

Shri Shivaji Education Society Amravati's

**SHRI SHIVAJI SCIENCE AND ARTS COLLEGE , CHIKHALI , DIST BULDANA**

NAAC Reaccredited with ' B++' Grade (CGPA-2.82)

**DEPARTMENT OF MATHEMATICS**

**SYLLABUS**

*(Prescribed by Sant Gadge Baba Amravati University ,Amravati)*

**B.Sc.Part-III (Semester-V)**

**MATHEMATICS I :\_ Mathematical Analysis**

Unit I	Continuity and differentiability of complex function, Analytic function, Cauchy-Riemann equations, Harmonic and conjugate functions, Milne-Thomson method.
Unit II	Elementary function, Mapping by elementary function, Mobius transformation, Fixed point, Cross ratio, Inverse and critical points, Conformal mapping.
Unit III	Riemann Integral : Integrability of continuous and monotonic functions , The fundamental theorem of integral calculus, Mean value theorem of integral calculus.
Unit IV	Improper integrals and their convergence, Comparison and limit tests.
Unit V	Metric spaces : Definition and examples of metric spaces, Neighbourhood , Limit point, Interior point, Open and Close sets, Cauchy sequences.

**REFERENCE BOOKS :**

- 1] V.A. Sharma, V.R. Patil, S.R. Bhoyar, G.U. Khapekar, A.N. Rangari, V.J. Gaikwad, R.M. Dhaigude : A Text Book of Mathematical Analysis, Dnyanpath Publication, Amravati, First edition 2022.
- 2] T. M.Karade,J.N.Salunke,M.S.Bendre,S.N.Bayaskar,S.A.Salve,S.B.Khobragade : Elements of Mathematical Analysis, Sonu-Nilu Publication, Nagpur, 2024.
- 3] R.R.Goldberg: Methods of Real Analysis, Oxford IBH publishing Co. New Delhi, 1970.
- 4] Walter Rudin : Principles of Mathematical Analysis, International students edition(Third edition)
- 5] T. M. Apostol : Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.,
- 6] S.Lang : Under graduate Analysis, Springer-Verlag New York, 1983.
- 7] D.Somasundaram&B.Choudhari:A First Course in Mathematical Analysis, New Delhi. 1997. 8] Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi.
- 9] P.K.Jain & S.K.Kaushik: An Introduction to Real Analysis, S.Chand & Co. New Delhi, 2000.
- 10] R.V.Churchilnand J.W.Brown, Complex Variables and Applications, 5<sup>th</sup> Edition , McGrawHill ,New York, 1990
- 11] Mark J Ablowitz and : A.S. Fokas, Complex Variable Introduction and Application ,Cambridge University Press, SouthAsianEdition, 1998.
- 12] Shanti Narayan: Theory of functions of Complex Variable,, S.Chand and Co. New Delhi.
- 13] E.T.Copton,: Metric Spaces, Cambridge University Press , 1968.
- 14] P.K.Jain and K.Ahmed,: Metric Spaces, Narosa Publishing House, New Delhi 1996.
- 15] G.F.Simmons: Introduction to Topology and Modern Analysis, Mc Graw Hill, New York, 1963.
- 16] Murray R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Outline Series.
- 17] S.C.Malik and Arora: Mathematical Analysis, Wiley Estern Ltd., New Delhi.

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**DEPARTMENT OF MATHEMATICS****SYLLABUS***(Prescribed by Sant Gadge Baba Amravati University, Amravati)***B.Sc. Part-III (Semester-V)****MATHEMATICS :\_ Mathematical Methods**

Unit I	Legendre's equation, Legendre's polynomials, generating function of $P_n(x)$ , recurrence formulae for $P_n(x)$ , Orthogonality of Legendre's polynomial, Rodrigue's formula.
Unit II	Bessel's equation, Solution of Bessel's equation, Generating function for $J_n(x)$ , Recurrence formulae for $J_n(x)$ .
Unit III	Fourier series, Fourier series for odd and even functions, half-range Fourier sine and cosine series.
Unit IV	<b>Laplace transform</b> : Laplace transform of some elementary functions, Existence of Laplace transform, Properties of Laplace transform, Laplace transform of derivatives and integrals, Multiplication of $t^n$ and division by t, Inverse Laplace transform, Convolution property.
Unit V	<b>Fourier Transform</b> : Finite Fourier sine transform; Inverse finite Fourier sine transform and cosine transform, Infinite Fourier transform, Infinite Fourier sine transform and cosine transform, Properties of Fourier transform.

**REFERENCE BOOKS :**

- 1] V.A.Sharma, V.R.Patil ,S.R.Bhoyar ,G.U.Khapekar, A.N.Rangari, N.K.Puranik, V.D.Jadhao : A Text Book of Mathematical Methods, Dnyanpath Publication, Amravati, First edition 2022.
- 2] T.M.Karade, N.T.Karade, V.G.Mete, I.D.Pawade, K.R.Muley, MinakshiT.Sarode : Mathematical Methods, Sonu- Nilu Publication, Nagpur, 2024.
- 3] Erwin Kreyszig : Advanced Engineering Mathematics, John Wiley and Sons, Inc. New York,1999.
- 4] 4] A. R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd., London.
  - 5] Frank Ayres : Theory and Problems of Differential Equations, McGraw Hill Book Company, 1972.
  - 6] B.Courant and D.Hilbert : Methods of Mathematical Physics,Vol.I&II,Wiley-interscience,1953.
  - 7] I. N. Sneddon : Fourier transform, McGraw Hill Book Co.
- 8] Goel and Gupta : Integral Transforms, Pragati Prakashan, Meerut.
- 9] Rai singhaniya, M. D .,Integral Transform, S. Chand & Co .,N.D.

## Mini-Project Phase-I

Semester-V	Particulars	System of marks and Credit			
		Maximum Marks		Total Credit	Minimum Passing
		Practical Internal	Practical External		
Mini – Project on any innovative topic					
Mini – Project Phase-I	Submission	15	---	1.125	25
	Viva-voce	10	---		
	Presentation	---	15		
	Viva-voce	---	10		
	<b>Total Marks</b>	<b>50</b>		<b>1.125</b>	<b>25</b>

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**SYLLABUS**

*(Prescribed by Sant Gadge Baba Amravati University, Amravati)*

**B.Sc .Part-III (Semester-VI)**

**MATHEMATICS I : \_ Linear Algebra**

Unit	Content
Unit I	<b>Vector space:</b> Definition and example of vector spaces, subspaces, sum and direct sum of subspaces, linear span, linear dependence, independence and their basic properties, basis, finite dimensional vector spaces, existence theorem for bases, invariance of the number of elements of a basis set, dimension.
Unit II	<b>Linear transformations :</b> Linear transformation and their representation as matrices ,algebra of linear transformations, rank-nullity theorem, change of basis.
Unit III	<b>Dual Spaces:</b> Dual space, bi dual space and natural isomorphism, ad joint of a linear transformation, Eigen values and eigen vectors of a linear transformation.
Unit IV	<b>Inner Product Spaces :</b> Inner product spaces , Cauchy- Schwarz inequality , orthogonal Vectors , orthogonal complements, ortho normal sets and bases , Bessel's inequality for finite dimensional spaces, Gram-Schmidt orthogonalization process.
Unit V	<b>Modules :</b> Modules , sub modules , quotient modules , homo morphism and isomorphism theorems.

## REFERENCE BOOKS :

- 1] T. M. Karade , Vidya N. Mahalle , V.D .Elkar , P. P. Khade, S. L. Munde, A. S. Bansod : Introductory Linear Algebra, Sonu Nilu Publication, Nagpur. 2024.
- 2] I. N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
- 3] N.Jacobson : Basic Algebra, Vol.I and II W. H. Freeman, 1980 (Hindustan Publishing Co.)
- 4] .Shanti Narayan : A Text Book Of Modern Abstract Algebra, S. Chandand Co., New Delhi.
- 5] B. Datta : Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd. New Delhi, 2000
- 6] P. B.Bhattacharya,S.K.JainandS.R.Nagpal:BasicAbstractAlgebra(IIIndEdition)Cambridge University Press Indian Edition,1997.
- 7] K.HoffmanandR.Kunze,;LinearAlgebra,IIIndEditionPrenticeHall,EnglewoodCliffs,NewJe rsey,1971.
- 8] ]S. K. Jain, A Guna wardhana and P. B. Bhattacharya : Basic Linear algebra with MATLAB, Key College Publishing(Springer-Verlag),2001.
- 9]S.Kumaresan :Linear Algebra ,A Geometric Approach, P Prentice Hall of India Pvt. Ltd. New Delhi, 2000
- 10] Vivek Sahai and Vikas Bisht : Algebra, Narosa Publishing House, 1997.
- 11] D. S. Malik , J. N. Mordeson and M. K. Sen : Fundamentals of Abstract Algebra, McGraw Hill International Edition1997.
- 12] Joseph A. Gallian : Contemporary Abstract Algebra, Narosa publishing house.
- 13] P. B. Bhattacharya, S. K. Jain and S. R. Nagpaul : First Course in Linear Algebra.
- 14] V. Krishnamurty, V. P. Mainru, J. L. Arrora :An Introduction to Linear Algebra.

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**B.Sc.Part-II (Semester-VI)**

**MATHEMATICS :\_ Special Theory of Relativity**

Unit	Content
Unit I	<b>Review of Newtonian Mechanics :</b> Inertial frames, Speed of light and Galilean relativity, Relative character of space and time, Postulates of Special theory of relativity, Lorentz Transformation and its geometrical interpretation. Group properties of transformation.
Unit II	<b>Relativistic Kinematics :</b> Composition of parallel velocities , Length contraction, Time Dilation, Transformation equation for components of velocities and acceleration of a particle, Lorentz contraction factor, The thermodynamics of moving systems: The two laws of thermodynamics for a moving system, The Lorentz transformation for thermodynamics quantities a) volume and pressure b) energy c) work d) heat e) entropy f) temperature.
Unit III	<b>Geometrical Representation of Space-Time :</b> Four dimensional Minkowskian space-time of relativity, Time like and space like intervals, Proper time, World line, Four vectors and Tensors in Minkowskian space- time ,Past ,Present and future null cone ,Basic tensors ,Covariant, Contravariant, Mixed, Operations on tensors, Outer product, Inner product, Quotient law.
Unit IV	<b>Relativistic Mechanics :</b> Variation of mass velocity, Equivalence of mass and energy, Transformation equations for mass, momentum and energy, Relativistic force and transformation equations for its components, The energy momentum tensor.
Unit V	<b>Electromagnetism :</b> Maxwell's equation of electromagnetic theory in vacuum, Propagation of electric and magnetic field strengths, Scalar and vector potential, Transformation of electromagnetic four potential vector, Transformation of charged density and current density, Lagrangian for a charged particle in electromagnetic field, The force on a moving charged, Lorentz force, Gauge transformation, Four-dimensional formulation of the theory,  <b>Maxwell's equation in tensor form, transformation for electric and magnetic field strength, energy momentum tensor of the electromagnetic field, Component of inter electric and magnetic strength.</b>

## Mini – Project Phase-II

Semester-VI	Particulars	System of marks and Credit			
Mini – Project on any innovative topic		Maximum Marks		Total Credit	Minimum Passing
		Practical Internal	Practical External		
Mini-Project Phase-II	Submission	15	---	1.125	25
	Viva-voce	10	---		
	Presentation	---	15		
	Viva-voce	---	10		
	<b>Total Marks</b>	<b>50</b>		<b>1.125</b>	<b>25</b>