested Readings:

1. Calculas of variations by I.M.GelfandandS.V.Fomin,Prentice Hall.Inc.,1963

Online Resources:

1. http://en.wikipedia.org/wiki/integralequation

2. http://mathworld.wolfram.com/IntegralEquation.html

Practical/Activities:

1. Online quiz/ Assignment

SUBJECT: REAL ANALYSIS

Course title :	REAL ANALYSIS	Course code :	MSCMA-401
Year:	2nd Year	Semester:	4th Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Contents	Credit	Weightage
1	**Advanced Set Theory:** Equivalent Sets, Countable and Uncountable Sets, The concept of a cardinal number, The cardinals $\aleph_o$ and c, Addition and multiplication of cardinals, Cartesian product, Axiom of Choice, Multiplication of cardinal numbers, Order relation and order types, Well ordered sets, Transfinite induction, Addition and multiplication of ordinals Statements of Zorn's lemma, Maximalist principle and their simple implications	1	20%
2	**Lévesque Measure:** Algebra and $\sigma-$ algebra of sets, $\sigma-$ algebra of Boral sets, Lévesque outer measure on , measurable sets. Lévesque measure, Measurable function. Little wood's three principles, Ego off's theorem	1	20%
3	**Lévesque Integral:** Integral of a simple function , Riemann Integral, Lévesque integral of a bounded functions. The integral of a non-negative functions. The general Lévesque Integral, Fate's lemma.	1	20%
4	**Measure and Integration:** Measure space, measurable functions Integration. General convergence theorem, monotone convergence theorem , Lévesque convergence theorem, convergence in measure.	1	20%
5	**Differentiation & Integration**: Differentiation of monotone functions. Functions of Bounded variation. Differentiation of an Integral. Absolute continuity and convex functions.	1	20%

Reference Books:

1. W .R udin: Real & Complex Analysis 3 edition Mc Graw-Hill,1966.
2. G.de Barra :Measure theory and Integration,WileyEasternLtd.,1985.
3. T.M A postol :Mathematical Analysis, Narosa Publication House-1985.
4. P.R. Halmos : Measuret heory,Springer–1974.

Suggested Readings:

1. Robert G. Bartle and Donald R.Sherbert ,*Introduction to Real Analysis*,(3rdEd.1999)
2. T.M. Apostal, Mathematical Analysis,(2ndEd.AddisonWesley,1974)

Online Resources:

1. https://www.youtube.com/watch?v=md5UCR7mcIY&list=PLbMVogVj5nJSxFihV-ec4A3z_FOGPRCo-
2. https://nptel.ac.in/courses/111106053

Practical/Activities:

1. Group Discussion
2. Assignment

SUBJECT: FUNCTION ALANALYSIS–2

Course title :	FUNCTION ALANALYSIS–2	Course code :	MSCMA-402
Year:	2nd Year	Semester:	4th Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Contents	Credit	Weightage
1	Dual and transpose of a Hilbert spaces ,ad joint of an operator, self – ad joint, normal, unitary operators, projections.	1	20%
2	Hann –Bench theorem and its applications, open mapping Theorem ,dual normed space, naturalim bedding of normed space into double dual space of nor med space.	1	20%
3	Finite dimensional spectral theorem, Weak convergence	1	20%
4	Banachalgerbera: definition and examples, regular and Singular elements, topological divisors of zero ,spectral of an element and spectral radius, radical and simplicity..	1	20%
5	Gelf and mapping, applications of the formula of the spectral radius, involutions in Banachal gebra ,Ideals in C(X),Banach –Stone theorem, Commutative C* -algebras.	1	20%

Reference Books:

1. G.F. Simmons: Introduction to Topology and Modern Analysis ,Mc . Graw -Hill International Book Company, 1963.
2. Erwin Kreyszig: Introduction to Functional Analysis with Applications, John Wiley & Sons,1978.
3. Bal mohan V. Lemay: Functional Analysis, New Age Interna tional Limited.
4. P.K .Jain ,O.P AhujaFunctionalAnalysis,NewAgeInternational(P)Ltd.Publishers,&Khalil Ahmed: 1995.
5. K. Chandrasekhar Rao: Functional Analysis,Narosa,2002
6. D .Soma sundram:A First Course In Functional Analysis,Narosa,2006.
7. S.K. Berberain: Lectures In Functional Analysis and Operator theory,Springer Verlag
8. R Larson: Banach Algebra ,Marcell Dekker,1973.

Suggested Readings:
1. Introduction to Functional data analysis.
2. Fundamentals of Mathematical analysis.

Online Resources:

1. http://youtu.be/GY6XUIX3uYi
2. http://youtu.be/35A8H966PhM.
3. https://youtu.be/pcwv7wc5pBI

Practical/Activities:

1. Online quiz
2. Assignment

SUBJECT: NUMERIC ALANALYSIS

Course title :	NUMERIC ALANALYSIS	Course code :	MSCMA-403
Year:	2nd Year	Semester:	4th Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Contents	Credit	Weightage
1	**Error Analysis** Errors, Absolute errors, Rounding errors, Truncation errors, In herent Errors, Major and Minor approximations in numbers **The Solution of Linear Systems** Gaussian elimination method with pivoting, LU Decomposition methods,, Algorithm and convergence of Jacobi iterative Method, Algorithm and convergence of Gauss Seidel Method, Eigen value and eigenvector, Power method **The Solution of Non-Linear Equation** Bisection Method, Fixed point iterative method, Newton Raphson method, Secant method, Method of false position, Algorithms and convergence of these methods	1	20%
2	**Difference Operators** Shift operators, Forward difference operators, Back ward difference operators ,Average and central difference operators **Ordinary Differential Equations** Euler's, Improved Euler's, Modified Euler's methods with error analysis, Range – Kutta methods wither or analysis, Predictor-corrector methods for solving initial value problems, Finite Difference, Collocation and variation methods for boundary value problems	1	20%

3	**Interpolation** Lagrange's interpolation, Newton's divided difference interpolation, Newton's for ward and backward difference interpolation, Central difference interpolation, Hermit interpolation, Splineinterpolation, Errors and algorithms of these interpolations	1	20%
4	**Numerical Differentiation** Newton's Forward ,Backward and central formulae for numerical differentiation **Numerical Integration** Rectangular rule, Trapezoidal rule, Simpsonrule,Boole's rule, Weddle's rule, Gaussian quadrature formulae, Errors in quadrature formulae, Newton-Cotes formulae	1	20%
5	**Difference Equations** Linear homogeneous and non-homogeneous difference equations with constant coefficients ,Difference reducible to linear form, difference equations with constant coefficie Simultaneousness.	1	20%

Reference Books:

1. Curtis F. Gerald and Patrick O. Wheatley ,*Applied Numerical Analysis*, (Addison-Wesley Publishing Co. Pearson Education, 2003)
2. Richard L. Burden and J. Douglas Faires ,*Numerical Analysis*,(Brooks/Cole Publishing Company,1997)
3. John H. Mathews, *Numerical Methods for Mathematics*, *Science and Engineering*, (Prentice Hall International, 2003)
4. StevenC.ChapraandRaymondP.Canale,*NumericalMethodsforEngineers*,(McGraw Hill International Edition, 1998)

Suggested Readings:

1. Gupta P K & Hira D.S," Operation Research "Third Edition, S Chand & Company Ltd., New Delhi,2005

Online Resources:

1. https://www.bbau.ac.in
2. https://pubsonline.informs.org

Practical/Activities:

1. Online Quiz
2. Assignment

MK UNIVERSITY

PATAN, GUJARAT

ESTABLISHED BY THE GUJARAT GOVT.   RECOGNIZED BY UGC UNDER SECTION 2(f) OF UGC ACT,1956

SUBJECT: MATHEMATICAL STATISTICS–2

Course title :	MATHEMATICAL STATISTICS–2	Course code :	MSCMA-404
Year:	2nd Year	Semester:	4th Sem.
Course type :	Discipline Specific Course	Course credit :	05

Content:

Unit	Contents	Credit	Weightage
1	**Sampling Distribution:** Chi – square, t and F – distributions with their properties, distribution of sample mean and variance, distribution of order statistics and sample range from continuous populations.	1	20%
2	**Point Estimation:** Estimators, properties of unbiasedness, consistency, sufficiency, efficiency, completeness, uniqueness, methods of estimation.	1	20%
3	**Testing of Hypothesis:** Null hypothesis and its test of significance, simple and composite hypothesis, M.**P.** test, UMP test, Likelihood test **(**excluding properties of Likelihood ratio Test**)**	1	20%
4	**Application of Sampling Distribution:** Test of mean and variance in the normal distribution, Test of single proportion and equality of two proportions, Chi – square test, t – test, F – test.	1	20%
5	**Linear Estimation:** Gauss Mark off linear models, BLUE, Gauss Mark off Theorem, estimation with linear restrictions on parameters, residual sum of squares, analysis of variance, analysis of variance for one way and two way classified data with one observation per cell.	1	20%

Reference Books:

1. Gupta and Kapoor :Fundamentals of Mathematical Statistics.
2. S.P.Gupta: Statistical Methods, Sultan Chand & Sons.
3. Harold J,Larson :Introduction toprob ability.Theory and Statistical Inference.Wiley1982.
4. V.K.Rohatgi: An introduction to probability theory and mathematical Statistics. John Wiley& Sons, 1976.

Suggested Readings:

a)V.K.Rohatgi: An introduction to probability theory and mathematical Statistics. John Wiley & Sons, 1976.

Online Resources:

a) https://you.be/5Mfc6gGzmpc

Practical/Activities:

a) Group discussion.
b) To prepare assignments on statistics.
c) MCQs quiz.

SUBJECT: RESEARCH METHODOLOGY

Course title :	RESEARCH METHODOLOGY	Course code :	MSCMA-405
Year:	2nd Year	Semester:	4th Sem.
Course type :	Discipline Specific Course	Course credit :	02

Content:

Unit	Contents	Credit	Weightage
1	Research Methodology: An Introduction Meaning of Research –Objectives of Research–Motivation in Research–Types of Research – Significance of Research – Research and Scientific Methods– Importance of knowing How Research is Done – Research Process – Criteria of Good Research. Defining the Research Problem What is a Research – Selecting the Problems–Necessity of Defining the Problem– Technique involved in Defining a Problem	1	50%
2	Research Design Meaning of Research Design–Features of a Good Design – Importance Concepts Relating to Research Design– Different Research Design – Basic Principles of Experimental Designs. Scientific Writing, Research Proposal, Research Paper, Review Paper, Thesis, Conference Report, Book Review and Project Report (any two), Reference Writing, Scientific Abbreviations. Preparation and Delivery of Scientific Presentations, Research Report / Thesis Formatting and Typing (Computing),Title page, Certificate, Declaration, Acknowledgement, List of Table, Figures, Abbreviations and Symbols, Chapters Quotations, Table, Figures, Summary, Appendices, References etc.	1	50%

Reference Books:

1. Research Methodology Methods and Techniques C.R.Kothari
2. Research Methodology Methods and Statistical Techniques Santosh Gupta
3. Who to write and publish a scientific paperby Day, R.A.
4. Guide to write scientific paper by Garson, G.D.

Reference Books:

a) Research Methodology Methods and Techniques C.R. Kothari

b) Research Methodology Methods and Statistical Techniques Santosh Gupta

Suggested Readings:

a) Who to write and publish a scientific paper by Day, R.A.
b) Guide to write scientific paper by Garson, G.D.

Online Resources:
a) https://you.be/Pouqksj7px8

Practical/Activities:

a) Finding and using sources of information.
b) Planning a research project.
c) Conducting research.
d) Using and analyzing data.
e) Discman a ting results.
f) Acting ethically.
g) Developing deeper research skills.