FOURTH YEAR UNDER GRADUATE PROGRAM(NEP-2020)

Program: Bachelor of Science (2024-28) DISCIPLINE- MATHEMATICS Session-2024-25

DSC -01 to08		DSE-0	DSE-01to12		DGE-01&02		
Code	Title	Title Code		Code	Title		
MASC-01	Elementary Calculus	MASE-01	Advanced Calculus				
MASC-02	Algebra	MASE-02	Mechanics	MAGE-01 MAGE-02	Elementary Calculus Algebra		
MASC-03	Differential Equations	MASE-03	Numerical Methods	WAGE-02	Algeora		
MASC-04	Abstract Algebra		Number Theory	SEC			
MASC-05	Real Analysis		Integral Transforms	MASEC-01	Introduction to Latex		
MASC-06	Metric Spaces		Topology	MASEC-01 MASEC-02	Python		
MASC-07	Advanced Real Analysis	MASE-07	Complex Analysis - I	WASEC-02			
MASC-08	Advanced Abstract Algebra	MASE-08	Discrete Mathematics	VAC			
		MASE-09	Measure Theory	MAVAC-01	Basic Mathematics and Logic		
			General and Algebraic Fopology				
			Complex Analysis - II				
		MASE-12	Graph Theory				

Program Outcomes(PO):

PO1: Ability to develop scientific temper and acquire in-depth knowledge of algebra, calculus, real analysis, complex analysis, topology and several other branches of mathematics. This program helps learners in building a solid foundation for higher studies in mathematics.

PO2:Utilize mathematics to solve theoretical and applied problems by critical thinking, understanding, analysis and synthesis.

PO3. The skills and knowledge gained has intrinsic beauty, which also leads to proficiency in analytical reasoning. This can be utilized in modeling and solving real life problems.

PO4. Ability to apply mathematical tools in Physics, Economics, Optimization and other subjects it will also develop understanding the architecture of curves and surfaces in plane and spaces etc.

PO5. This program will also enable the learners to join teaching profession in schools and this will help the students to enhance their employability for government jobs, jobs in banking insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

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(Cert 1 0 2 0 3 0	ogram: Bachelor in Science tificate/Diploma/Degree/Honors) Course Code	Semester - I				
2 (3 (Course Code		Session:2024	-2025		
3 (Course Code MASC-01				
	Course Title	Elem	entary Calculus			
4 1	Course Type		DSC			
	Pre-requisite(if any)	Knowledge of basic Differen				
5 0	Course Learning Outcome	This Course will enable th	a students to			
	(CLO)	Know about ancient Indian	Nothematician 1.1	· · · · ·		
		> Calculate the limit and ar	i mathematicians and the	ir contribution		
		Calculate the limit and example a construction	affiline the continuity and	understand th		
		geometrical interpretation to determine convergence.	of differentiability. App	ly various test		
		 Understand the consequence. 	<u> </u>			
		 Understand the consequence Understand concents of Conservation 	es of various mean value	theorems.		
		 Understand concepts of Cu Draw curves in Content 	rvature and Asymptotes	•		
		 Draw curves in Cartesian a Understand the classical 	 Draw curves in Cartesian and polar coordinate systems Understand the systems 			
		Understand the elementary integration of transcendental function				
. (Credit Value	s of reduction formulae.				
	Total Marks	4 C 1Credit =	= 15 hours- Learning and	observation		
_		Maximum Marks : 100	Minimum Passing 1	Marks:40		
otal r	B: Content of the Course					
UNIT	no of teaching – learning peri					
		Topics phy of Indian Mathematician		No of Periods		
	Bodhayan, Apasthamb,	Katyayan, Mahaveeracharya				
	Bhaskarachaya in special co	ntext of Leelavati	a, Brahmagupta and			
I	Sequences, Continuity and	15				
	Notion of convergence of	Sequences and series of real and to be a set				
	und continuity of a lea	Valued minchon. Ditterentiab	ility and its geometrical			
	Pretation. Elementary D	ifferentiation.	0			
	Expansion of Functions: Rolle's Theorem Lagrange'	6 maan 1 /1				
Π	and their geometrical inter	s mean value theorem, Cauchy	's mean value theorem	15		
	theorem, Maclaurin's and Ta	pretations, Successive difference ylor's theorems for expansion	entiation and Leibnitz	15		
_	Curvature, Asymptotes, C	Urve Tracing.				
	Curvature; Asymptotes of	Parallal agreents				
III		S. SVIIIMerry Conceptity and	D · · ·	15		
	angoins at one	III. WIIIITIDIE Dointe Position	and nature of double	15		
	Points, Huenig of Caltestall,	polar and parametric curves.				
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IV	Eleme	ration: entary integration, Integration of Transcendental function, Reduction lae, Definite integral.	15		
Part	C - Lear	rning Resource			
		Text Books, Reference Books, Other Deserves			
Text E	Books Rec	Jummended-			
1.	Howard	Anton, I. Bivens& Stephan Davis (2016). Calculus (10th edition). Wiley India.			
	CHOILDI	Chambauor (1700), Aspects of Calculus Springer V. 1			
5.	wiesiaw	Krawcewicz & BindhyachalRai (2003) Calculus with Martin Land			
	e e i uniti i	(2010). Differential Calculus (19th edition) Pothishels Det 11			
	HCC DUUK	s Recommended-			
5.	George E	3. Thomas Jr., Joel Hass, Christopher Heil& Maurice D. Weir (2018).			
	1110	mas Calculus (14th edition). Pearson Education			
6.	Jerrold N	Marsden, Anthony J. Tromba& Alan Weinstein (2009). Basic Multivariabl			
	Calculus,	Springer India Pvt. Limited.	e		
7.	James Ste	ewart (2012). Multivariable Calculus (7th edition). Brooks/Cole. Cengage.			
8.	Monty J.	Strauss, Gerald L. Bradley & Karl J. Smith (2011). Calculus (3rd edition)			
	Pear	son Education. Dorling Kindersley (India) Pvt. Ltd.			
-resou	rces: htt	tps://onlinecourses.nptel.ac.in			
	htt	ps://epqp.inflibnet.aci.in			
	htt	ps://swayam.gov.in			
		ps://www.mooc.org			
Part I). A goog	ps.//www.mooc.org			
Sugges	ted Cont	sment and Evaluation			
Maxim	um Mar	inuous Evaluation Methods:			
		100 Marks			
End Sa	emester F	Womin officer (MICH)			
ontinu	ous Inter	To Marks			
ssessm	ent (CIA)	Assignment/Seminar 10 Marker Dettor marks out of two test	/quiz +		
Conducte	ed by cours	se teacher) Obtained marks in Assignme	nt shall		
	mester	Two Section-A&B be considered against 30 ma			
Examin	ation	Section-A: Q1.Objective- 10x1=10 marks O2. Short answer type question 5-4	a o 1		
ExaminationSection-A: Q1.Objective- 10x1=10 marks Q2. Short answer type question-5x4=20marksESE)Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks					

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FOUR YEAR UNDER GRADUATE PROGRAM(2024-28) DEPARTMENT OF MATHEMATICS

COURSE CURRICULUM

: Introduction			
ficate/Diploma/Degree/Honors)	Semester - II	-	Session:2024-2025
Course Code			MASC-02
			Algebra
Pre requisite	Knowledge of ba	Discipline S	pecific Course (DSC)
Course Learning Outcome (CLO)	 Learn about th Understand Se Learn about th Learn about th Learn about Subgroups. 	l enable the e Matrix all t theory, Fu e theory of the fundar	e students to: gebra. unction and Relation equations. nental concepts of groups,
Credit Value	4 C		1Credit = 15 hours- Learning and
Total Marks	Maximum Marka	. 100	Observation Minimum Passing Marks:40
	h: Bachelor in Science ficate/Diploma/Degree/Honors) Course Code Course Title Course Type Pre requisite Course Learning Outcome (CLO) Credit Value	h: Bachelor in Science Semester - II Ficate/Diploma/Degree/Honors) Course Code Course Code I Course Title I Course Type I Pre requisite Knowledge of ba Course Learning Outcome This Course will (CLO) Learn about th > Learn about th Learn about th > Learn about th Learn about cose Credit Value 4 C	h: Bachelor in Science Semester - II Ficate/Diploma/Degree/Honors) Course Code Course Code Discipline S Course Title Discipline S Course Type Discipline S Pre requisite Knowledge of basic algebra Course Learning Outcome (CLO) This Course will enable theory, Fu > Learn about the Matrix alg Understand Set theory, Fu > Learn about the theory of Learn about the fundar Subgroups. Understand cosets and nor Credit Value 4 C

Part B:	Content of the Course	
Total no	of teaching – learning period =60 Periods (60 Hours)	
UNIT	Topics	
Ι	Matrix Algebra : Introduction, elementary operations of matrices, Inverse of a matrix. Special types of matrices: Transpose of a matrix, Symmetric and Skew symmetric matrices, Hermitian and Skew Hermitian matrix, Rank of a matrix, Echelon form of a matrix, Normal form, Application of matrices to a system of linear (both homogeneous and non-homogeneous) equations , Theorems on consistency of a system of linear equations. Eigen values and Eigen vectors, relation between Eigen values and Eigen vectors. Process of finding Eigen values and Eigen vectors, Cayley Hamilton theorem and its use in finding immune for the system of the	
II	Sets Theory & Functions: Sets, subsets Set operations and the laws of set theory and Venn diagrams. Examples of finite and infinite sets. Finite sets and counting principle. Empty set, properties of empty set. Standard set operations. Classes of a set. Power set of a set. Difference and symmetric difference of two sets. Set identities, Generalized union and intersection. Relations and Functions: Product set, Composition of relations, Types of relations, Partitions, Equivalence Relations with example of congruence modulo relation, Partial ordering relations. Function, Types of Function, Inverse Function, Composite of functions, Modular arithmetic and basic properties of congruences	15

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ш	Theory of equations: Symmetric functions of the roots of an equation Root of a multiplicity, Synthetic division, Greatest common Divisors, Relation between the roots and coefficients of general polynomial equations in one variable. Transformation of equations. Descarte's rule of signs. Solutions of cubic equations (Cardon method), Biquadrate equation.	15
IV	Group Theory: Definition and properties of a group, Abelian groups, Examples of groups, Subgroups and examples, Cosets and their properties, Lagrange's theorem and its applications, Normal subgroups and their properties, Simple groups, Factors groups.	15

Text Books, Reference Books, Other Resources

Text Books Recommended-

- 1. RamjiLal (2017). Algebra 1: Groups, Rings, Fields and Arithmetic. Springer.
- 2. Nathan Jacobson (2009). *Basic Algebra* I (2nd edition). Dover Publications
- 3. John B. Fraleigh (2007). A First Course in Abstract Algebra (7th edition). Pearson

Reference Books Recommended-

- 4. Michael Artin (2014). Algebra (2nd edition). Pearson.
- 5. Stephen H. Friedberg, Arnold J.Insel& Lawrence E. Spence (2003). Linear Algebra (4thedition). Prentice-Hall of India Pvt. Lt
- Joseph A. Gallian (2017). Contemporary Abstract Algebra (9th edition). Cengage.
 Kenneth Hoffman & Ray Kunze (2015). Linear Algebra (2nd edition). Prentice-Hall.
- 8. I. N. Herstein (2006). *Topics in Algebra* (2nd edition). Wiley India.

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E-resources: http	s://onlinecour	/onlinecourses.nptel.ac.in					
http	s://epqp.inflibr	net.aci.in					
http	s://swayam.go	v.in					
<u>http</u>	s://www.mooc	.org					
Part D: Assess	ment and H	Evaluation					
Suggested Conti							
Maximum Mark			100 Mar	ks			
Continuous Inte	rnal Assessme	nt (CIA):	30 Marks				
End Semester E	xamination (F	CSE):	70 Marks	S			
Continuous Intern	nal	Test /Quiz -	20+20 Marks	Better marks out of two test/quiz +			
Assessment (CIA)		Assignment/Seminar- 10 Marks		obtained marks in Assignment shall			
(Conducted by cours	e teacher)			be considered against 30 marks			
End Semester Two Section-A&B							
Examination	Section-A:	Q1.Objective- 10x	1=10 marks Q2. Sh	nort answer type question-5x4=20marks			
(ESE)	Section-B: I	Descriptive answe	r type question, 1 o	ut of 2 from each unit- 10x4= 40 Marks			

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FOUR YEAR UNDER GRADUATE PROGRAM (2024-28)

DEPARTMENT OF MATHEMATICS

COURSE CURRICULUM

Pa	rt A: Introduction		-			
Pr (Di	ogram: Bachelor in Science ploma/Degree/Honors)	Semester - III		Session:2024-2025		
1	Course Code			MASC-03		
2	Course Title			Differential Equations		
3	Course Type	Ι		pline Specific Course (DSC)		
4	Pre-requisite(if any)	Knowledge of basic Differential and Integral calculus and differential equation.				
5	Course Learning Outcome (CLO)	 solvable fir equations o Understand differential Learn abou equations u Know how 	ous t st or f sec the equa it so sing to	rechniques of getting exact solutions of certain rder differential equations and linear differential cond order. e genesis of ordinary as well as partial		
6	Credit Value	4 C	iui C	1Credit = 15 hours- Learning and Observation		
7	Total Marks	Maximum Marks : 1	00	Minimum Passing Marks:40		

Part B: Content of the Course

Total no of teaching – learning period =60 Periods (60 Hours)							
UNIT	Topics	No of Periods					
Ι	Contributions and Biography of Indian Mathematicians: Aryabhatta, Varahmihir, Bhaskar-I, Shreedharacharya, Shreepati and Parmeshwar. First Order and higher degree Differential Equations : Differential equations of first order and first degree, Equations in which variables are separable, Homogeneous equations, Linear differential equations and equations reducible to linear form, Exact differential equations, Integrating factor, First order higher degree equations solvable for x, y and p, Clairaut's form and singular solutions, orthogonal trajectories.	15					
Π	Linear and Ordinary simultaneous differential equations: Linear differential equations with constant coefficients, Homogeneous linear ordinary differential equations. Linear differential equations of second order.Transformation of the equation by changing the dependent variable/the independent variable.Method of variation of parameters. Ordinary simultaneous differential equations.	15					
III	First order Partial differential equations: Lagrange's solution, Some special types of equation which can be solved by methods other than general method, Charpit's general method of solution.	15					

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IV	Second and higher order Partial differential equations: Classification of Linear partial differential equation of second order, Homogeneous and non-homogeneous equation with constant coefficients, Partial differential equation reducible to equation with constant coefficients. Monge's Method.	
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Text Books, Reference Books, Other Resources

Text Books Recommended-

Dr. M. D. Rajsinghania, Ordinary and partial Differential Equation ,S. Chand and company Pvt.Ltd. 1. A.H. Siddiqi and P. Manchanda, A first course in Differential Equations with 2. Applications. Macmillan India Ltd.

Reference Books Recommended-

- Erwin Kreyszig (2011). Advanced Engineering Mathematics (10th edition). J. Wiley & Sons 3. B. Rai& D. P. Choudhury (2006). Ordinary Differential Equations - An Introduction. Narosa 4. Publishing House Pvt. Ltd. New Delhi.
- Shepley L. Ross (2007). Differential Equations (3rd edition). Wiley. 5.
- George F. Simmons (2017). Differential Equations with Applications and Historical Notes (3rd 6. edition). CRC Press. Taylor & Francis. 7.
- Ian N. Sneddon (2006). Elements of Partial Differential Equations. Dover Publications.

https://onlinecourses.nptel.ac.in E-resources: https://epqp.inflibnet.aci.in https://swayam.gov.in https://www.mooc.org

Part D: Assessment and Evaluation								
Suggested Con	Suggested Continuous Evaluation Methods:							
Maximum Mar	rks:	anation methous:						
Continuous Internal Assessment (CIA): 100 Marks 30 Marks								
End Semester	End Semester Examination (ESE): 70 Marks							
Continuous Inter Assessment (CIA	Continuous Internal		20+20 Marks	Better marks out of two test/quiz +				
(Conducted by cour	() rse teacher)	Assignment/Sem	inar- 10 Marks	obtained marks in Assignment shall be				
End Semester	Two Secti	on-A&B		considered against 30 marks				
Examination	Examination Section-A: Q1.Objective- 10x1=10 marks O2 Short answer trans and the first operation							
(ESE)								
Ji Australi, Four of 2 Hom each unit- 10x4= 40 Marks								

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Dent		COURSE CUR	RICULUM			
Part A	: Introduction					
Progra	m: Bachelor in Science	e Semester - IV Session:2024-2			025	
	a/Degree/Honors)				025	
2	Course Code		MASC-04			
3	Course Title		Abstract	Algebra		
4	Course Type	D	iscipline Specifi	ic Course (DSC)		
5	Rnowledge of algebra, vector space and inner product space					
2	Course Learning	Understand of Homon	10rphism, Isomorr	nhism of Group		
	Outcome (CLO)	Understand Cyclic and	d Permutation (Troung		
		Understand vector	spaces, subsp	baces, basis, dim	ension and their	
		properties.				
		Learn about properties theorems	erties of linear	transformation	and isomorphism	
2		cheorenno.			inter itemetiphism	
6	0 14 14 1	➤ Understand the conce	ept of linear trans	sformations.		
7	Credit Value	4 C	1Credit = 15 I	hours- Learning an	d Observation	
<u> </u>	Total Marks	Maximum Marks: 100	M	linimum Passing M	larks:40	
Part B:	Content of the Co	ourse				
Total no	of teaching – learning	g period =60 Periods (60) Hours)			
UNIT		Topics				
	Isomorphism Theor	rems. Cyclic and Perm	utation Groups		No of Periods	
I	Isomorphism Theorems , Cyclic and Permutation Groups : Group homomorphism and isomorphism with properties; First, second and third isomorphism theorem.					
	and isomorphism	incorems for groung	Victic ground		15	
	Chassifications of	subgroup of evelue of	round Permuta	and properties,		
	properties, Even and	Oud permutations (avie				
	King, Field and Inte	gral Domain Ideale				
	Definition and prop	erties of a ring exam	ple of rings S	ubrings Integral		
TT	additional and mondo, on					
II	Indeals and Outlen					
	- Duonacan Kings, Fin	VIIOIIIIIIII RINGE Volumom	inla arrest 1 D		15	
	Libenotoni Critorion.	FUIVIIOIIIIAI RINGE OVE	r (ammitations	D' TT ·		
	factorization domain.	R unique factorization	so is R [v1 v2			
	····· All].		pilos	55 15 IC [AI, AZ		
	Vector Spaces:					
	Definition and ex	amples of vector spaces	S. Subspaces Su	Im and direct		
TTT	Sum of Subspaces. LI	- 1 et - 1				
III	basic properties. Ba	ISIS. Finite dimensional	Vector grace	Do Davist		
	incoroni ior bases. II	ivariance of the number	r of elementa a	falst	15	
	Dimension. Existence	of complementary subs	nace of a subspo	an of a finite		
	annensional vector sp	ace. Dimension of sums	of subspaces. O	uotient space		
	and its dimension.		X			

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	Linear Transfor	rmation					
IV	Linear transform	ations and their representation					
	linear transforma	tions and their representation as m	atrices. The Algebra of	15			
	Bi-dual space and	transformations. The rank nullity theorem. Change of basis. Dual space.					
Part C - I	earning Reso	a natural isomorphism. Adjoint of a li	near transformation.				
I MITC - L	Rai mig Reso						
Text Books	Recommended-	Text Books, Reference Books, Oth	er Resources				
1	Nathan Jacobsor	(2000) $P_{\rm res}$ $(1 + 1)$ X (and $(1 + 1)$					
2	Nathan Jacobson	n (2009). Basic Algebra I (2 nd edition)	. Dover Publications.				
Reference B	ooks Recommen	<u>a (2009). Basic Algebra II (2nd edition)</u>). Dover Publications.				
3	I M Gel'fond (1						
J. 4	Kenneth Uoffma	989). Lectures on Linear Algebra. De	over Publications.	-			
	ixenneur riomna	I & Kav Klinze (2015) Lingar Alash	wa (and the bar	Hall.			
	20160 Lung (200.	J. Introduction to Linear Algebra (2)	adition) Carling T 1				
0.	Choose Strang (2	014). Linear Algebra and its Applicat	tions (2 nd edition). Elsevier				
E-resources:		courses.nptel.ac.in					
	https://epqp.in	flibnet.aci.in					
	https://swayam						
	https://www.m						
2							
Part D: A	ssessment an	d Evaluation		¥			
Suggested C	Continuous Eval	uation Methods:		3			
Maximum I	Marks:		r				
	Internal Assess	ment (CIA): 20 M					
End Semes	ter Examination						
Continuous I	Continuous Internal The 10 that As						
Assessment (CIA)		Test /Quiz – 20+20 Marks Assignment/Seminar- 10 Marks	Better marks out of two	test/quiz +			
(Conducted by	course teacher)	1001giment/Semmai- 10 Warks	obtained marks in Assig	nment shall be			
End Semeste	er Two Secti	on-A&B	considered against 30 m	arks			
Examination			The set set of the set				
(ESE)	Section-R	Q1.Objective- 10x1=10 marks Q2. S	snort answer type question	n-5x4=20marks			
	D.	Descriptive answer type question, 1	out of 2 from each unit-1	0x4= 40 Marks			

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FOUR YEAR UNDER GRADUATE PROGRAM (2024-28) DEPARTMENT OF MATHEMATICS COURSE CURRICULUM Part A: Introduction

Tart A: Introduction			
Program: Bachelor in Science (Degree/Honors)	Semester - V	Session:2024-2025	
1 Course Code	8	MASC-05	
2 Course Title			
3 Course Type	Die	Real Analysis	
4 Pre-requisite(if any)	Knowledge of algebra, calculus.	real numbers, set theory, functions and elementary	
5 Course Learning Outcome (CLO)	 This Course will enable the students to: Understand basic properties of real number system such as least upper bound property and Order property. Realize importance of bounded, convergent, Cauchy and monotonic sequences of real numbers, find their limit superior and limit inferior. Learn about Riemann integrability of bounded functions and algebra of R-integrable functions. Determine various applications of the fundamental theorem of integral calculus. Relate concepts of uniform continuity, differentiation, integration and uniform convergence 		
6 Credit Value	4 C	1Credit = 15 hours- Learning and Observation	
7 Total Marks	Maximum Marks : 100	Minimum Passing Marks:40	

Part B: Content of the Course			
Total r	10 of teaching – learning period =60 Periods (60 Hours)		
UNIT	Topics		
	Contributions and Biography of Indian Mathematicians	No of Periods	
	Swami Bharati Krishna Tirth, Madhav, NeelkanthSomayaji and ShrinivaasAayangarRamanujan Real Numbers :		
I	The set of real numbers R as an ordered field, Least upper bound properties of R, Metric property and completeness of R, Archimedean property of R, Dense subsets of R, Nested intervals property; Neighborhood of a point in R, Open sets, limit point of a set, closed and perfect sets in R.	15	
п	Convergence of sequences in R: Bounded and monotonic sequences, Convergent sequence and its limit, Limit theorems, Monotone convergence theorem, Subsequences, Bolzano-Weierstrass theorem, Limit superior and limit inferior, Cauchy sequence, Cauchy's convergence criterion.	15	
III	Infinite Series: Convergence and divergence of infinite series of positive real numbers, Necessary condition for convergence, Cauchy criterion for convergence; Test for	15	
A	Divergence; Test for		

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	convergence of positive term series; Basic comparison test, Comparison test, D'Alembert's Ratio test, Cauchy root test, Raabe's test, Logarithmic test, Cauchy Integral test, Alternating series, Leibnitz's test, Series of arbitrary terms, Absolute and conditional convergence, Rearrangement of series and Riemann's theorem.	
IV	Riemann Integration and Improper Integrals: Riemann integrability of bounded functions, Examples of R- integrable and non- integrable functions, Algebra of Riemann integrable functions, Integrability of continuous and monotonic functions, Darboux theorems, Fundamental theorem of integral calculus, Improper Integral.	

Text Books, Reference Books, Other Resources

Text Books Recommended-

- $1. {\rm T.M.Apostol} (2008). Mathematical Analysis: A Modern Approach to Advanced Calculus. Pearson and the contract of the co$ Education.
- 2. Charalambos D.Aliprantis ()OwenBurkinshaw 1998). Principles of Real Analysis. Academic Press

Reference Books Recommended-

- 3. RobertG.Bartle&DonaldR.Sherbert(2015).IntroductiontoRealAnalysis(4thedition).WileyIna.
- 4. GeraldG.Bilodeau, PaulR.Thie&G.E.Keough (2015). An Introduction to Analysis (2ndedition), Jones and BartlettIndiaPvt.Ltd.
- 5. E.Hewitt&K.Stromberg(2013).RealandAbstractAnalysis.Springer-Verlag.
- 6. K.A.Ross(2013). Elementary Analysis: The Theory of Calculus (2nd edition). Springer.
- 7 WalterRudin. Principles of Mathematical Analysis (3rd edition), TataMcGrawHill.

E-resources: https://onlinecourses.nptel.ac.in https://epqp.inflibnet.aci.in https://swayam.gov.in https://www.mooc.org

Part D: Assessment and Evaluation Suggested Continuous Fred

Suggested Continuous Evaluation Methods:				
Maximum Marks:		100 M	arks	
Continuous Inte	rnal Assess	ment (CIA):	30 Ma	
End Semester E	xamination	(ESE):	70 Ma	
Continuous Intern	nal	Test /Quiz -	20+20 Marks	
Assessment (CIA)			minar- 10 Marks	Better marks out of two test/quiz +
(Conducted by cours	e teacher)	rissignment/se	minar- 10 Marks	obtained marks in Assignment shall be
End Semester	/	107		considered against 30 marks
	Two Secti	on-A&B		
Examination Section-A: Q1.Objective-1			0x1=10 marks 02 s	hort answer tree much 5 4 00
Examination (ESE) Section A: Q1.Objective- 10x1=10 marks Q2. Short answer type		short answer type question-5x4=20marks		
(ESE) Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks				

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14	irt A: Introduction			
Pro Sci	ogram: Bachelor in ience (Degree/Honors)	Semester - VI		Session:2024-2025
1	Course Code			
2	Course Title			MASC-06
3				Metric Spaces
4	Course Type		Discipline	e Specific Course (DSC)
5	Pre-requisite(if any)	Knowledge of basi	c real analysis	
	Course Learning Outcome (CLO)	 This Course will enable the students to- Understand concepts of metric, distance, convergence, completeness, compactness, connectedness, Bolzano-Weierstrass property. Apply these concepts to key classes of spaces. Learn to analyze mapping between spaces. Identify the continuity of a function defined on metric spaces homeomorphism. Attain background for advanced courses in real analysis, functional analysis and topology. 		
6	Credit Value	4 C		Credit = 15 hours Loss 101
7	Total Marks	Maximum Marks :	100 N	Credit = 15 hours- Learning and Observation /inimum Passing Marks:40

Part	Part B: Content of the Course				
Total	Total no of teaching – learning period =60 Periods (60 Hours)				
UNIT	Topics	No CD 1			
I	Concepts in metric spaces: Definition and examples of metric spaces, Open spheres and closed spheres, Neighborhoods, Open sets, Interior, exterior and boundary points, Closed sets, Limit points and isolated points, Interior and closure of a set, Boundary of a set, Bounded sets, Distance between two sets, Diameter of a set, Subspace of a metric space.	1			
II	Complete Metric Spaces and Continuous Functions: Cauchy and Convergent sequences, Completeness of metric spaces, Cantor's intersection theorem, Dense sets and separable spaces, Nowhere dense sets and Baire's category theorem, Continuous and uniformly continuous functions, Homeomorphism, Banach contraction principle.	15			
III	Compactness: Compact spaces, Sequential compactness, Bolzano-Weierstrass property, Compactness and finite intersection property, Heine-Borel theorem, Totally bounded sets, Equivalence of compactness and sequential compactness, Continuous functions on compact spaces.	15			
IV	Connectedness: Separated sets, Disconnected and connected sets, Components, Connected subsets of \mathbb{R} , Continuous functions on connected sets.	15			



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		Part C - Learning Resou	Iroo			
]	Text Books, Reference Books, Oth	n ce			
Text Books Recor	nmended-		lei Kesources			
. 1. Mathematica Meerut	. 1. Mathematical Analysis II- Metric Spaces, J N Sharma, Krishna Prakashan Mandir.					
Reference Books	Recommen	ided-				
2. Metric Spaces	s, P K Jain a	nd Khalil Ahmad, New Age Internati Spaces, D Gopal, A Deshmukh, A S	onal, NewDelhi. Randive and S Yadav, CRC Press,			
E-resources:						
https://onlinecourses.nptel.ac.in https://epqp.inflibnet.aci.in https://swayam.gov.in https://www.mooc.org						
Part D: Assess	sment and	l Evaluation				
Suggested Conti Maximum Mark	nuous Eval		larks			
Continuous Inte	rnal Assess	ment (CIA): 30 M				
End Semester E	xamination	(ESE): 70 Ma	the second se			
Continuous Intern Assessment (CIA) (Conducted by cours	e teacher)	Test /Quiz – 20+20 Marks Assignment/Seminar- 10 Marks	Better marks out of two test/quiz + obtained marks in Assignment shall be considered against 30 marks			
End Semester Examination (ESE)	Two Secti Section-A:	Q1.Objective- 10x1=10 marks Q2. S	Short answer type question-5x4=20marks			
(ESE) Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks						

Name and signature of convener & members of CBOS-Do-s. Dashprate Deferhalt (Dr. P. K. Sahn KO

COURSE CURRICULUM			
Part A: Introduction			
Program: Bachelor in Science (Honors/Honors with Research)	Semester - VII	Session:2024-2025	
1 Course Code		MASC-07	
2 Course Title		Advanced Real Analysis	
3 Course Type	Disc	ipline Specific Course (DSC)	
4 Pre-requisite(if any)	Knowledge of basic rea	l analysis, sequence, series	
 4 Pre-requisite(if any) 5 Course Learning Outcome (CLO) At the end of the course, the students will be able to : > Understand the concept of sequences and series of functions, porseries apply the test for their convergence, divergence and ap Abel's and Tauber's theorems. > Understand the concept of functions of several variables a properties of sets of vectors in Rⁿ, maxima and minima of r valued functions from R to R and from Rⁿ to R, concept Integration theory that is closely related to the theory of Euclide spaces and derivatives of functions of several variables. > Understand the concept of Riemann-Stieltjes integral and apply to evaluate definite integrals arising in different fields of scier and engineering. 		ncept of sequences and series of functions, power est for their convergence, divergence and apply i's theorems. concept of functions of several variables and of vectors in \mathbb{R}^n , maxima and minima of real from R to R and from \mathbb{R}^n to R, concept of that is closely related to the theory of Euclidean ives of functions of several variables. oncept of Riemann-Stielties integral and apply it	
Credit Value	4 C	1Credit = 15 hours- Learning and Observation	
Total Marks	Maximum Marks : 100	Minimum Passing Marks:40	

Part B: Content of the Course

Total no of teaching – learning period =60 Periods (60 Hours)			
UNIT	Topics	No of Desite J	
I	The Riemann – Stieltjes Integral: Definition and existence of Riemann-Stieltjes integral, Properties of the Integral, integration and differentiation, the fundamental theorem of Calculus, integration of vector-valued functions, Uniform convergence and Riemann-Stieltjes integration, Rectifiable curves.	No of Periods	
II	Sequence and Series of Functions: Sequences and series of functions, pointwise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, Abel's and Dirichlet's tests for uniform convergence, uniform convergence and continuity, uniform convergence and differentiation, uniform convergence and integration, Weierstrass approximation theorem.	15	
	Functions of Several Variables: Linear transformations, Derivatives in an open subset of R ⁿ , Chain rule, Partial derivatives, interchange of the order of differentiation, Derivatives of higher orders, Taylor's theorem, Inverse function theorem, Implicit function theorem.	15	
	in the second theorem, implicit function theorem.		

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IV	Jacobians, extremum problems and Power Series: Jacobians, extremum problems with constraints, Lagrange's multiplier method, Differentiation of integrals. Uniqueness theorem for power series, Abel's theorem,	15
	Taylor's theorem Tauber's theorems	15

Text Books, Reference Books, Other Resources

Text Books Recommended-

- Principle of Mathematical Analysis By Walter Rudin(3rd edition) McGrawHill, 1976, 1. International student edition.
- 2. Real Analysis By H.L.Roydon, Macmillan Pub.Co.Inc.4th Edition, New York .1962.

References Books Recommended-

- 1. T.M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
- 2. Gabriel Klambauer, Mathematical Analysis, Marcel Dekkar, Inc. New York, 1975.
- 3. A.J. White, Real Analysis; an introduction, Addison-Wesley Publishing Co., Inc., 1968.
- 4. E. Hewitt and K. Stromberg. Real and Abstract Analysis, Berlin, Springer, 1969.
- 5. I.P. Natanson, Theory of Functions of a Real Variable. Vol. 1, Frederick Ungar Publishing Co., 1961.
- 6.A. Friedman, Foundations of Modern Analysis, Holt, Rinehart and Winston, Inc., New York, 1970.
- 7. Serge Lang, Analysis I & II, Addison-Wesley Publishing Company, Inc. 1969.

8..Walter Rudin, Real & Complex Analysis, Tata McGraw-Hill Publishing Co.Ltd. NewDelhi, 1966.

E-resources:				
https	://onlineco			
http	os://epqp.inf	libnet.aci.in		
http	os://swayam	.gov.in		
http	s://www.m	ooc.org		
Part D: Assess	ment and	d Evaluation		
Suggested Contin	nuous Eval	uation Methods:		
Maximum Mark	s:			Marks
Continuous Inter	rnal Assess	ment (CIA):		larks
End Semester Ex	xamination	(ESE):		arks
Continuous Intern	al	Test /Quiz –	20+20 Marks	
Assessment (CIA)			ninar- 10 Marks	Better marks out of two test/quiz +
(Conducted by course		r tosiginnent/ Ser	milai - 10 Marks	obtained marks in Assignment shall be
End Semester	Two Secti	an A & D		considered against 30 marks
Examination				
No	Section-A:	Q1.Objective- 1()x1=10 marks Q2.	Short answer type question-5x4=20marks
(ESE)	Section-B:	Descriptive answ	ver type question,	l out of 2 from each unit- $10x4=40$ Marks

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FOUR YEAR UNDER GRADUATE PROGRAM(2024-25) DEPARTMENT OF MATHEMATICS COURSE CURRICULUM Part A. Intraduct

	Part A: Introduction			
Scie	gram: Bachelor in nce (Honors/Honors with	Semester - VIII	Session:2024-2025	
Rese	arch)			
1	Course Code		MASC-08	
2	Course Title	Ac	lvanced Abstract Algebra	
3	Course Type	Dis	cipline Specific Course (DSC)	
4	Pre-requisite(if any)	Knowledge of Abstract	Algebra	
	Course Learning Outcome (CLO)	 At the end of the course, the students will be able to: Demonstrate capacity for mathematical reasoning through analyzing, Proving and explaining concepts from advanced algebra. Understand the concept of Normal and subnormal series, solvable group, state and prove Jordan-Holder theorem. Understand the concepts of fields, extension of fields and splitting fields of polynomials Create, select and apply appropriate algebraic structures such as Galois extensions, Automorphisms of groups and fixed fields, Fundamental theorem of Galois theory to understand and use the Fundamental theorem of Algebra, solvability of polynomials. Understand the concepts of modules, Noetherian and artinian modules. Prove Wedderburns theorem on finite division rings. 		
6	Credit Value	4 C	1Credit = 15 hours- Learning and Observation	
7	Total Marks	Maximum Marks : 100	Minimum Passing Marks:40	

	Part B: Content of the Course					
Unit	Topics No. of					
I	Counting Principle and Sylow's TheoremHoursGroup-Automorphism, inner automorphism, Automorphism groups and their computations. Conjugacy relation; Normalizer; Counting principle and the class equation of a finite group. Center for Group of prime order. Abelianizing of a group and its universal property ;Sylow's theorems. Sylow's subgroup; Structure theorem for finite Abelian groups.15					
Π	Field TheoryExtension fields; algebraic and transcendental extensions; Separable and inseparable extensions; Perfect fields; Finite fields; Algebraically closed fields.15					
III	Group Series and Galois TheoryNormal and subnormal series; composition series; Jordan-Holder theorem.Automorphism of extensions; Galois extensions; Fundamental theorem ofGalois Theory					
Dr. S. Dashpuer On Ail Ch Minit Dr. S. Dashpuer On Ail Ch Minit (Dr. P. K. Schw) 4000 17						

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Modules

IV

Modules. Submodules Quotient Modules. Homomorphism Isomorphism theorems.Cyclic modules; simple modules; Semi-simple modules; Schuler's lemma; free modules; Noetherian and Artinian modules and rings; Hilbert basis theorem; WedderburnArtin theorem; Uniform modules; primary modules; Noether-Laskar theorem.

15

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Text Books Recommended:

- 1. P.B. Bhattacharya, S. K. Jain, S.R. Nagpaul : Basic Abstract Algebra, Cambridge University press 2. I.N. Herstein : Topics in Albegra, Wiley Eastern Ltd.
- 3. VivekSahai and VikasBist, Algebra, Narosa Publishing House, 1999.

References Books Recommended:

- 1. M.Artin, Algeabra, Prentice -Hall of India, 1991.
- 2. P.M. Cohn, Algebra, Vols. I, II&III, John Wiley & Sons, 1982, 1989, 1991.
- 3. N.Jacobson, Basic Algebra, Vols. I, W.H. Freeman, 1980 (also published by Hindustan Publishing Company).
- 4. S.Lang, Algebra, 3rd edition, Addison-Wesley, 1993.
- 5. I.S. Luther and I.B.S. Passi, Algebra, Vol. I-Groups, Vol.II-Rings, Narosa Publishing House (Vol.1-1996, Vol. II-1999)
- 6. D.S.Malik, J.N.Mordeson, and M.K.Sen, Fundamentals of Abstract Algebra, McGraw-Hill, International Edition, 1997.
- 7. QuaziZameeruddin and SurjeetSingh : Modern Algebra
- 8. I. Stewart, Galois theory, 2nd edition, chapman and Hall, 1989.
- 9. J.P. Escofier, Galois theory, GTM Vol.204, Springer, 2001..
- 10. Fraleigh, A first course in Algebra Algebra, Narosa, 1982.
- 11. K.B. Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.
- 12. S.K.jain, A. Gunawardena and P.B Bhattacharya, Basic Linear Algebra with MATLAB, Key College Publishing (Springer-Verlag),2001.
- 13. S.Kumaresan, Linear Algebra, A Geometric Approach, Prentice-Hall of India, 2000.
- 14. T.Y. Lam, lectures on Modules and Rings, GTM Vol. 189, SpringerVerlag, 1999.

E-resources: https://onlinecourses.nptel.ac.in https://epqp.inflibnet.aci.in https://swayam.gov.in

https://www.mooc.org

Part D: Assessment and Evaluation Suggested Continuous Evaluation Methods: Maximum Marks: 100 Marks Continuous Internal Assessment (CIA): End Semester Examination (ESE):

30 Marks 70 Marks

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Continuous Internal Assessment (CIA) (Conducted by course teacher)		Test /Quiz – Assignment/Ser	20+20 Marks ninar- 10 Marks	Better marks out of two test/quiz + obtained marks in Assignment shall be considered against 30 marks
Examination	Two Secti Section-A Section-B:	Q1.Objective- 10	0x1=10 marks Q2. ver type question, 1	Short answer type question-5x4=20marks out of 2 from each unit- 10x4= 40 Marks

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Pa	Part A: Introduction					
]	Program: Bachelor in Science	Semester - I	Session:2024	-2025		
	ertificate/Diploma/Degree/Honors)					
$\frac{1}{2}$	Course Code	MAGE-01				
2	Course Title		mentary Calculus			
3	Course Type	Gene	eric Elective (GE)			
4	Pre-requisite(if any)	Knowledge of basic Different	ential and Integral calculus			
5	Course Learning Outcome	This Course will enable t	he students to:			
	(CLO)	Know about ancient India	an Mathematicians and the	ir contribution		
		➢ Calculate the limit and ex	xamine the continuity and	understand the		
		geometrical interpretation	n of differentiability. App	ly various tests		
		to determine convergence).			
		> Understand the consequent	nces of various mean value	theorems		
		Understand concepts of C	urvature and Asymptotes			
		> Draw curves in Cartesian	and polar coordinate syste	ms		
		> Understand the elementar	v integration of transcende	ntal function		
		and understand application	ns of reduction formulae	mai function		
6	Credit Value		t = 15 hours- Learning and	observation		
7	Total Marks	Maximum Marks : 100	Minimum Passing			
Par	t B: Content of the Course					
Tota	al no of teaching – learning per	od =60 Periods (60 Hours)				
UN		Topics		No of Periods		
	Contributions and Biogra	phy of Indian Mathematicia	ins:	110 01 1 01 10 43		
		Bodhayan, Apasthamb, Katyayan, Mahayeeracharya Brahmagunta and				
Ι	Bhaskarachaya in special co					
•	Sequences, Continuity and Notion of convergence of	15				
	limit and continuity of a rea					
	interpretation. Elementary I	limit and continuity of a real valued function; Differentiability and its geometrical interpretation. Elementary Differentiation.				
	Expansion of Functions:					
п	Rolle's Theorem, Lagrange	's mean value theorem, Cauch	hy's mean value theorem			
	and their geometrical inte	rpretations. Successive diffe	erentiation and Leibnitz	15		
	theorem, Maclaurin's and Taylor's theorems for expansion of a function					
	Curvature: Asymptotes, (Curvature, Asymptotes, Curve Tracing:				
Ш	Curvature; Asymptotes of general algebraic curves, Parallel asymptotes, Asymptotes parallel to axes; Symmetry, Concavity and convexity, Points of 15					
	inflection, Tangents at original	Asymptotes parallel to axes; Symmetry, Concavity and convexity, Points of inflection, Tangents at origin, Multiple points, Position and nature of double				
	points; Tracing of Cartesian	polar and parametric curves.	and nature of double			
	Integration:					
IV		Elementary integration, Integration of Transcendental function, Reduction				
	formulae, Definite integral.		,	15		
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Dr. S. Dashput Dr. (Dr. P. K. Sahr) 20

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Part C - Lear	ning Resou	rce				
	Text Books, Reference Books, Other Resources					
Text Books Rec	ommended-					
1. Howard	Anton, I. Bive	ens& Stephan Day	vis (2016). Calculus	(10th edition). Wiley India.		
2. Gabriel K	Clambauer (19	986). Aspects of (Calculus. Springer-V	Verlag.		
3. Wieslaw	Krawcewicz	& BindhyachalRa	i (2003). Calculus y	with Maple Labs Narosa		
4. Gorakh P	Prasad (2016).	Differential Calc	ulus (19th edition).	Pothishala Pvt. Ltd.		
Reference Books	s Recommen	ded-				
5. George B	3. Thomas Jr.,	Joel Hass, Christ	opher Heil& Maurie	ce D. Weir (2018)		
Tho	mas' Calculus	(14th edition). P	earson Education.	2010).		
6. Jerrold N	Marsden, Ant	hony J. Tromba	& Alan Weinstein	(2009). Basic Multivariable		
Calculus,	Springer Indi	a Pvt. Limited.		(2009). Dasie Multivariable		
7. James Ste	ewart (2012).	Multivariable Cal	culus (7th edition)	Brooks/Cole. Cengage.		
8. Monty J.	. Strauss, Ger	rald L. Bradley	& Karl I Smith (?	011). Calculus (3rd edition).		
Pears	son Education	. Dorling Kinders	sley (India) Pvt. Ltd	(Siù edition).		
		urses.nptel.ac.in				
	ps://epqp.infli					
	ps://swayam.g					
	ps://www.mo					
Part D: Asses						
Suggested Cont						
Maximum Mar	ks:	ation withous:	100 34			
		nent (CIA):	100 M 30 Ma			
End Semester I	Continuous Internal Assessment (CIA):30 MarksEnd Semester Examination (ESE):70 Marks					
Continuous Inter	Continuous Internal Test/Quiz – 20+20 Marks Better marks out of two test/quiz +					
Assessment (CIA		Assignment/Ser	minar- 10 Marks	obtained marks in Assignment shall		
(Conducted by course teacher) be considered against 30 marks				be considered against 30 marks		
End Semester	Two Section					
Examination (ESE)	10 marks Q2. Short allswel type dilestion-5x4=/(marks)					
(ESE) Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks						

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Part A: Introduction					
Program: Bachelor in Science (Certificate/Diploma/Degree/Honors)		Semester - II Session:2024-2025		Session:2024-2025	
1	Course Code			MAGE-02	
2	Course Title			Algebra	
3	Course Type		Gener	ic Elective (GE)	
4	Pre requisite	Knowledge of ba	asic algebra	, determinants and matrices.	
5	Course Learning Outcome (CLO)	This Course will Learn about th Understand Se Learn about th	l enable the ne Matrix alg et theory, Fu ne theory of the fundar	e students to: gebra. nction and Relation equations. nental concepts of groups,	
6	Credit Value	4 C		1Credit = 15 hours- Learning and	
7	Total Marks	Maximum Marks	s : 100	Observation Minimum Passing Marks:40	

	Content of the Course	
Total no c	of teaching – learning period =60 Periods (60 Hours)	-
UNIT	Topics	No of Period
Ι	Matrix Algebra : Introduction, elementary operations of matrices, Inverse of a matrix. Special types of matrices: Transpose of a matrix, Symmetric and Skew symmetric matrices, Hermitian and Skew Hermitian matrix, Rank of a matrix, Echelon form of a matrix, Normal form, Application of matrices to a system of linear (both homogeneous and non-homogeneous) equations, Theorems on consistency of a system of linear equations. Eigen values and Eigen vectors, relation between Eigen values and Eigen vectors. Process of finding Eigen values and Eigen vectors, Cayley Hamilton theorem, and its use to finding inverse of a matrix.	
	Sets Theory & Functions: Sets, subsets Set operations and the laws of set theory and Venn diagrams. Examples of finite and infinite sets. Finite sets and counting principle. Empty set, properties of empty set. Standard set operations. Classes of a set. Power set of a set. Difference and symmetric difference of two sets. Set identities, Generalized union and intersection. Relations and Functions: Product set, Composition of relations, Types of relations, Partitions, Equivalence Relations with example of congruence modulo relation, Partial ordering relations. Function, Types of Function, Inverse Function, Composite of functions, Modular arithmetic and basic properties of congruences	15

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, III	Theory of equations: Symmetric functions of the roots of an equation Root of a multiplicity, Synthetic division, Greatest common Divisors, Relation between the roots and coefficients of general polynomial equations in one variable. Transformation of equations. Descarte's rule of signs. Solutions of cubic equations (Cardon method), Biquadrate equation.	15
TV/	Group Theory: Definition and properties of a group, Abelian groups, Examples of groups, Subgroups and examples, Cosets and their properties, Lagrange's theorem and its applications, Normal subgroups and their properties, Simple groups, Factors groups.	15

Text Books, Reference Books, Other Resources

Text Books Recommended-

- 1. RamjiLal (2017). Algebra 1: Groups, Rings, Fields and Arithmetic. Springer.
- 2. Nathan Jacobson (2009). Basic Algebra I (2nd edition). Dover Publications
- 3. John B. Fraleigh (2007). A First Course in Abstract Algebra (7th edition). Pearson

Reference Books Recommended-

- 4. Michael Artin (2014). Algebra (2nd edition). Pearson.
- 5. Stephen H. Friedberg, Arnold J.Insel& Lawrence E. Spence (2003). Linear Algebra (4thedition). Prentice-Hall of India Pvt. Lt
- 6. Joseph A. Gallian (2017). Contemporary Abstract Algebra (9th edition). Cengage.
- 7. Kenneth Hoffman & Ray Kunze (2015). *Linear Algebra* (2nd edition). Prentice-Hall.
- 8. I. N. Herstein (2006). Topics in Algebra (2nd edition). Wiley India.

E-resources: <u>https://onlinecourses.nptel.ac.in</u> <u>https://epqp.inflibnet.aci.in</u> <u>https://swayam.gov.in</u> <u>https://www.mooc.org</u>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:					
Maximum Marks	•		100 Mar	2 S	
Continuous Intern	nal Assessme	nt (CIA):	CIA): 30 Marks		
End Semester Ex	amination (F	CSE):	70 Marks	-	
Continuous Interna	al	Test /Quiz -	20+20 Marks	Better marks out of two test/quiz +	
Assessment (CIA)		Assignment/Ser	minar- 10 Marks	obtained marks in Assignment shall	
(Conducted by course	,			be considered against 30 marks	
End Semester	Two Section	n-A&B		ganst 50 marks	
Examination Section-A: Q		Q1.Objective- 10x	1=10 marks O ₂ . Sh	ort answer type question 5x4-20morter	
Examination (ESE)Section-A: Q1.Objective- 10x1=10 marks Q2. Short answer type question-5x2 Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4=			at of 2 from each unit- 10x4= 40 Marks		

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De	n no4	A . Tratus J	COURSE CL	RRICULUM			
Pa		A: Introduction	1				
	Pro	gram: Bachelor in	Semester - III	Session:2024-2025			
	Science						
1		loma/Degree/Honors)					
2	_	Course Code MASE-01					
10.00	_	ourse Title		Advanced Calculus			
3		ourse Type	Di	iscipline Specific Elective (DSE)			
4		e-requisite (if any)	Basic idea of elementa	ry differential and integral calculus			
5		ourse Learning	This Course will ena	able the students to:			
	01	utcome (CLO)	Calculate the line	mit and examine the continuity and u	understand the		
1			concepts of lim	it, continuity and differentiability of	of functions of		
			more than one v	variable with geometrical interpretati	on		
			> To Understand	the concepts of mean value theore	ems with their		
			applications.				
			To understand the	ne concept of maxima and minima for	r functions of		
			two and three va	riables with their uses and techniques			
			Understand con	nceptual variations while advancing	from one		
			variable to seve	eralvariables in calculus.	- 7		
			Understand the concept of integration of functions of two and three				
			variables and the	variables and their evaluation technique with emphasis on beta and			
s			gamma functions	· · · · ·			
6	_	redit Value	4 C	1Credit = 15 hours- Learning and	observation		
7	Te	otal Marks	Maximum Marks : Minimum Passing Marks:40				
	_		100	C .			
Part	t B:	Content of the Cour	se				
Tota	al no	o of teaching – learni	ng period =60 Periods	(60 Hours)			
UN	IIT		Topics		No of Periods		
		Limit and continuity	of function of two and t	hree variables Mean value theorems	110 01 1 011005		
Ι		of function of two	variables- First mean va	alue theorem and taylor's theorem	e .		
1		Faluar Differentiatio	15				
Partial Differentiation and Euler's theorem on homogeneous functions, Chavariables.				÷			
		Partial Derivation and	d differentiability of fun	ction of two variables. Schwartz's			
II theorem, Young's theorem, Implicit function theorem. Fourier		theorem. Fourier series Fourier	15				
expansion of piece wise monotonic function.				15			
III Jacobians, Maxima, Minima and saddle points of function of two van Lagrange's multipliers method. Envelopes, Evolutes			oints of function of two variables				
			Evolutes	15			
		Beta and Gamma fu	nction. Double and trip	ple integrals .Dirichelet's integrals.			
IV		Change of order of i	ntegration.		15		
			-		15		

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Part C - Lean	rning Pase					
	Part C - Learning Resource					
Text Books Rec	L bob no mmo	ext Books, Reference Books, Other	r Resources			
1. OOlakii Pi	asad (2016).	Differential Calculus (19th edition)). Pothishala Pvt. Ltd.			
2. Iviameman	ical Analysis	, S.C. malik and S. Arora, New age	international, Delhi			
J. Howard An	nton, I. Biver	ns & Stephan Davis (2016). Calcul	us (10th edition). Wiley India.			
4.Gabriel Kla	imbauer (198	36). Aspects of Calculus. Springer-	Verlag.			
5. Wieslaw K	rawcewicz &	Bindhyachal Rai (2003). Calculus	with Maple Labs.			
o.Principles c	of Mathemati	cal analysis, W.Rudin, McGraw Hil	1 Publication			
7.Jerrold Mar	sden, Antho	ny J. Tromba & Alan Weinstein (20	(09) Basic			
8. James Stev	vart (2012). I	Multivariable Calculus (7th edition)). Brooks/Cole. Cengage.			
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	https://epar	<u>.inflibnet.aci.in</u>	8			
		vam.gov.inhttps://www.mooc.org				
	<u>nups.//swa</u>	vam.gov.mmups.//www.mooc.org				
Part D: Asses	ssment and	d Evaluation				
		uation Methods:				
Maximum Mar	ks:	100 M	forte			
Continuous Int	ernal Assess	ment (CIA): 30 Ma				
End Semester	Examination	(ESE): 70 Ma				
Continuous Inter		Test /Quiz – 20+20 Marks				
Assessment (CIA)	Assignment/Seminar- 10 Marks	Better marks out of two test/quiz +			
(Conducted has a set of a set			obtained marks in Assignment shall			
End Semester	Two Section	n-A&B	be considered against 30 marks			
Examination						
(ESE)	200 answer type question-5x4=20marks					
(ESE) Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks						

Name and signature of convener & members of CBOS-Omicantelsti Jant Pr mili .s. Dast DA E m P.k. San

		COURSE CURR	ICOLOM		
	rt A: Introduction				
Pr	ogram: Bachelor in Science	Semester - IV	Session:2024-2025		
1	(Diploma/Degree/Honors)				
1	Course Code		MASE-02		
2	Course Title		MECHANICS		
3	Course Type	Disci	pline Specific Elective (DSE)		
4	Pre-requisite(if any)	Basic idea of Statics ar			
5	Course Learning	This Course will enab			
	Outcome (CLO)	The object of th	he paper is to give students knowledge of basic		
		mechanics such	as simple harmonic motion, motion under other		
		laws and forces.	ina • venusi na zarezore		
		Learn about a n	ul point, a nul line, and a nul plane with respect		
		to a system of f	forces acting on a rigid body together with the		
		idea of central as	xis.		
		Understand ne	ccessary conditions for the equilibrium of		
		particles acted up	pon by various forces and learn the principle of		
		virtual work for	a system of coplanar forces acting on a rigid		
		body. Determine	e the centre of gravity of some materialistic		
		systems and disc	cuss the equilibrium of a uniform cable hanging		
		freely under its o	own weight.		
		> Deal with the kinematics and kinetics of the rectilinear and			
		planar motions	of a particle including the constrained		
		oscillatory motic	ons of particles. Learn that a particle moving		
		under a central	force describes a plane curve and know the		
		Kepler's laws of	the planetary motions, which were deduced by		
		him long before the mathematical theory given by Newton.			
		Understand the reduction of force system in three dimension			
to a resultant force ac			ce acting at a base point and a resultant couple,		
(C Providence	which is independent of the choice of base of reduction.			
6	Credit Value	4 C	1Credit =15 hours-Learning and Observation		
7	Total Marks	Maximum Marks : 100	Minimum Passing Marks:40		

Part B:	Content of the Course	
Total no	of teaching – learning period =60 Periods (60 Hours)	
UNIT	Topics	No of Periods
Ι	Analytical conditions of equilibrium of Coplanar Forces. Forces in three dimensions, Poinsot's central axis, Wrenches, Null lines and planes.	15
II	Virtual work, Stable and Unstable equilibrium, Catenary.	15
III	Velocities and accelerations along and transverse directions, and along tangential and normal directions, Simple harmonic motion, Motion under other law of forces. Elastic strings.	15

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Dr. S. Dashpruter Dr. S. Dashpruter (Dr. P. K. Sahu) _____

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w	Motion in resisting medium, Constrained motion, Motion on smooth and rough plane curves. Motion of particles of varying mass, Central orbit, Keplers laws of motion, Rocket motion, Motion of particle in three	
	Replets laws of motion, Rocket motion, Motion of particle in three	15
	dimensions.	

Text Books, Reference Books, Other Resources **Text Books Recommended-**1.R.S. Verma (1962). a text books of statics Pothishala Pvt. Ltd. 2. P.L. Shrivastava (1964). Elementary dynamics. Ram Narayan Lal, Beni Prasad Publishers Allahabad **Reference Books Recommended-**3. A.S. Ramsey (2009), Statics, Cambridge University Press 4. A.S. Ramsey (2009), Dynamics, Cambridge University Press 5. S.L. Loney (2006), An Elementary Treatise on the dynamics of a partical and of rigid bodies. . 6. J.L. Synge an Griffith (1949). Principal of Mechanics, McGraw-Hill. **E-Recourses:** https://onlinecourses.nptel.ac.in https://epgp.inflibnet.aci.in https://swayam.gov.in https://www.mooc.org Part D: Assessment and Evaluation Suggested Continuous Evaluation Methods: Maximum Marks: 100 Marks **Continuous Internal Assessment (CIA): 30 Marks** End Semester Examination (ESE): 70 Marks **Continuous** Internal Test /Ouiz -20+20 Marks Better marks out of two test/quiz + Assessment (CIA) Assignment/Seminar-10 Marks obtained marks in Assignment shall (Conducted by course teacher) be considered against 30 marks Two Section-A&B **End Semester** Examination Section-A: Q1.Objective- 10x1=10 marks Q2. Short answer type question-5x4=20marks (ESE) Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks

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		COURSE CU	KRICULUM	
Pa	rt A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Semester - V	Session:2024-2025	
1	Course Code		MASE-03	
2	Course Title		Numerical Methods	
3	Course Type	Dis	cipline Specific Elective (DSE)	
4	Pre-requisite (if any)	Basic idea of Numerical solutions, Differential equation and theory of		
5	Course Learning Outcome (CLO)	 eqution. This Course will enable the students to: The aim of this course is to teach the student the application of various numerical techniques for variety of problems occurring in the daily life. The main outcome will be that student will be able to handle problems and finding approximated solution. Obtain numerical solutions of algebraic and transcendental equations. Find numerical solutions of system of linear equations and to check the accuracy of the solutions. Learn about various interpolating and extrapolating methods to find numerical solutions. 		
6	Credit Value	4 C	1Credit =15 hours-Learning and Observation	
7	Total Marks	Maximum Marks : 100	Minimum Passing Marks:40	
	rt B: Content of the			

Total no o	Total no of teaching – learning period =60 Periods (60 Hours)				
UNIT	Topics	No of Periods			
I	Numerical Methods for Solving Algebraic and Transcendental Equations Round-off error and computer arithmetic, Local and global truncation errors, Algorithms and convergence; Bisection method, false position method, fixed point iteration method, Newton's method and secant method for solving equations.	15			
II	Lagrange and Newton interpolations, Piecewise linear interpolation, Cubic spline interpolation, Finite difference operators, Gregory Newton forward and backward difference interpolations.	15			
ш	First order and higher order approximation for first derivative, Approximation for second derivative; Numerical integration: Trapezoidal rule, Simpson's rule and its error analysis, BulirschStoer extrapolation methods, Richardson extrapolation.	15			
IV	Euler's method, RungeKutta methods, Higher order one step method, Multi- step methods; Finite difference method, Shooting method, Real life examples: Google search engine, 1D and 2D simulations, Weather forecasting.	15			



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		Part C - Learning Resour	ce
	Т	ext Books, Reference Books, Othe	r Resources
Text Books Rec	ommended-		
1.	M.K. Jain, S.	R. K. Iyengar& R. K. Jain (2012). N	umerical Methods for Scientific
and	d Engineering	Computation (6th edition). New Ag	e International Publishers
2.	C. F. Gerald &	& P. O. Wheatley (2008). Applied N	umerical Analysis (7th edition),
Pea	arson Educati	on, India.	
Reference Book	s Recommen	ded-	
3.]	Brian Bradie ((2006), A Friendly Introduction to N	umerical Analysis Pearson
4.]	Robert J. Schi	lling & Sandra L. Harris (1999). Ap	plied Numerical Methods for
Eng	gineers Using	MATLAB and C. Thomson-Brook	s/Cole.
E-Recourses:			
	s·//onlinecour	ses.nptel.ac.in	
	s://epqp.inflib		
	s://swayam.go		
	s://www.moo		
Part D: Asse	ssment and	d Evaluation	
Suggested Cont	tinuous Eval	uation Methods:	
Maximum Mar	·ks:		Aarks
Continuous Int	ernal Assess	ment (CIA): 30 M	larks
End Semester			arks
Continuous Inte		Test /Quiz – 20+20 Marks	Better marks out of two test/quiz +
Assessment (CIA		Assignment/Seminar- 10 Marks	obtained marks in Assignment shall
(Conducted by cour			be considered against 30 marks
End Semester	Two Section		
Examination	Section-A: (Q1.Objective- 10x1=10 marks Q2. S	hort answer type question-5x4=20mar
(ESE) Section-B: Descriptive answer type question, 1 out of 2			10x4 - 40 Mar

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Pa	rt A: Introdu	ction			
]	Program: Bache	lor in	Semester - VI	Session:2024-2025	
	Science				
	(Degree/Honor	rs)			
1	Course Code			MASE-04	
2	Course Title	_		Number Theory	
3	Course Type			Discipline Specific Elective (DSE)	
4	Pre-requisite (i		Basic idea of theory of equation and congruence relations		
5	Course Learnin	g	This Course will enable the students to:		
	Outcome (CLO)	Know about distribution of prime and congruence.		
			Solve Number theoretic functions		
			Learn primitive, Quadratic Reciprocity Law and Public Key		
	Encryption				
6	Credit Value		4C	1Credit = 15 hours- Learning and observation	
7	Total Marks	Maxim	mum Marks : 100 Minimum Passing Marks : 40		

Part B: Content of the Course

Total no o	f teaching – learning period =60 Periods (60 Hours)	
UNIT	Topics	No of Periods
I	Distribution of Primes and Theory of Congruences Linear Diophantine equation, Prime Counting function, Prime number theorem, Goldbach conjecture, Fermat and Mersenne primes, Congruence relation and it's properties, Linear congruence and Chinese remainder theorem, Fermats' little theorem, Wilson's theorem.	15
Ш	Number Theoretic Functions Number theoretic functions for dum and number of divisors, Multiplicative function, The Mobius inversion formula, The greatest integer function. Euler's phi-function and properties, Euler's theorem.	15
III	Primitive The order of an integer modulo n, Primitive roots for primes, Composite numbers having primitive roots; Definition of quadratic residue of an odd prime, and Euler's criterion.	15
IV	Quadratic Reciprocity Law and Public Key Encription The Legendre symbol and it's properties, Quadratic reciprocity, Quadratic congruences with composite moduli; Public key encription, RSA encription and decription.	15

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Text Books, Reference Books, Other Resources

Text Books Recommended-

1. Burton, David M. (2012) : Elementary Number Theory(7th ed.) Mc-Graw Hill Education Pvt. Ltd. Indian Reprint.

Reference Books Recommended-

2. Jones, G. A., & Jones, J. Mary. (2005) : Elementary Number Theory. Undergraduate Mathematics Series(SUMS). First Indian Print.

E-Recourses:

https://onlinecourses.nptel.ac.in https://epqp.inflibnet.aci.in https://swayam.gov.in https://www.mooc.org

Part D: Assessment and Evaluation						
Suggested Cont	tinuous Eval	uation Methods:				
Maximum Mar	rks:		100 M	larks		
Continuous Int	ernal Assess	ment (CIA):	30 Ma			
End Semester	Examination	(ESE):	70 Ma			
Continuous Inter Assessment (CIA	Continuous Internal		20+20 Marks ninar- 10 Marks	Better marks out of two test/quiz + obtained marks in Assignment shall		
(Conducted by cour	rse teacher)	Ð		be considered against 30 marks		
End Semester	End Semester Two Section-A&B			er constation against 50 marks		
Examination	Examination Section-A: Q1.Objective- 10			ort answer type question 5x4-20mortes		
(ESE)	Examination (ESE)Section-A: Q1.Objective- 10x1=10 marks Q2. Short answer type question-5x4=20marks Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks					

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		COURSEC	JKRICULUM
Part	A: Introduction		
Program: Bachelor in Science (Honors/Honors with Research)		Semester - VII	Session:2024-2025
1	Course Code		MASE-05
2	Course Title		Integral Transforms
3	Course Type		Discipline Specific Elective (DSE)
4	Pre-requisite (if any)	Basic idea of differ	entiation and integration
5	Course Learning Outcome (CLO)	 This Course will ➢ Know about function,Lap ➢ Solve ordination ➢ Explain Participation 	enable the students to: at piece wise continuous functions,Dirac delta place transforms and its properties. ry differential equations using Laplace transforms. arseval's identity,Plancherel's theorem and of Fourier transforms to boundary value
6	Credit Value	4C	1Credit = 15 hours- Learning and Observation
7	Total Marks	Maximum Marks :	100 Minimum Passing Marks : 40

Total no	of teaching – learning period =60 Periods (60 Hours)	
Unit	Topics	No. of Periods
I	LaplaceTransforms: Integral transform, Kernel of an integral transform, Reduction of integral transform intoLaplace transform, Linearity, Existence theorem, Laplace transforms of derivatives and integrals, Shifting theorems, Change of scale property, Laplace transforms of periodic functions, Dirac's delta function.	15
п	Laplace Transforms (Continued) and Applications: Differentiation and integration of transforms, Convolution theorem, Integral equations, Inverse Laplace transform, Lerch's theorem, Linearity property of inverse Laplace transform, Translations theorems of inverse Laplace transform, Inverse transform of derivatives, Applications of Laplace transform in obtaining solutions of ordinary differential equations and integral equations.	15
ш	FourierTransforms: Fourier and inverse Fourier transforms, Fourier sine and cosine transforms, Inverse Fouriersine and cosine transforms, Linearity property, Change of scale property, Shifting property, Modulation theorem, Relation between Fourier and Laplace transforms.	15

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IV	Solution of Equations by Fourier Transforms : Solution of integral equation by Fourier sine and cosine transforms, Convolution theorem for Fourier transform, Parseval's identity for Fourier transform, Plancherel's theorem, Fourier transform of derivatives, Applications of infinite Fourier transforms to boundary value problems, Finite Fourier transform, Inversion formula for finite Fourier transforms.	15
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Text Books, Reference Books, Other Resources

Text Books Recommended-

- 1. JamesWardBrown&RuelV.Churchill.Fourier Series and
- BoundaryValueProblems.McGraw-HillEducation. 2011
- 2. CharlesK.Chui.An Introduction to Wavelets.AcademicPress 1992

Reference Books Recommended-

- 3. ErwinKreyszig. Advanced Engineering Mathematics (10th edition). Wiley. 2011
- 4. WalterRudin. Fourier Analysison Groups. DoverPublications. 2017
- 5. A.Zygmund. TrigonometricSeries (3rdedition). Cambridge University Press. 2002

E-Recourses:

https://onlinecourses.nptel.ac.in https://epqp.inflibnet.aci.in https://swayam.gov.in https://www.mooc.org

Part D: Assessment and Evaluation **Suggested Continuous Evaluation Methods:** Maximum Marks: 100 Marks Continuous Internal Assessment (CIA): **30 Marks** End Semester Examination (ESE): 70 Marks **Continuous Internal** Test /Quiz -20+20 Marks Better marks out of two test/quiz + Assessment (CIA) Assignment/Seminar- 10 Marks obtained marks in Assignment shall (Conducted by course teacher) be considered against 30 marks **End Semester Two Section-A&B** Section-A: Q1.Objective- 10x1=10 marks Q2. Short answer type question-5x4=20marks Examination (ESE) Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks

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P				COURSE CI	URF	RICULUM	
	Part A: Introduction						
Pro (Ho	Program: Bachelor in Science Semester - VII Session:2024- (Honors/Honors with Research)					2025	
1		urse Code				MASE-06	
2		urse Title				Topology	
3		arse Type		Di	iscipl	line Specific Elective (DSE)	
4		requisite(if any)	Knowle	dge of basic ide	as of	set theory and analysis including	g metric spaces.
5		 This Course will enable the students to: Understand the concept of countable and uncountable sets and i properties. Understand the concept of topological spaces and i examples, bases, sub-bases, subspaces and relative topology. Understand the concept of countable, separable spaces and separation 					table sets and its al spaces and its pology.
				Understand the unctions. Understand the netric spaces.	conc	ept and properties of connected pt and properties of contable pt and properties of contable pt and properties of connected	ctness, continuous le compactness in
6		edit Value		4 C		1Credit = 15 hours- Learning	and Observation
7		tal Marks	Maximu	m Marks : 100		Minimum Passing Marks : 40	guild Observation
Part	B:	Content of the	e Cours	e			
Total	no	of teaching – lear	ning per	riod =60 Periods	(60	Hours)	
Un				Topic			N. C. D. I. I.
I	Topological Space : No. of Period Cardinal numbers and its arithmetic. Definition and examples of topological Spaces No. of Period						
II		Continuous fund Continuous fund spaces. Lindelo separability.	ctions an	nd homeomorphi	ism.	First and Second Countable ces. Second countability and	15
III	IIICompactness and Connectedness: Compactness. Continuous functions and compact sets. Basic properties of Compactness. Compactness and finite intersection property. Sequentially and countably compact sets. Local compactness, Connected spaces, Connectedness on the real line.Components, Locally connected spaces.15Totally connected spaces.					15	
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Separation axioms:			
Separation	axio		

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1	Separation axioms; T0, T1, T2, T3, T4; their Characterizations and	
	basic properties. Urysohn's lemma, Tietze extension theorem, T5	
	spaces and Tychonoff spaces	

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		Part C - Learning Resou	rce
	Т	ext Books, Reference Books, Oth	er Resources
Text Books Rec	ommended :		
1. Introduction	to General T	opology By K.D.Joshi, Wiley Easter	n Ltd., 1983
2. Topology, A	First Course	By James R. Munkres, Prentice Hal	l of India Pvt. Ltd., New Delhi,2000.
References Boo	ks Recomme	nded :	or man I vi. Edd., New Dellii,2000.
 J. Dugundji, George F.Sin J.Hocking an J.L. Kelley, O L. Steen and W.Thron, To N. Bourbaki, R. Engelking W. J. Pervin, E.H.Spanier 	Topology, A mmons, Introd d G Young, T General Topo J. Seebach, C pologically S General Top c, General Top Foundations c, Algebraic T	llyn and Bacon, 1966 (reprinted in In duction to Topology and modern Ana Fopology, Addison-Wiley Reading, 1 logy, Van Nostrand, Reinhold Co. N	lew York,1995. Rinehart and Winston, New York, 1970. n, New York,1966. y, Reading, 1966. Warszawa, 1977. ss Inc. New York,1964. 966
E-Recourses:			f
	s://onlinecour	ses.nptel.ac.in	
	s://epqp.inflib		
	s://swayam.go		
1.00	://www.moo		
Part D: Asses			
Suggested Cont	inuous Eval	ation Methods:	
Maximum Mar	'ks:	100 M	for la
Continuous Int		nent (CIA): 30 Ma	
End Semester	Examination	(ESE): 70 Ma	
Continuous Inter		$\frac{1}{\text{Test /Quiz} - 20+20 \text{ Marks}}$	
Assessment (CIA)		Assignment/Seminar-10 Marks	Better marks out of two test/quiz +
(Conducted by course teacher)			obtained marks in Assignment shall
End Semester			to considered against 50 marks
Examination			ort answer type question 5-4-20
(ESE)	Section-B. T	tion-A: Q1.Objective- $10x1=10$ marks Q2. Short answer type question- $5x4=20$ marks tion-B: Descriptive answer type question, 1 out of 2 from each unit- $10x4=40$ Marks	
A	Section-D. L	osciptive answer type question, 1 of	ut of 2 from each unit- $10x4 = 40$ Marks

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	COURSE CURRICULUM				
Part A	A: Introduction				
Progr Hon	ram: Bachelor in Scienc ors/Honors with Research	ce (Semester - VII h)	Session:2024-2025		
1	Course Code		MASE -07		
2	Course Title		Complex Analysis - I		
3	Course Type	Discipline Specific Elective (DSE)			
4	Pre-requisite(if any)	Basic knowledge of complex analysis and calculus.			
5	Course Learning Outcome (CLO)	 Basic knowledge of complex analysis and calculus. This Course will enable the students to: Understand Complex number and their properties. Learn about properties of linear transformation and isomorphism theorems. Understand the concept of Limit, Continuity, Differentiability of Complex and Analytic function. Obtain various variants of Mobius transformations. Obtain various Conformal mapping and types of transformations. 			
6	Credit Value	4C	1Credit = 15 hours- Learning and Observation		
7	Total Marks	Maximum Marks :100	Minimum Passing Marks :40		

Total no	of teaching – learning period =60 Periods (60 Hours)	
Unit	Topics	No of Davis I
I	Complex Numbers and Their Geometrical Representation: Complex numbers as ordered pairs, Geometrical representation of complex numbers, Modulus and argument of complex numbers and its Properties, Equation of straight line and circle, Cauchy's inequality and Lagrange's identity.	No. of Periods
II	Continuity and Differentiability of Complex and Analytic Functions: Limit, Continuity, Differentiability of functions of a Complex variables, Analytic function, Cauchy – Riemann equations, Conjugate function, Laplace's Differential equations, Harmonic functions, Orthogonal system and Construction of Analytic function.	15
III	Mobius Transformation: Jacobian of Transformation, Linear Transformation, Mobius Transformation, Linear Group, Fixed point of Mobius transformation, Cross ratio, Inverse Point, Properties of Mobius transformation.	15
IV	Conformal Mappings: Conformal mapping, Necessary and sufficient condition for $w = f(z)$ to represent a conformal mapping, Transformation $w = z^a$, Inverse, exponential, logarithmic and trigonometrical transformation.	15

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Part C - Learning Resource
Text Books, Reference Books, Other Resources
ext Books Recommended :
1. Complex Analysis By L.V.Ahlfors, McGraw - Hill, 1979.
2. J.B. Conway, Functions of one Complex variable, Springer-Verlag, International student- Editional Narosa Publishing House, 1980.
3. H.K. Pathak, Complex Analysis and Applications, ShikshaSahityaPrakashan, 2019
Reference Books Recommended :
1. H.A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford 1990.
2. Complex Function Theory By D. Sarason
 Liang-shin Hahn & Bernard Epstein, Classical Complex Analysis, Jones and Bartlett Publishe International, London, 1996.
A. S. Lang, Complex Analysis, Addison Wesley 1977
D. D. Sarason, Complex Function Theory Hindustan Book Agency, Dolk: 1004
University press, South Asian Edition, 1998
C.Caratheodory, Theory of Functions (2 Vols.) Chelsea Publishing Company, 1064
. L.C. Incliniaish, The Incorv of Functions Oxford University Proga London
. S. Polinusamy, Foundations of Complex Analysis, Narosa Publishing House, 1997
Recourses:
https://onlinecourses.nptel.ac.in
https://epqp.inflibnet.aci.in
https://swayam.gov.in
https://www.mooc.org

Part D: Assessment and Evaluation							
Suggested Cont	Suggested Continuous Evaluation Methods:						
Maximum Mar	rks:		100 M	larke			
Continuous Int	ernal Assess	ment (CIA):	30 Ma				
End Semester Examination		1 (ESE):	70 Ma				
	Continuous Internal		20+20 Marks	Better marks out of two test/quiz +			
Assessment (CIA) (Conducted by course teacher)		Assignment/Ser	ninar- 10 Marks	obtained marks in Assignment shall			
End Semester	Two Sectio	n-A&B		be considered against 30 marks			
Examination	Section-A: Q1.Objective- 10x1=10 marks Q2. Short answer type question-5x4=20marks						
(ESE)	(ESE) Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Ma						
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Pa	ert A: Introduction			
	Program: Bachelor in Second S	cience	Semester - VII	Session:2024-2025
	(Honors/Honors with Res	earch)		56551011:2024-2025
1	Course Code			MASE-08
2	Course Title		I	Discrete Mathematics
3	Course Type			ine Specific Elective (DSE)
_4	Pre-requisite (if any)	Basic id	ea of logic and or	der relations
5	Course Learning	This C	Course will enable	the students to:
	Outcome (CLO)	 This Course will enable the students to: ➤ The course aims at introducing the concepts of Lattices, sub Lattices and Homomorphisms between Lattices. > Understand the uses ofBoolean algebra in daily life. > Understand the uses of grammer and languages in daily life. > Learn about the Finite state machines in different fields. 		
6	Credit Value	4C		oblems using finite-state and Tuning machines.
6	Total Marks	4C 1Credit = 15 hours- Learning and observat. Maximum Marks : 100 Minimum Passing Marks:40		

Part B: Content of the Course Total no of teaching – learning period =60 Periods (60 Hours) Unit Topics No. of Periods Lattices-Lattices as partially ordered sets-their properties. Lattices as Algebraic Systems. Sublattices. Direct products and Homomorphisms. Some special Lattices I e.g. Complete, Complemented and Distributive Lattices. 15 Boolean Algebras: Boolean Algebras. Boolean Algebras as Lattices. Various Boolean Identities. Boolean Functions, The Switching Algebra example, Sub-Π algebras. 15 Grammars, Languages and Regular sets. Phrase-structure Grammars. Rewriting rules. Derivations. Sentential forms. Language generated by a Grammar. Regular, Context-Free and Context Sensitive Grammars and Languages. Regular expressions and the Pumping Lemma. Kleen's theorem. Notions of Syntax Analysis. Polish III 15 Notations. Conversion of Infix Expressions to Polish notation. The Reverse Polish notations. Finite state machines – Equivalent machines. Finite state machines as language recognizers. Finite Automata. Acceptors. Non-deterministic Finite Automata and equivalence of its power to that of Deterministic Finite Automata. Moore and IV 15 mealy Machines. Turing Machine and Partial Recursive Functions.

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Part C - Lean	ning Resou	irce		
		Fext Books , Reference	Books, Othe	er Resources
Text Books Rec	commended :			A Resources
1. M.I	K. Gupta.Disc	rete Mathematics.Krish	na Prakashan	Media(P) I td
2. J.I	7. Tremblay &	R. Manohar, Discrete M	Aathematical	Structures with Applications to Computer
BUIC	fice, McGlaw-	HIII BOOK CO. New York.		a second es when reprications to compute
Reference Book				
1. C	L. Liu, Eleme	nts of Discrete Mathemati	cs, McGraw-H	Hill Book Co.
3. 8	eymour Lepsch	utz, Finite mathematics M	CGraw-Hill B	look Co. New York
4. S	. Wiitala Discr	ete mathematics McGraw-	Hill Book Co.	New York
E-Recourses:				
http:	s://onlinecours	es.nptel.ac.in		
<u>http</u>	s://epqp.inflibn	et.aci.in		
	s://swayam.gov			
https	s://www.mooc.	org		
Part D: Asse	ssment and	Evaluation		
		ation Methods:		
Maximum Mar	rks:	acton mechous.	100 1/	T 1
Continuous Int		mont (CIA).	100 M	
End Semester	Examination	(ESF).	30 Ma	
Continuous Inte			70 Ma -20 Marks	
Assessment (CIA		Assignment/Seminar-		Better marks out of two test/quiz +
(Conducted by cou	rse teacher)	Assignment/Semmar-	10 Marks	obtained marks in Assignment shall
End Semester	Two Section	n 1 & D		be considered against 30 marks
Examination			1 00 7	
(ESE)	Section D. I	21.00 jective- $10XI = 10$	marks Q2. SP	nort answer type question-5x4=20marks
	Section-B: I	Descriptive answer type	question, 1 o	ut of 2 from each unit- $10x4 = 40$ Marks

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Part A: Introduction						
Pr	ogram: Bachelor in Scie	ence Semester - VIII	Session:2024-2025			
(H	onors/Honors with Resea	rch)				
1	Course Code		MASE-09			
2	Course Title		Measure Theory			
3	3 Course Type Discipline Specific Elective (DSE)					
4	Pre-requisite(if any)	Knowledge of real analy	vsis			
5	Course Learning	This Course will enable the students to:				
	Outcome (CLO)		elopment of measure and integration theory and			
		Borel, Lebesgue	e measurability, and compare integration theory of			
		Lebesgue and Ri	emann with examples and counter examples			
Understand the concept and properties of functions of						
		variation.				
6	Credit Value	4C	1Credit = 15 hours- Learning and Observation			
7	Total Marks	Maximum Marks: 100	Minimum Passing Marks:40			

Part	B: Content of the Course				
Total	no of teaching – learning period =60 Periods (60 Hours)				
Unit	Topics	No. of Periods			
I	Measurable Sets: Lebesgue outer measure, Lebesgue measure, Properties of measurable sets, Borel sets and their measurability characterization of measurable sets, Non measurable set.	15			
II	Measurable Function: Definition and properties, Simple, Step and characteristics function,				
III	Lebesgue Integral: Lebesgue integral of a bounded function, Comparison of Riemann integral and Lebesgue integral, Bounded Convergence Theorem, Integral of non negative measurable functions, Fatou's lemma, Monotone convergence theorem, General Lebesgue integral, Lebesgue dominated convergence theorem.	15			
IV	Differentiation and Integration: Dini derivatives, Differentiation of monotone functions, Lebesgue theorem, Function of bounded variation, Differentiation of an integral, Lebesgue sets, Absolutely Continuous Functions, Integral of the derivatives	15			
A CH	K. Sahu) even 40 A	A A			

		Part C -	Learning Reso	Durce
	T	ext Books, Refe	rence Books, Oth	er Resources
Text Books R	ecommended	:		
1.	G.de Barra, M	easure Theory an	nd Integration, Wile	ey Eastern Limited, 1981.
Z.	P.K. Jain and	V.P. Gupta, Leb	esgue Measure and	, New Age International (P) Limited
	rublished, Ne	w Deini, 1986 R	eprint 2000).	
	Denn, 1997		on to Measure and	Integration, Norosa Publishing House,
Reference Boo	ks Recomme	nded :		
1	. Richard L.	Wheeden and A	ntoniZygmund, Me	easure and Integral: An Introduction to
	Real Analys	s, marcer Dekke	$r \ln c. 1977.$	
2	. J.H. William 1962	son, Lebesgue Ir	tegration, Holt Rin	ehart and Winston, Inc. New York.
5.	P.R. Halmos,	Measure Theory	, Van Nostrand, Pr	inceton 1950
6.	T.G. Hawki	ns, Lebesgue's	Theory, of Integ	ration: Its Origins and Development,
	Chersea, Nev	V YOFK, 1979.		
7.	K.R. Parthas	arathy, Introduct	ion to Probability	and Measure, Macmillan Company of
	mula Liu., D	enn, 1977.		
8.	R.G. Bartle, 7	The Elements of I	ntegration, John W	iley & Sons, Inc. New York, 1966.
E-Recourses:				
htt	ps://onlinecours	es.nptel.ac.in		
	ps://epqp.inflibi			
	ps://swayam.go			
<u>httr</u>	s://www.mooc.	org		
		d Evaluation		
Suggested Con	ntinuous Eval	uation Methods	•	
Maximum Ma			100	Marks
Continuous Ir	ternal Assess	ment (CIA):	30 N	Aarks
End Semester				Iarks
Continuous Int		Test /Quiz –	20+20 Marks	Better marks out of two test/quiz +
Assessment (CI		Assignment/Ser	ninar- 10 Marks	obtained marks in Assignment shall
(Conducted by course teacher)				be considered against 30 marks
End	Two Section			
Semester	Section-A: Q	1.Objective- 10x	1=10 marks Q2. SI	hort answer type question-5x4=20marks
Examination (FSF)	Section-B: D	escriptive answer	r type question, 1 o	put of 2 from each unit- $10x4=40$ Marks
(ESE)				

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COORSE CURRICULUM						
	Part A: Introduction					
Pro	ogram: Bachelor in Scie	ence	Semester - VIII	Session:2024-2025		
(H	onors/Honors with Resea	rch)		50331011.2024-2025		
1	Course Code			MASE - 10		
2	Course Title		Ge	neral and Algebraic Topology		
3	Course Type		Dis	cipline Specific Elective (DSE)		
4	Pre-requisite(if any)	Knov	vledge of Topolog	gical spaces and related concepts		
5	Course Learning Outcome (CLO)	At th	e end of the cour Understand the spaces. Understand en Understand the properties and	rse, the students will be able to : the concept of products in different topological mbedding, metrization and its related theorems. e concept of net, filter and its various topological their inter-relations. ndamental group and covering spaces.		
6	Credit Value	4C		1Credit = 15 hours Loorning and Oh		
7	Total Marks		num Marks :100	1Credit = 15 hours- Learning and Observation Minimum Passing Marks :40		

Part B: Content of the Course

Unit	Topics	No CD 1
	Product Topology	No. of Periods
I	Tychonoff product topology; Separation axioms and product spaces; Compactness and product spaces; Connectedness and product spaces; Countability and product spaces.	15
II	Embedding and metrization Embedding lemma and Tychonoff embedding. The Urysohnmetrization theorem. Metrization theorems and Paracompactness-Local finiteness. The Nagata-Smirnov metrization theorem. Para compactness. The Smirnov metrization theorem.	15
III	Nets and filter Topology and convergence of nets.Hausdorffness andnets. Compactness and nets. Filters and their convergence. Canonical way of converting nets to filters and vice-versa. Ultra-filters and Compactness.	15
IV	The fundamental group and Covering spaces Homotopy of paths; The fundamental group; Covering Spaces; The fundamental group of the circle and the fundamental theorem of algebra.	15

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Part C - Learning Resource

Text Books, Reference Books, Other Resources

Text Books Recommended :

- 1. Introduction to General Topology ByK.D.Joshi, Wiley Eastern Ltd., 1983.
- 2. Topology, A First Course By James R. Munkres, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

References Books Recommended:

- 1. J. Dugundji, Topology, Allyn and Bacon, 1966 (reprinted in India by Prentice Hallof India Pvt. Ltd.).
- George F.Simmons, Introduction to Topology and modern Analysis, McGraw-Hill Book Company, 1963.
- 3. J.Hocking and G Young, Topology, Addison-Wiley Reading, 1961.
- 4. J.L. Kelley, General Topology, Van Nostrand, Reinhold Co., New York, 1995.
- 5. L. Steen and J. Seebach, Counter examples in Topology, Holt, Rinehart and Winston, New York, 1970.
- 6. W.Thron, Topologically Structures, Holt, Rinehart and Winston, New York, 1966.
- 7. N. Bourbaki, General Topology Part I (Transl.), Addison Wesley, Reading, 1966.
- 8. R. Engelking, General Topology, Polish Scientific Publishers, Warszawa, 1977.
- 9. W. J. Pervin, Foundations of General Topology, Academic Press Inc. New York, 1964.
- 10. E.H.Spanier, Algebraic Topology, McGraw-Hill, New York, 1966.
- 11. S. Willard, General Topology, Addison-Wesley, Reading, 1970.
- 12. Crump W.Baker, Introduction to Topology, Wm C. Brown Publisher, 1991.
- 13. Sze-Tsen Hu, Elements of General Topology, Holden-Day, Inc. 1965.

E-Recourses:

https://onlinecourses.nptel.ac.in https://epqp.inflibnet.aci.in https://swayam.gov.in https://www.mooc.org

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:					
Maximum Ma	Maximum Marks:			Marks	
Continuous In	Continuous Internal Assessment (CIA):			Iarks	
End Semeste	End Semester Examination (E			larks	
Continuous Internal		Test /Quiz -	20+20 Marks	Better marks out of two test/quiz +	
Assessment (C)	[A)	Assignment/Sen	ninar- 10 Marks	obtained marks in Assignment shall	
(Conducted by co	urse teacher)			be considered against 30 marks	
	End Two Section-A&B				
SemesterSection-A: Q1.Objective- 10xExaminationSection-B: Descriptive answer			1=10 marks O2. Sh	ort answer type question 5x4-20me de	
			type question 1 or	ut of 2 from each unit- 10x4= 40 Marks	
(ESE)		ecomptive answer	type question, 1 of	ut of 2 from each unit- 10x4= 40 Marks	

Name and signature of convener & members of CBOS-Dr. s. Dashpiller Dr. Omkar hils hi vartur & Drakh M Dr. p. k. Sahu en (W 43

	COURSE CURRICULUM					
Pa	Part A: Introduction					
Pro (H	onors/Honors with Rese	ience Semester - VIII arch)	Session:2024-2025			
1	Course Code		MASE-11			
2	Course Title		Complex Analysis - II			
3	Course Type	Dis	cipline Specific Elective (DSE)			
4	Pre-requisite(if any)	Basic discussion of con analytic functions.	mplex numbers, complex variable functions and			
5	Course Learning Outcome (CLO)	 Understand the co theorem to evaluate mappings, bilinear th Understand the conce Understand the conce Zeta function, Gam concept of Analytic (power series of analy of Harmonic function) Understand the conce exponent of Converge 	amental Complex integration. Incept of residues and apply Cauchy's residue integrals. Understand the concept of conformal ransformations, their properties and classifications. Ept about the spaces of analytic functions. Ept of Weierstrass' factorization theorem, Riemann ma function and its properties. Understand the Continuation and its properties. Gain knowledge of tic function. Understand the concept and properties as on a disc. Cept of Canonical products, entire function and			
6	Credit Value	4C	1Credit = 15 hours- Learning and Observation			
7	Total Marks	Maximum Marks :100	Minimum Passing Marks :40			
			Training Iviality .40			

Part B: Content of the Course

	Total n	o of teaching – learning period =60 Periods (60 Hours)							
		or comming – carming period –ov Periods (ov Hours)							
	Unit	Topics	No. of Periods						
	Ι	Complex integration:							
		Complex integration, Cauchy-Goursat. Theorem. Cauchy's integral	15						
		formula. Higher order derivatives. Morera's Theorem. Cauchy's							
•		inequality and Liouville's theorem. The fundamental theorem of algebra.							
		Taylor's theorem. Laurent's series. Isolated singularities. Meromorphic							
		functions. Maximum modulus principle. Schwarz lemma. The argument							
		principle. Rouche's theorem Inverse function theorem.							
ſ	II	Calculus of Residues:							
		Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of	15						
		many valued functions with special reference to $\arg z$, $\log z$ and z^a . Bilinear							
L		transformations, their properties and classifications. Definitions and							
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	examples of Conformal mappings. Spaces of analytic functions. Hurwitz's	
TTT	theorem. Montel's theorem Riemann manning theorem	
III	Entire Functions and Analytic Continuation:	15
	weierstrass' factorisation theorem Gamma function and its many its	15
	Riemann Zeta Iuncijon. Kjemann's functional equation Dunge to 1	
	Wittag-Lettier's theorem. Analytic Continuation Uniqueness of the	
	unarytic continuation. Uniqueness of analytic continuation along a survey	
	Tower series memory of analytic continuation Schwarz D. C.	
	The pie. Wonodromy theorem and its consequences	
IV	Harmonic Functionand Canonical products:	15
	Harmonic functions on a disk. Harnack's inequality and theorem	15
	Different Floblem. Green's function Canonical products Jongan's	
	formula. I UISSUII-JEIISEN TOrmilla Hadamard's three similar (1	
	order of an entire function. Exponent of Convergence Borol's theorem	
	Hadamard's factorization theorem.	
Part C	- Learning Resource	
	Text Books, Reference Books, Other Resources	
Text Bo	oks Recommended :	
1. (Complex Analysis By L.V.Ahlfors, McGraw - Hill, 1979.	
2.	J.B. Conway, Functions of one Complex verichts G.	
]	J.B. Conway, Functions of one Complex variable, Springer-Verlag, Internat Edition, Narosa Publishing House, 1980.	ional student-
— 3. H	I.K. Pathak. Complex Analysis and Applications. Glill 1. G. Lin T. S.	
Reference	I.K. Pathak, Complex Analysis and Applications, ShikshaSahityaPrakashan, 201 es Books Recommended:	9
1. F	I.A. Priestly Introduction to Complex Analysis Classics	
2.0	I.A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford 1990. Complex Function Theory By D.Sarason	
3.	Liang-shin Hahn & Bernard Enstein Cluster Land	
F	Liang-shin Hahn & Bernard Epstein, Classical Complex Analysis, Jones Jublishers International, London, 1996.	and Bartlett
	Lang, Complex Analysis, Addison Wesley, 1977.	
5 D	Sarason Complex Eurotics The Utility 1977.	
6	Sarason, Complex Function Theory, Hindustan Book Agency, Delhi, 1994.	
0. 1	Mark J.Ablowitz and A.S. Fokas, Complex Variables: Introduction and	Applications,
		/
8 U	Hille, Analytic Function Theory (2 Vols.) Gonn& Co., 1959.	
0. 1	H.J. Fuchs, Topics in the Theory of Functions of one Complex Variable, D.Vanl 967.	Nostrand Co.,
10	Caratheodory, Theory of Functions (2 Vols.) Chelsea Publishing Company, 1964	
10.1	The state of the second s	
12 9	Valter Rudin, Real and Complex Analysis, McGraw-Hill Book Co., 1966.	
12	Surs and A.Zyginund, Analytic Filinctions Monografic Matamaturana 1000	
15.1	. C Incliniaish, The Incorv of Functions Oxford University Dream I and	
17. 1	A. Vetell, A Second Course in Complex Analysis W A Daniania 1007	
15.0	.1 Onliusanity, Foundations of Complex Analysis Narosa Publishing Hauss 1007	
E-Recour	565.	
	<u>https://onlinecourses.nptel.ac.in</u> <u>https://epqp.inflibnet.aci.in</u>	
	https://swayam.gov.in	
	https://www.mooc.org	
	<u>mapsin www.mooc.org</u>	
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Part D: Assessment and Evaluation					
Suggested Co	Suggested Continuous Evaluation Methods:				
Maximum Ma	arks:			N/	
Continuous I	nternal Asses	ssment (CIA):		Marks	
End Semeste	r Examinatio	on (ESE):		1arks	
Continuous Int	Continuous Internal Test /Quiz –			larks	
Assessment (Cl		Assignment/Sen	20+20 Marks	Better marks out of two test/quiz +	
(Conducted by co	urse teacher)	Assignment/Sen	inar-10 Marks	obtained marks in Assignment shall	
End				be considered against 30 marks	
Semester	Two Section-A&B				
Examination	Section-A: Q1.Objective- 10x1=10 marks Q2. Short answer type question-5x4=20marks				
(ESE)	Section-B: I	Descriptive answer	type question, 1 or	ut of 2 from each unit- 10x4= 40 Marks	

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COURSE CURRICULUM					
Par	t A: Introduction				
]	Program: Bachelor in Sc (Honors/Honors with Rese	eience arch)	Semester - V	III	Session:2024-2025
1	Course Code				MASE-12
2	Course Title				Graph Theory
3	Course Type		Discipline Specific Elective (DSE)		
4	Pre-requisite(if any)	Basic	discussion of Gr	aph	, Trees and matrices.
5	Course Learning Outcome (CLO)	 A; th U fu: K 	eir examples. Inderstand the d ndamental circui now the applicat	finiti efini ts. ions	he students to: on and basics of graphs along with types and tion of a tree and learn its applications to of graph theory to network flows. of planarity of a graph.
		 Relate the graph theory to the real-world problems. 			
5	Credit Value		4C		edit = 15 hours- Learning and observation
7	Total Marks	Maximu	m Marks :100		nimum Passing Marks :40

Part B: Content of the Course

Unit	Topics	
	Paths, Circuits and Graph Isomorphisms :	No. of Periods
I	Definition and examples of a graph, Subgraph, Walks, Paths and circuits; Connected graphs, disconnected graphs and components of a graph; Euler and Hamiltonian graphs, Graph isomorphisms, Adjacency matrix and incidence matrix of a graph, Directed graphs and their elementary properties.	15
Π	Planar Graphs : Planar graph, Euler theorem for a planar graph, Various representations of a planar graph, Dual of a planar graph, Detection of planarity, Kuratowski's theorem. Weighted graph, Travelling salesman problem, shorted path Dijkstra's algorithm.	15

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TT	Cut-Sets and	Cut-Vertices :		
III	sets Cut-vert	graph and its properties, Fundament	al circuits and cut-	15
	isomorphism	ices, Connectivity and separability, and 2- isomorphism.	Network flows, 1-	10
	Trees and Fu	ndamental Circuits :		
IV	Definition and	nuamental Circuits :		
IV	theorem on a	properties of trees, Rooted and bin	ary trees, Cayley's	15
	Minimal span	counting tree, Spanning tree, Fur ning trees in a connected graph.	ndamental circuits,	
		Part C Learning D		
		Part C - Learning Reso		
		Text Books, Reference Books, Oth	er Resources	
	Recommended			
1	. R. Balakrishr	an & K. Ranganathan (2012). A Tex	tbook of Graph Theory	Springer
2	. Ruisingii Do	(2010). Graph Theory with An	olications to Engineering	ng and Computer
	Belefice. De	over r ubilications.	Digitori	ng and computer
F	References Boo	oks Recommended :		
3	. Reinhard Die	stel (2017). Graph Theory (5th editio	n). Springer.	
4. Eugar G. Goodaire & Michael M. Parmenter (2018) Discrete Methometics with G				
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5	. Douglas West	i cultoni. realson		
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5 E-Recoursess <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u>	Douglas West attps://onlinecoun attps://epqp.inflit attps://www.moo asessment an ontinuous Eva farks: Internal Assess er Examination atternal CIA) course teacher)	t (2017). Introduction to Graph Theoret (2017). Introducti (2017). Introduction to Graph Theor	ry (2nd edition). Pearson Marks Marks Jarks Better marks out of two obtained marks in Ass	wo test/quiz +
5 E-Recourses: <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u>	Douglas West attps://onlinecoun attps://epqp.inflit attps://www.moo sessment and ontinuous Eva farks: Internal Assess er Examination atternal CIA) course teacher) Two Section	t (2017). Introduction to Graph Theoret (2017). Introducti (2017). Introduction to Graph Theor	Marks Marks Jarks Better marks out of two obtained marks in Ass be considered against	wo test/quiz + signment shall 30 marks
5 E-Recourses: <u>H</u> <u>H</u> <u>H</u> <u>H</u> <u>H</u> <u>H</u> <u>H</u> <u>H</u> <u>H</u> <u>H</u>	Douglas West attps://onlinecoun attps://epqp.inflit attps://swayam.gu attps://www.moo asessment and ontinuous Eva farks: Internal Assess er Examination atternal CIA) course teacher) Two Section Section-A: (t (2017). Introduction to Graph Theoret (2017). Introducti (2017). Introduction to Graph Theor	Marks Marks Jarks Better marks out of two obtained marks in Ass be considered against	wo test/quiz + signment shall 30 marks
5 E-Recourses: <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u> <u>h</u>	Douglas West attps://onlinecoun attps://epqp.inflit attps://swayam.gu attps://www.moo attps://www.moo attps://www.moo attps://www.moo attps://www.moo attps://www.moo attps://www.moo attps://www.moo attps://attp	t (2017). Introduction to Graph Theoret (2017). Introducti (2017). Introduction to Graph Theor	Marks Marks Marks Iarks Better marks out of two obtained marks in Ass be considered against	wo test/quiz + signment shall 30 marks

Name and signature of convener & members of CBOS-

Dr. Omilian Rel shivent Dornort de Dr. S. Dashf P. K. Sahr

Part	t A: Introduction		
Prog (Cert	ram: Bachelor in Science tificate/Diploma/Degree/Honors)	SEMESTER-II/IV/V/VI	Session: 2024-2025
1	Course Code	MAS	FC-1
2	Course Title	Introduction to LATEX	
3	Course Type	Skill Enhancemen	nt Course (SEC)
4	Pre-requisite (if, any)	Basic understanding of docume markup languages, and willing and formatting conventions.	ent editing, familiarity with ness to learn LaTeX syntax
5	Course Learning Outcome (CLO)	 This Course will enable the standard part of the standard	ants in a document and an Table Structures.
6	Credit Value	(1C + 1C) = 30 Ho	= 15 Hours – Theoretical learning and purs Laboratory or Field
7	Total Marks	Max. Marks: 50	learning/Training Min Passing Marks: 20

Part B: Content of the Course Total No. of Teaching-learning Periods: Theory - 15 Periods (15 Hrs) and Lab. or Field learning/Training 30 Periods (30 Hours) Unit **Topics (Course contents)** No. of Period Basics: Introduction to LaTeX, Text, Symbols and Commands, Document Ι layout and organization, displayed text. Mathematical formulas, Graphics inclusion and color. Floating tables and figures, User customizations. Beyond the Basics: Document management, Postscript and PDF, Beamer, Frames, Bibliographic data bases and BiBTeX, Presentation material. II Practicals Based on-1.Introduction to TeX and LaTeX- Creating and typesetting a simple LaTeX document, 2.Adding basic information to documents- Environments, Footnotes,

15

30

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Sectioning, Displayed material. 3.Accents and symbols- Mathematical typesetting (elementary and advanced): Subscript/ Superscript, Fractions, Roots, Ellipsis,

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4. Mathematical symbols- Arrays, Delimiters, Multiline formulas,	
5.Putting one thing above another-Spacing and changing style in math mode.	
6.Pictures and graphics in LaTeX-Simple pictures using PSTricks,	
r lotting of functions.	
7.Beamer, Frames-Setting up beamer document, Enhancing beamer presentation	
8.Bibliographic data bases and BiBTeX -Create and manage bibliographic references using BiBTeX	
S P Protection doing DIDTCA	

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Text Books Recommended-

1. Murugan Swaminathan, Latex For Beginners, Publisher: Notion Press

Reference Books Recommended

2. Dilip Datta, Latex in 24 Hours A Practical Guide for Scientific Writing, Springer

E-resources:

Free Online LaTeX Editor- https://www.overleaf.com/

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:				
Maximum Marks:	50 Marks			
Continuous Interna	al Assessment (CIA): 15 Marks			
End Semester Exa	m (ESE): 35 Marks			
Continuous Internal Assessment (CIA): (By Course Coordinator)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar +Attendance - 05 Total Marks - 15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks		
End Semester Exam (ESE):	 Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on learned skill - 20 Marks B. Spotting based on tools (written) 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks 	Managed by Coordinator as per skilling		

Name and signature of convener & members of CBOS-

P. K. Sahu)

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Pa	Part A: Introduction			
Pro (Ce	ogram: Bachelor in Science rtificate/Diploma/Degree/Honors)	Class: B.Sc. II/IV/V/VI Semester	Session: 2024-2025	
1	Course Code		MASEC-2	
2	Course Title		Python	
3	Course Type	Skill Enh	ancement Course (SEC)	
4	Pre-requisite (if, any)	Basic understanding of pr syntax.	ogramming concepts, familiarity with	
5	Course Learning Outcome (CLO)	 syntax. This Course will enable the students to: > To write python programs, develop a small application .an logic for problem solving. > To be familiar about the basic constructs of programmin such as data, operations, conditions, loops, functions etc. > To be familiar with string and its operation. > To develop basic concepts of function and terminology. > To determine the methods to create and develop Python programs by > Utilizing the data structures like lists and tuples. 		
6	Credit Value	$\begin{array}{c c c c c c c c c c c c c c c c c c c $		
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20	

	Part B: Content of the Course	
UNI		
Т	Topics	No. of
I	 (A) Python Basic and IDE :- Introduction of Python, Installing Python, Running Simple Program, Removing Keys, Traversing a Dictionary . Basic of Python :-Data type of Python., Variable declaration rule, Python Identifier and reserved words, Input Output Function Operator of Python, Advanced Python operator(Membership and identity), Comments in Python, Line and Indentation, (B) Conditional structure :- if Statements, if -else and statement, Nested if , if-elif- else ladder Loop Control Structure, While loop, For loop, Nested loop, Break Statement, Continue Statement, Pass Statement - Practical 6 ,7& 8 (C) String and Function String Basics, Accessing and updating String, Built-in String Methods Function in Python, Declaration and Calling function, Function Argument, Anonymous Functions Python Lists, Accessing and updating List, Basic List Operation, Built-in List Methods, Python Tuple, Accessing and updating tuple, Basic tuple operation, Built-in tuple 	Hours 15

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п	List of practicals based on Python :-	30
	 Practical 1 - Write a Python program that asks the user for their name and 	
	age, then prints a message greeting the user with their name and mentioning	
	then age.	
	 Practical 2 - Define a list with at least three elements of different data types and print the list. 	
	 Practical 3- Writeaprogram thattakestwonumberandprint thesumof thesenumbers. 	
	 Practical 4 -Writeaprogramtocheckwhethertheinputnumberiseven orodd. 	
	 Practical 5- Write a program to compare three numbers and print the largest one. 	
	 Practical 6- Writeaprogramtoprint factors of a given number. 	
	 Practical 7-Writeaprogram toprint tableusingwhileLoop. 	
	 Practical 8 -Writeaprogramtocreatethe followingPattern 	
	 Practical 9- Write a Python program that takes a lowercase string from the 	
	user and converts it to uppercase.	
	Practical 10- Write a function that takes a string input and checks if it is a	
	pannuome or not.	
	 Practical 11- Write a Python program that defines a function to calculate the sum of two numbers. 	
	 Practical 12- Create a tuple representing the days of the week and 	
	update the last element with "Sunday". Print the updated tuple.	
	 Practical 13- Write a Python program that concatenates two tuples and 	
	prints the concatenated tuple.	
	 Practical 14- WAP to create a list of numbers and sort the list in 	
	ascending order.	
	 Practical 15- Write a list function to convert a string into a list, as in list (-abc) gives [a, b, c]. 	

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Text Books Recommended-

- 1. Fundamentals of Python first programs, 2nd Edition, Kenneth A. Lambert.
- 2. Beginning Python from Novice to Professional, Third Edition, Magnus Lie Hetland

Reference Books Recommended-

- 3. Python for Science and Engineering, Hans-PetterHalvorsen.
- 4. Python Programming: An Introduction to Computer Science, Third Edition, John Zelle.
- 5. Introduction to Scientific Computing in Python, Continuum Analytics and Robert Johansson.

E-Recourses:

https://onlinecourses.nptel.ac.in https://epqp.inflibnet.aci.in https://swayam.gov.in https://www.mooc.org

PART -D: Assessment and Evaluat	ion
Suggested Continuous Evaluation Methods:	
Maximum Marks: 50	Marks
Continuous Internal Assessment (CIA): 15 Mark	
End Semester Exam (ESE): 35 Mar	cs A
Sin Que	52 Cr Harmit

Continuous Internal Assessment (CIA): (By Course Coordinator)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar +Attendance - 05 Total Marks - 15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15
End Semester Exam (ESE):	 Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on learned skill - 20 Marks B. Spotting based on tools (written) - 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks 	Marks Managed by Coordinator as per skilling

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Part	A: Introduction			
Program: Bachelor in Science (Certificate/Diploma/Degree/Honors)		Class: B.Sc. I/III/V Sem Session:2024-2025		
1	Course Code	MAVAC-1		
2	Course Title	Basic Mathematics and Logic		
3	Course Type	Value Addition Course		
4	Course Learning Outcome (CLO)	 This Course will enable the students- To orient them towards life-long learning, to develop power of concentration and to overcome the fear of mathematics from their mind. To cultivate scientific temper through systematic, critical and lateral thinking. To enhance their logical, analytical and reasoning skills useful for competitive exams. To make understand the relevance and need of quantitative methods for making business decisions. 		
5	Credit Value	2 Credits Credit = 15 Hours - learning & Observation		
6	Total Marks	Max. Marks: 50 Min Passing Marks: 20		

PART	-B: Content of the Course	
	Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30	Hours)
Unit	. Topics (Course contents)	
	Basic Mathematics	
I	 Brief history of Vedic Mathematics (In Indian Knowledge Tradition), Sanskrit terminology involved in 16 Sutras and 13 Sub-Sutras and their meaning , Addition , Subtraction , Multiplication & Division using different techniques of Vedic Mathematics , Squaring numbers , Square roots of perfect squares , Cube roots of perfect cubes , Methods of quick verification of answers through Digit Sum Method 	8
п	Problem based on Numbers, Decimal Fractions, Average, Simple Interest, Percentage, Clocks	8
III	Problems on Profit & Loss, Discount, Ages, Speed, Time & Distance, Train, Ratio & Proportion, Mixture	8

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IV Logical Ability: Problems on Series Completion, Coding- Decoding, Inserting the Miss Character, Problems on Mirror Image & Water Image			
Problems on Blood relations, Direction Sense Tests, Cubes & Dice, Logical Deductions based on Universal, Particular, Affermative & Negative Premises.			

		Part	C - Learn	ing Res	ource	
	Te	ext Books, R	eference B	looks, O	ther Resource	28
Text Books Recomm	nended-					
2. Abilitit Limited.,N 3. Dr. R.S New Delh	Juna, Qu Iew Dell . Aggarw i	iantitative Ap ii. val , Verbal &	otitude, Ta	ta McGr	aw Hill Publisl	oany Ltd., New Delhi. ning Company and and Company Ltd.,
Reference Books Re	commen	ded-				
5. Govind Competitiv 6.Vedic M	ve Exam athemati	ingh &Rakes inations) cs Made Eas	sh Kumar , y Publishe	Text Bo d by Dha	ok of Quickes	ublications , Patna t Mathematics (For all
PART -D: Ass				ation		
Suggested Continuou Maximum Marks: Continuous Internal End Semester Exam	Assessm (ESE):		ls: 50 Mai 15 Mai 35 Mar	ks		
Continuous Internal Assessment (CIA): (By Course Teacher)		ternal Test / (signment/Sem otal Marks -	ninar +Atter			Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester		ection – A &				
Exam (ESE):	Section Section	A: Q1. Objec B: Descriptiv	tive – 05 x e answer ty	l= 05 Ma pe qts.,1c	rk; Q2. Short an out of 2 from eac	swer type- 5x2 =10 Marks ch unit- 4x05 =20 Marks

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