SCHOOL OF STUDIES IN MATHEMATICS, VIKRAM UNIVERSITY, UJJAIN
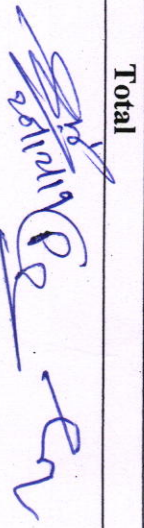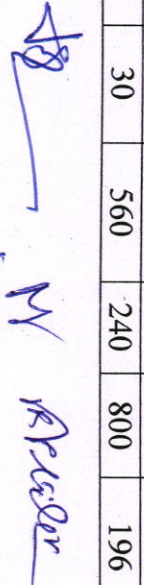## M.A./M.Sc. (MATHEMATICS)-SEMESTER IV-SESSION: 2019-20
SCHEME OF EXAMINATION FOR NEW CBCS

Paper code	Course Name (Theory/Practical)	Discipline	Credits	Examination Scheme			Minimum Marks		
				Maximum Marks			End Semester Exam	Internal (CCE)	
				End Semester Exam	CCE	Total Marks			
MAT-C401	Functional Analysis-II	CORE	4	60	40	100	21	14	
MAT-C402	Fundamental of Computer Science (Theory)-II	CORE	3	40	40	100	14	14	
	Fundamental of Computer Science (Practical)-II	CORE	1	20	-	100	7	-	
MAT-E403 (A,B,C,D,E,F)	(to choose 1 out of 6) A. Advanced Functional Analysis-II B. Mechanics C. Differentiable Structures on manifolds-II D. General Theory of Relativity and Cosmology-II E. Abstract Harmonic Analysis-II F. Mathematics of Finance & Insurance -II	ELECTIVE- I	4	60	40	100	21	14	
MAT-E404 (A,B,C,D,E,F)	(to choose 1 out of 6) A. Theory of Linear Operator II B. Advanced Numerical Analysis –II C. Fuzzy Sets and their Applications-II D. Advanced Graph Theory-II E. Advanced Special Function-II F. Spherical Trigonometry and Astronomy-II	ELECTIVE- II	4	60	40	100	21	14	
MAT-E405 (A,B,C,D,E,F)	(to choose 1 out of 6) A. Operations Research -II B. Computational Biology –II C. Fluid Mechanics –II D. Bio- Mechanics -II E. Analytic Number Theory-II F. Integral Transform-II	ELECTIVE- III	4	60	40	100	21	14	
MAT-E406	Tourism Management	ELECTIVE- IV	4	60	40	100	21	14	
MAT-P407	Project Work	-	3	100	-	100	35	-	
MAT-V408	Comprehensive Viva-Voce	-	3	100	-	100	35	-	
	Total		30	560	240	800	196	84	

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

<u>SEMESTER IV</u>

Paper I (MAT-C401) Functional Analysis-II

Unit-1

Hahn-Banach theorem, Hahn-Banach theorem for complex vector space and normed spaces, Reflexive spaces, Catigory Theorem and Uniform boundedness theorem.

Unit-2

Strong and Weak convergence, Open Mapping Theorem, Closed Linear Operators and closed Graph Theorem., Closed Range Theorem.

Unit-3

Inner product spaces, Hilbert spaces, further properties of inner product spaces, Orthogonal complements and Direct Sums (Projection Operator)

Unit-4

Complete Orthonormal sets and Bessel's Inequality, Convergence Theorems and fourier coeifficients ,total orthonormal sets and sequences Parsval's Relation Riesz representation theorem.

Unit-5

Representation of Functionals on Hilbert space (Riesz theorem, Riesz representation). Hilbert adjoint operator, Self-adjoint operators, Unitary operators and Normal operators

Recommended Books:

[1] E. Kreyszig, Introductory Functional Analysis with applications, John Wiley & Sons.

[2] G.F. Simmons, Introduction to Topology & Modern Analysis Mc Graw Hill, New

Reference :

[1] B. Choudhary and Sudarshan Nanda. Functional Analysis with applications, Wiley Eastem Ltd. .

Max. Marks 100 (Credit 4)

Regular
Theory Marks : 40 (Min. 14) (Credit 3)
C.C.E. Marks : 40 (Min. 14)
Practical Marks: 20 (Min 7) (Credit 1)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

SEMESTER IV

Paper II (MAT-C402) Fundamentals of Computer Science - II (Theory and Practical)

Unit 1 -

Inheritance, Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Templates including Class Templates.

Unit 2 -

C++ Streams, C++ Stream Classes, put() and get() Functions, getline() and write() Functions.

Unit 3 -

Database Systems - Role of Database Systems, Database Systems Architecture.

Unit 4 -

SQL -Basic Features including views, Integrity Constraints, Key, Functional Depedency, Multivalued Functional Dependency, Database Design- Normalization up to BCNF.

Unit 5 -

Operating Systems - User Interface, Processor Mangement, Memory management , Network and Distributed Systems.

Reference Books :

[1] E. Balagurusamy, Object Oriented Programming with C++, III Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.

[1] S.B.Lipman , J Lajoi; C++ Primer Addison Wesley.

[2] C.J. Date ; Introduction to Database systems, Addition Wesley.

[3] C. Ritchie; Operating Systems, Incorporating UNIX and Windows, BPB Publications.

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)
SEMESTER IV

Paper III (MAT-E403-A) (ELECTIVE-I) Advanced Functional Analysis-II

Unit-1

Finite - dimensional topological vector spaces. Linear Varieties and Hyperplanes. Geometric form of Hahn -Banch theorem. . Chapter 2(2.2), 5(5.1, 5.2) 6(6.2), 7 and 9 (9.4) of R. Larsen.

Unit-2

Uniform - Boundedness principle. Open Mapping theorem and closed graph theorem for Frehet spaces, Banach - Alaouglu theorem. Chapter 6(6.2), 7 and 9 (9.4) of R. Larsen.

Unit-3

Extreme points and Extremal sets. Krein- Milman's theorem. Duality polar. Bipolar theorem. Baralled and Bornological spaces.

Unit-4

Macekey Spaces. Sami-reflexive and Reflexive topological vector spaces. Montel Spaces and Schwarz spaces. Quasi-completeness. Chapter 11(11.1, 11.2) of R. Larsen

Unit-5

Inverse Limit and inductive limit of locally convex spaces. Distributions. [Walter Rudin and L.V. Kantorovich and G.P. Akilov].

Recommended Books :

[1]   R.Larsen, Functional Analysis, Marcel Dekker, Inc. New york, 1973.

[2]   Walter Rudin, Functional Analysis, TMH Edition,1974.

[3]   L.V.Kantorovich and G.P. Akilov, Functional Analysis, Pergamon Press 1982.

Reference Books :

1.   Laurent Schwartz, Functional Analysis Courant Institute of Mathematical Sciences, New York University, 1964.

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)
SEMESTER IV

Paper III (MAT-E403-B) (ELECTIVE-I) Mechanics

Unit-1

Generalized cordinates. Holonomic and Non-holonomic systems. Scleronomic and Rheonomic System Generalized Potential. Lagrange's equations of first kind. Lagrange's equations of second Kind. Uniqueness of solution. Energy equation for conservative fields.

Unit-2

Hamilton's variables, Hamilton's canonical equations, Donkin's theorem, Matovating probelms of calculus of variations, Shortest distance. Minimum surface of revolution. Brachistochrone problem. Fundamental lemma of calculus of variations. Euler's equation for one dependent function and its generalization to (i) n dependent functions. (ii)higher order derivatives.

Unit-3

Hamilton's Principle. Principle of least action, Hamilton-Jacobi equation (time-dependent and time-independent), Whittaker's equations, Statement of Lee HWA Chung's theorem, Poincare Carten Integal invariant.

Unit 4-

Poisson's Bracket. Poisson's Identity. Jacobi-Poisson theorem, Lagrange Brackets. Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets, Invariance of Lagrange brackets and Poisson brackets under canonical transformations.

Unit-5

Hamilton-Jacobi Theory: Solution of Hamilton-Jacobi equation, Jacobi theorem. Method of saperation of variables.

Attraction and Potential of rod, disc, Spherical shells and sphere.

Reference Books:

(1) Narayanan Chandra Rana & Pramod Sharad Chandra Joag, Classical Mechanics, Tata Mcgraw Hill 1991.
(2) F. Gantmacher, Lectures in Analytic Mechanics MIR Publishers.
(3) M. Ray, Attraction and Potential, Student's Friends and Company, Agra.
(4) H. Goldstein Classical Machanics (2nd Edition), Narosa Publishing House , .

Regular	
Theory Marks : 60 (Min. 21)	
C.C.E. Marks : 40 (Min. 14)	

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)
SEMESTER IV

Paper III (MAT-E403-C) (ELECTIVE-I) Differentiable Structures on manifolds-II

Unit-1

Kahler manifolds. Affine conncetion

Unit-2

Holomorphic sectional curvature. Curvature tensor. Almost analytic vector fields.

Unit-3

Nearly Kahler manifolds, Curvature identities. Constant Holomorphic sectional curvature

Unit-4

Almost analytic vector fields Almost Kahler Manifold Anilities vector fields, Almost Contact manifolds : Lie derivative normal contact structure

Unit-5

Affinely almost almost cosymplectic manifold, Almost Grayn manifolds: D-conformal transformation, Perticular affined connection K- Contact Rumanian manifolds.

Reference Books.

1-   B.B, Sinha, An Introduction to Modern Differential Geometry, Kalyani Publishers, New Delhi. 1982.

2-   K. Yano and M. Kon, Structure of Manifolds, World Scientific Publishing co-Pvt. Ltd. 1984.

3-   A. Bejaneu, Geometry of Cr- Submanifolds, D. Reidel Publishing Company, , 1986

Reference Books:

1-   R.S, Mishra, A course in tensons with application to Riemannian geometry pothishala Pvt. Ltd. 1965.

2-   R.S. Mishra, Structures on Differentiable manifold and theire applications, Chandrema Prakashan , 1984.

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)
SEMESTER IV

Paper III (MAT-E403-D) (ELECTIVE-I) General Theory of Relativity and Cosmology-II

Unit-1

Review of the special theory of relativity and the Newtonian Theory of gravitation. Principle of equivalence and general covariance, geodesic principle.

Unit-2

Newtonian approximation of relativistic equations of motion. Einstein's field equations and its Newtonian approximation.

Unit-3

Schwarzschild external solution and its isotropic form. Planetary orbits and anologues of Kepler's Laws in general relativity. Advance of perihelion of a planet

Unit-4

Bending of light rays in a gravitational field. Gravitational redshift of spectral lines. Radar echo delay.

Unit-5

Energy-momentum tensor of a perfect fluid. Schwarzschild internal solution. Boundary conditions.

Recommended Books:

[1] S.R.Roy and Raj : Theory of Relativity Jaipur Publishing House,Jaipur, 1987.

[2] S. K. Shrivastva: General Relativity and Cosmology, PHI, .

[3] J.V. Narlikar, General Relativity and Cosmology: The Macmillan Company of Limited, 1978.

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

SEMESTER IV

Paper III (MAT-E403-E) (ELECTIVE-I) Abstract Harmonic Analysis II

Unit-1

The Haar covering function Existence and properties of Haar covering function Definition and properties of the function Ig (f) . Existence and Uniqueness of the Haar integral ,

Unit-2

Translation in $L_p(G)$, uniform continuity of translation character, Characters, Characters group, properties of characters

Unit-3

Character group or dual group Locally compact abelian group non - trivial complex homomorphism.

Unit-4

The Fourier transform, Convolution, convolution of function set A (Γ) of all Fourier transforms invariance, of A (Γ),

Unit-5

Fourier Stieltjes transform set B(Γ) of all Fourier Stieltjes transform, invariance of B (Γ), Duality Theorem.

Recommended Books.

1- George Bachman Elements of Abstract Harmonic Analysis Acadmic Press, New Your. 1964

2- Taqdir Hussain Introduction to Topological Group W.D. Saudss Company 1966 to ok W.O.

3- Walter Rudin, Fourier Analysis On Group Intersceince publisher , John wiley, New York , 1967

Reference Books.

1- Edwin Hewit and Kenneth A. Ross. Abstract Harmonic Analysis -1, Springer - Verlag, Berlin, 1963.

2- lynn H. Loomis : An Introduction to Abstract Harmonic Analysis, D, Van Nostrand Co. Princeton.

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

SEMESTER IV

Paper III (MAT-E403-F) (ELECTIVE-I) Mathematics of Finance and Insurance- II

Unit-1

A Brief introduction to financial Markets,

Unit-2

basics of Securities, Stocks Bonds and financial derivatives,

Unit-3

Viz forwards, Futures, Options and Swaps.

Unit-4

An Introduction to stochastic Calculus stochastic process, geometric Brownian motion stochastic integration andI ito's lemma

Unit-5

Option Pricing models- Binamial Models and Black Scholes Option Pricing Model for European Options, Black Scholes formula and computation of greeks.

Text Books:

Options, Futures and other Drivatives by Jhon C. Hull Prentice -Hall of India Pvt. Ltd. An introduction to Mathematic Finance by Cheldon M. Ross, Cambridge University Press.

Reference Books:

An Introduction to Mathematics of Financial Derivatives by Salih N.Neftci, Academic Press, Inc. mathematics of Financial markets by Ribert J. Elliot & P.E. Kopp Springer Verlag, New Yorlk Inc.

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

<u>SEMESTER IV</u>

Paper IV (MAT-E404-A) (ELECTIVE-II) Theory of Linear Operators II

Unit-1

Spectral representation of bounded self- adjoint linear operators. Spectral theorem. Spectral measures. Spectral Integral.

Unit-2

Regular Spectral Measure. Real and Complex Spectral Measure. Complex Spectral Integral Description of the Spectral Subspaces. Characterization of the Spectral Subspaces.

Unit-3

The Spectral theorem for bounded Normal Operators. Unbounded linear operators in Hilbert spece. Hellinger- Toeplitz theorem. Hilbert adjoint operators.

Unit-4

Symmetric and self -adjoint linear operators. Closed linear operators and closures. Spectrum of an unbounded self-adjoint linear operators.

Unit-5

Spectral theorem for unitary and self- adjoint linear operators. Multiplication operator and Differentiation Operator. Chapter 10, E. Kreyszig.

Recommended Books:

(1)   E. Kreyszig Introductory functional analysis with applications, Jhon wiley & Sons, Nwe York, 1978.

Referance Books:

(1)   P. R. Halmos Introduction to Hilbert space and the theory of Spectral Multiplicity, Second edition, Chelsea publishing co. N.Y. 1957.

(2)   N. Dundford and J.T. Schwartz, linear operator -3 part, Interscience / Wiley, New York 1958-71.

(3)   G.Bachman and L. Narci, Functuional analysis, Academic press , 1966

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

<u>**SEMESTER IV**</u>

Paper IV (MAT-E404-B) (ELECTIVE-II) Advanced Numerical Analysis II

Unit-1

   Extrapolation methods ordinary differential equations. multi step methods Predicator and corrector method

Unit-2

   stability analysis of multistep methods. Ordinary differential equation

Unit-3

   boundary value problems shooting method.

Unit-4

   Finte difference methods

Unit-5

   finite element method

Text book -

(1)   Numerical Mmethod for scientific and Engineering computation by M.K. Jain, S.R.K. Iyenger, R.K. Jain south Edition (2003) New Age.

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

SEMESTER IV

Paper IV (MAT-E404-C) (ELECTIVE-II) Fuzzy Sets and Their Applications II

Unit-1

Fuzzy Relation and fuzzy graphs - Fuzzy relation on Fuzzy sets, Composition of Fuzzy relation,

Unit-2

Min-Max composition and its properties, Fuzzy equivalence relation Fuzzy compatibility relation Fuzzy relation equation Fuzzy graphs, Similarity relation.

Unit-3

Possibility Theory-Fuzzy measures, Evidence theory, Necessity Measure, possibility measure,

Unit-4

possibility distribution, possibility theory and fuzzy sets possibility theory versus probability theory.

Unit-5

Fuzzy Logic-An overview of classical logic, multivalued logics, Fuzzy proposition Fuzzy quantifiers Linguistic variables and hedges, Inference from conditional fuzzy proposition, the compositional rule of inference.

Text Books:

(1)   Fuzzy set theory and its Applications by H.J. Zimmermann, Allied Publishers Ltd., , 1991.

(2)   Fuzzy sets and Fuzzy logic by G.J. Klir and B. Yuan Prentice - Hall of India, ,1995

Reference Books:-

(1)   Fuzzy sets and Uncertainty and Information by G.J. Kalia Tina A. Foljer - Prentice - Hall of India.

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

<u>**SEMESTER IV**</u>

Paper IV (MAT-E404-D) (ELECTIVE-II) Advanced Graph Theory- II

Unit-1

Connectivity and separability in graphs Abstract graphs geometric graphs planar graphs Kurtowski two graphs embedding and regions of a planar graphs Detection of planarity

Unit-2

Geometric dual and combinationa dual.

Unit-3

Coloring and covering of graphs, Chromatic, Polynomial chromatic partitioning Dimmer problem Domination sets independent sets, Four colour conjecture.

Unit-4

Digraph and types of digraphs, Digraph and binary relation Equivalence relation in a graph Directed path walk circuit and connectedness Eulerian digraph, arborscence matrices A, B and C of digraphs.

Unit-5

Adjacency metric of a digraph, Alogorithms, Kruskal algorithm, Prism algorithm, Dijkastra Algorithm.

Text Book :-

1- Graph Theory with Application to Engineering and Computer Science by Narsingh Deo.

Reference Book :-

1- Graph Theory by Harary.

Regular		
Theory Marks : 60 (Min. 21)		
C.C.E. Marks : 40 (Min. 14)		

M.Sc. Mathematics

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SEMESTER IV

Paper IV (MAT-E404-E) (ELECTIVE-II) Advanced Special Function II

Unit-1

Bessel function and Legendre polynomials : Definition of Jn (z), Bessel's differential equation ,Generating function, Bessel's integral with index half and an odd integer,

Unit-2

Generating function for Legendre polynomials Rodrigues formula, Bateman's generating function, Additional generating funtions, Hypergeometric forms of Pn (X) , Special properties of PnX), Some more generating functions, Laplace's first integral form, Othergonality.

Unit-3

Special properties of PnX), Some more generating functions, Laplace's first integral form, Othergonality.

Unit-4

Definition of Hermite polynomials Hn(x), Pure recurrence relations, Differential recurrence relations, Rodrigue's formula, Other generating functions, Othogonality, Expansion of polynomials, more generating functions.

Unit-5

Laguerre Polynomials : The Laguerre Polynomials Ln(X), Generating functions, Pure recurrence relations, Differential recurrence relation, Rodrigo's formula, Orthogonal, Expansion of polynomials, Special properties, Other generating functions.

Books Recommended ;

1- Rainville, E.D, ; Special Functions, The Macmillan co., New york 1971,

2- Srivastava, H.M. Gupta, K.C. and Goyal, S.P.; The H-functions of One and Two Variables with applications, South Asian Publication, New Delhi.

3- Saran, N., Sharma S.D. and Trivedi, - Special Functions with application, Pragati prakashan, 1986.

Reference Books.

1- Lebdev, N.N, Special Functions and Their Applications, Prentice Hall, Englewood Cliffs, New jersey, USA 1995.

2- Whittaker, E.T. and Watson, G.N., A Course of Modern Analysis Cambridge University Press, London, 1963

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

<u>SEMESTER IV</u>

Paper IV (MAT-E404-F) (ELECTIVE-II) Spherical Trigonometry an Astronomy- II

Unit-1

Spherical Astronomy - Various system of references and related topics.

Unit-2

Celestial sphere,

Unit-3

Transit instrument. Atmospheric Retraction. Time planetary phenomena.

Unit-4

Atmospheric Retraction.

Unit-5

Time planetary phenomena.

Text Books:-
1- A text book of spherical trigonometry : Gorakh Prasad.
2- A text book of spherical Astronomy : Gorakh Prasad.

Reference Book.
1- Spherical Astronomy - Smarat
2- spherical Astronomy - Bell

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

SEMESTER IV

Paper V (MAT-E405-A) (ELECTIVE-III) Operations Research II

Unit-1

Network analysis, constraints in Network, Construction of network, Critical Path Method (CPM) PERT, PERT Calculation, Resource Levelling by Network Techniques and advances of network (PERT/CPM).

Unit-2

Dynamic Programming - recursive equation approach, Characteristic of Dynamic Programming, Computational procedure, Integer programming Gomory's all I.P.P. method, Branch and Bound Technique.

Unit-3

Game theory - Two person Zero-sum games, Maximix-Minimax principle, games with out saddle points - Mixed strategies, Graphical solution of 2Xn and Mx2 Games, Solution by Linear Programming,

Unit-4

Non-linear programming: Mathematical Formulation, General Non-linear Programming Problems, Problems of Constrained Maxima and Minima (Kuhn-Tucker Condition), Non-negative Constraints,

Unit-5

Quadratic programming: Wolfe's Modified Simplex method, Beale's Method, Separable programming, Convex programming, Separable programming algorithms.

Recommended Books :-

1- Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi.

Reference Books:-

1- S.D, Sharma, Operation Research,

2- F.S, Hiller and G.J. Lieberman, Industrial Engineering Series, 1995 (This book comes with a CD containing software)

3- G. Hadley , Linear Programming, Narosa Publishing House. 1995.

4- G. Hadley, Linear and Dynamic programming, Addison - Wesley

5- H.A. Taha, Operations Research - An introduction, Macmillan Publishing co. Inc. .

6- Prem Kumar Gupta and D.S. Hira, Operation Reasearch, an Introdution, S. Chand & Company Ltd.

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

<u>**SEMESTER IV**</u>

Paper V (MAT-E405-B) (ELECTIVE-III) Computational Biology- II

Unit-1

  Integer programming, Partition Problems, Traveling Salesman Problem (TSP) simulated annealing Sequence.

Unit-2

  Assembly - Sequencing strategies,

Unit-3

  Traveling Salesman Problem (TSP) simulated annealing Sequence.

Unit-4

  Fragment alignment, Sequence accuracy,

Unit-5

  sequence comparisons Methods - Local and global alignment, Dynamic programming method.

Text Books:-

1-Introduction to Computational Biology by M.S, Waterman Chapman & Hall, 1995.

2-Bio informatics - A practical Guide to the analysis of Genes and Proteins by A. Baxevanis and B. Ouelette, WileyInterscience (1998).

Reference Books:-

1-   Introduction to Bio informatics by Attwood.

2-   Bioinformatics-Sequence and Genome analysis by David W.Mount.

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

SEMESTER IV

Paper V (MAT-E405-C) (ELECTIVE-III) Fluid Mechanics- II

Unit-1

Motion of a sphere through agapsquid at rest as infinity. equation of motion of a sphere, stress components in a real fluid.

Unit-2

Relations between rectangular components of stress convection between streses and gradients of velocity,

Unit-3

plane Poiseuille and coquette flows between two parallel plate, flow through tubes of uniform, cross - section in the former of circle, annulus under constant pressure gradient.

Unit-4

Dynamical similarity, Reynolds number, Prandt's boundary layer, boundary layer equations in two dimension, blasius solution

Unit-5

boundary layer thickness, displacement thickness, Karman itegral conditions, separation of boundary layer flow.

Text Books.

1- A text book of Fluid Mechanics in SI units by R.K, Rajput.

2- An introduction to Fluid Dynamics by R.K. Rathy, Oxford and IBH Published Co.

Reference Books:

1- Fluid Mechanics (Springer) By Joseph H. Spurk.

2- Fluid Mechanics by Irfan A Khan (H.R.W.)

3- An Introduction to Fluid Mechanics by G.K. Batchelor, Foundation Books, , 1994.

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

SEMESTER IV

Paper V (MAT-E405-D) (ELECTIVE-III) Bio-Mechanics- II

Unit-1

Solution of steady state and Unsteady - state flow problems in one dimesion, application of finite element method and exact solutions.

Unit-2

Diffusion processes in biology ; diffusion in Tissue Fick's principle,

Unit-3

One, two and three Dimensional diffusion problems and their solution, Water Transport, Diffusion through membranes.

Unit-4

Respiratory Gas Flows, flow in Airways, Interaction Between convection and diffusion Exchange between Alvoelar Gas and Erythrocytes,

Unit-5

Pulmonary function Test, Dynamics of Ventilation system.

Text books:

1- Introduction to Mathematical Biology by S.I. Rubinow, J. Wiley & Sons.

2- Biomechanics by Y.C, Fung, Springer - Verlag.

3- Introduction to Biomathematics by V.P. Saxena, Vishwa Prakashan (Wiley eastern)

Reference Book :-

1- Biofluid Dynamics by Mazumdar.

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

<u>SEMESTER IV</u>

Paper V (MAT-E405-E) (ELECTIVE-III) Analytic Number Theory- II

Unit-1
    Dirichlet series and Euler products,

Unit-2
    the function defined by Dirichlet series, the halfplane of convergence of a Dirichlet series.

Unit-3
    Integral formula for the coefficients of Dirichlet series

Unit-4
    Analytic properties of Dirichilet series, Mean value formula for Dirichilet series.

Unit-5
    Properties of the gamma function, Integral representations of Hurwitz zeta functions, Analytic continuation of Hurwitz zeta function.

Book Rocommneded :
1- T.M. Apostol, Introduction to Analytic Number Theory, Narosa Pub, House, 1989.

Regular
Theory Marks : 60 (Min. 21)
C.C.E. Marks : 40 (Min. 14)

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)

SEMESTER IV

Paper V (MAT-E405-F) (ELECTIVE-III) Integral Transform II

Unit-1

Application of Laplace Transform to Boundary Value Problems.

Unit-2

Electric Circuits. Application to Beams.

Unit-3

The complex Fourier Transform, Inversion Formula, Fourier cosine and sine transform,

Unit-4

properties of Fourier Transoforms, Convolution & Parseval's identity

Unit-5

Fourier Transform of the derivatives, Finite Fourier Sine & Cosine Transform, Inversion Operational and combined properties Fourier transform.

Books recommended :-

[1]   Integral Transforms by Goyal & Gupta.

[2]   Integral Transforms by Sneddon

Regular	
Theory Marks : 60 (Min. 21)	
C.C.E. Marks : 40 (Min. 14)	

M.Sc. Mathematics

Under CBCS (Only for School of Studies in Mathematics)
<u>SEMESTER IV</u>

Paper VI (MAT-E406) (ELECTIVE-IV) Tourism Management

UNIT I: Introduction

Concept of tourism & importance in economy, types of tourism, tourism in Madhya Pradesh history and development ,Geography, Climate, Forest , River and Mountain.

UNIT II: Overall Scenario

Present scenario, planning, development and opportunities. Social and Economical impact of tourism, role of public and private sector in the promotion of tourism.

UNIT III: Tourism Resources

Physical and Biographical ,Tourist satisfaction and service quality-Transport accommodation, other facilities and amenities available in Madhya Pradesh. Role of tourist service provider, heritage site in M.P.

UNIT IV: Financial aspects of Tourism

Requirements of capital investment, sources of finance, Madhya Pradesh State Tourism Development Corporation Limited - funds, finance, policies, packages and its role for the development of tourism in Madhya Pradesh.

UNIT V: Practical training

Case studies of popular tourist places and tourist statistics in Madhya Pradesh, Analytical studies of tourist arrivals trends.

Books recommended :-
1. Ancient Geography of M.P-Bhattacharya D.K
2. All district Gazettes of M.P
3. Tourism planning -Gunn. Clare A