FOURTH YEAR UNDER GRADUATE PROGRAM(NEP-2020)

Program: Bachelor of Science (2024-28)

DISCIPLINE- MATHEMATICS

Session-2024-25

DSC -01 to08		DSE-01to12		DGE-01&02	
Code	Title	Code	Title	Code	Title
MASC-01	Elementary Calculus	MASE-01	Advanced Calculus	MAGE-01	Elementary Calculus
MASC-02	Algebra	MASE-02	Mechanics	MAGE-02	Algebra
MASC-03	Differential Equations	MASE-03	Numerical Methods	III/AGE-02	80014
MASC-04	Abstract Algebra	MASE-04	Number Theory	SEC	
MASC-05	Real Analysis	MASE-05	Integral Transforms	MASEC-01	Introduction to Latex
MASC-06	Metric Spaces	MASE-06	Topology	MASEC-02	Python
MASC-07	Advanced Real Analysis	MASE-07	Complex Analysis - I	MAGEG-02	- y mon
MASC-08	Advanced Abstract Algebra	MASE-08	Discrete Mathematics	VAC	
			Measure Theory	MAVAC-01	Basic Mathematics and Logic
			General and Algebraic Topology		20810
		MASE-11	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.

D9.

F.R. Salus

Dr. Madhu Shritz

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.

Profession Shows Dr. S. Eron D

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

COURSE CURRICULUM

	COURSE CURRICULUM				
Pa	Part A: Introduction				
Ce (Ce	Program: Bachelor in Science ertificate/Diploma/Degree/Honors	Semester - I	Session:2024	4-2025	
1	Course Code	Course Code			
2	Course Title	Flor	MASC-01 mentary Calculus		
3	Course Type	Ele			
4	Pre-requisite(if any)				
5	Course Learning Outcome This Course will enable the students to:			S	
	CLO) Know about ancient Indian Mathematicians and their contribution				
	Calculate the limit and examine the continuity and are last				
		Calculate the limit and examine the continuity and understand the			
		geometrical interpretation of differentiability. Apply various tests to determine convergence.			
	 Understand the consequences of various mean value theorems. 				
	 Understand concepts of Curvature and Asymptotes. 				
	Draw curves in Cartesian and polar coordinate systems				
		➤ Understand the elementar	wintagration of	ems	
		Understand the elementary integration of transcendental function and understand applications of reduction formulae.			
6	Credit Value	4 C 1Credit = 15 hours. Learning and all			
7	Total Marks	Maximum Marks : 100	- 13 hours- Learning and	observation	
Part	B: Content of the Course	THE THE PART OF TH	Minimum Passing	Marks:40	
Tota	otal no of teaching – learning period =60 Periods (60 Hours)				
UN	1.1	Topics		T 27 00	
	Contributions and Biogra	phy of Indian Mathematicia	nc•	No of Periods	
	Doullayan, Apasthamb.	Katyayan Mahayaaraaham	ya, Brahmagupta and		
I	Bhaskarachaya in special context of Leelayati				
	Sequences, Continuity and Differentiability: Notion of convergence of seguences.			15	
Notion of convergence of sequences and series of real numbers, Defin			numbers, Definition of		
	limit and continuity of a real valued function; Differentiability and its geometrical interpretation. Elementary Differentiation.				
	Expansion of Functions:				
II	Rolle's Theorem, Lagrange's mean value theorem. Cauchy's mean value				
	Boundarious microliciations Successive differentiation - 1 T 11			15	
	theorem, whachaufill sailed 18	Wor's theorems for expansion	of a function		
	Cui vature, Asymptotes.	IIIVe Tracing			
III	Curvature; Asymptotes of general algebraic curves, Parallel asymptotes, Asymptotes parallel to axes; Symmetry, Concavity and convexity, Points of inflection. Tangents at origin Multiple and Convexity and Convexity, Points of				
AAI	Janpietes parallel to axe	S. SVIIIIIPETTY Concernity on	d	15	
	points; Tracing of Cartesian,	III. WILLIAM DOINTS Position	and nature of double		
	Tuenig of Cartesian,	polar and parametric curves.			

Dr. S. Dashpeth

the skylan

3

Dr. Madhushit

	IV	Integration: Elementary integration, Integration of Transcendental function, Reduction formulae, Definite integral.	15
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https://epqp.inflibnet.aci.in https://www.mooc.org Part D: Assessment and Evaluation Suggested Continuous Evaluation Methods: Maximum Marks: Continuous Internal Assessment (CIA): End Semester Examination 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 Two Section-A&B Section-A: O1.Objective- 10x1=10 marks O2. Short are selected.						
Text Books, Reference Books, Other Resources Text Books Recommended 1. Howard Anton, I. Bivens& Stephan Davis (2016). Calculus (10th edition). Wiley India. 2. Gabriel Klambauer (1986). Aspects of Calculus. Springer-Verlag. 3. Wieslaw Krawcewicz & BindhyachalRai (2003). Calculus with Maple Labs. Narosa. 4. Gorakh Prasad (2016). Differential Calculus (19th edition). Pothishala Pvt. Ltd. Reference Books Recommended- 5. George B. Thomas Jr., Joel Hass, Christopher Heil& Maurice D. Weir (2018). Thomas' Calculus (14th edition). Pearson Education. 6. Jerrold Marsden, Anthony J. Tromba& Alan Weinstein (2009). Basic Multivariable Calculus, Springer India Pvt. Limited. 7. James Stewart (2012). Multivariable Calculus (7th edition). Brooks/Cole. Cengage. 8. Monty J. Strauss, Gerald L. Bradley & Karl J. Smith (2011). Calculus (3rd edition). Pearson Education. Dorling Kindersley (India) Pvt. Ltd. E-resources: https://onlinecourses.nptel.ac.in https://epap.infilbnet.acj.in https://epap.infilbnet.acj.in https://swayam.gov.in https://www.moo.org Part D: Assessment and Evaluation Suggested Continuous Evaluation Methods: Maximum Marks: 100 Marks Continuous Internal Assessment (CIA): 30 Marks Text /Quiz — 20+20 Marks Onducted by course teacher) Two Section-A&B Section-A: Q1.Objective-10x1=10 marks Q2. Short answer type question-5x4=20marks bection-B: Descriptive answer type question, 1 out of 2 from each unit-10x4=40 Marks	Part C - Lea	Part C - Learning Resource				
1. Howard Anton, I. Bivens& Stephan Davis (2016). Calculus (10th edition). Wiley India. 2. Gabriel Klambauer (1986). Aspects of Calculus. Springer-Verlag. 3. Wieslaw Krawcewicz & BindhyachalRai (2003). Calculus with Maple Labs. Narosa. 4. Gorakh Prasad (2016). Differential Calculus (19th edition). Pothishala Pvt. Ltd. Reference Books Recommended- 5. George B. Thomas Jr., Joel Hass, Christopher Heil& Maurice D. Weir (2018). Thomas' Calculus (14th edition). Pearson Education. 6. Jerrold Marsden, Anthony J. Tromba& Alan Weinstein (2009). Basic Multivariable Calculus, Springer India Pvt. Limited. 7. James Stewart (2012). Multivariable Calculus (7th edition). Brooks/Cole. Cengage. 8. Monty J. Strauss, Gerald L. Bradley & Karl J. Smith (2011). Calculus (3rd edition). Pearson Education. Dorling Kindersley (India) Pvt. Ltd. Feresources: https://onlinecourses.nptel.ac.in https://epqp.inflibnet.aci.in https://epqp.inflibnet.aci.in https://swayam.gov.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 Continuous Internal Assessment (CIA): 30 Marks Continuous Internal Assessment (CIA): 30 Marks Assignment/Seminar- 10 Marks bottained marks in Assignment shall be considered against 30 marks Two 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	Text Books, Reference Books, Other B					
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4. Gorakh Prasad (2016). Differential Calculus (19th edition). Pothishala Pvt. Ltd. Reference Books Recommended- 5. George B. Thomas Jr., Joel Hass, Christopher Heil& Maurice D. Weir (2018). Thomas' Calculus (14th edition). Pearson Education. 6. Jerrold Marsden, Anthony J. Tromba& Alan Weinstein (2009). Basic Multivariable Calculus, Springer India Pvt. Limited. 7. James Stewart (2012). Multivariable Calculus (7th edition). Brooks/Cole. Cengage. 8. Monty J. Strauss, Gerald L. Bradley & Karl J. Smith (2011). Calculus (3rd edition). Pearson Education. Dorling Kindersley (India) Pvt. Ltd. E-resources: https://onlinecourses.nptel.ac.in https://swayam.gov.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 Continuous Internal Assessment (CIA): 20+20 Marks Conducted by course teacher) End Semester Examination (ESE): 70 Marks 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	2. Gabriel	Klambauer (1	986). Aspects of Calculus Springer	(10th edition). Wiley India.		
Reference Books Recommended- 5. George B. Thomas Jr., Joel Hass, Christopher Heil& Maurice D. Weir (2018). Thomas' Calculus (14th edition). Pearson Education. 6. Jerrold Marsden, Anthony J. Tromba& Alan Weinstein (2009). Basic Multivariable Calculus, Springer India Pvt. Limited. 7. James Stewart (2012). Multivariable Calculus (7th edition). Brooks/Cole. Cengage. 8. Monty J. Strauss, Gerald L. Bradley & Karl J. Smith (2011). Calculus (3rd edition). Pearson Education. Dorling Kindersley (India) Pvt. Ltd. E-resources: https://onlinecourses.nptel.ac.in https://swayam.gov.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 Continuous Internal Semination (ESE): 70 Marks Conducted by course teacher) End Semester Examination (ESE): Two Section-A&B Section-A: Q1.Objective- 10x1=10 marks Q2. Short answer type question-5x4=20 marks Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks	3. Wieslay	w Krawcewicz	& Bindhyachal Rai (2002) Caland	verlag.		
5. George B. Thomas Jr., Joel Hass, Christopher Heil& Maurice D. Weir (2018). Thomas' Calculus (14th edition). Pearson Education. 6. Jerrold Marsden, Anthony J. Tromba& Alan Weinstein (2009). Basic Multivariable Calculus, Springer India Pvt. Limited. 7. James Stewart (2012). Multivariable Calculus (7th edition). Brooks/Cole. Cengage. 8. Monty J. Strauss, Gerald L. Bradley & Karl J. Smith (2011). Calculus (3rd edition). Pearson Education. Dorling Kindersley (India) Pvt. Ltd. E-resources: https://onlinecourses.nptel.ac.in https://onlinecourses.nptel.ac.in https://swayam.gov.in https://swayam.gov.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 Conducted by course teacher) End Semester Examination (ESE): Two Section-A&B 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	4. Gorakh	Prasad (2016). Differential Calculus (10th edition). Proceedings of the Prasad (2016).				
5. George B. Thomas Jr., Joel Hass, Christopher Heil& Maurice D. Weir (2018). Thomas' Calculus (14th edition). Pearson Education. 6. Jerrold Marsden, Anthony J. Tromba& Alan Weinstein (2009). Basic Multivariable Calculus, Springer India Pvt. Limited. 7. James Stewart (2012). Multivariable Calculus (7th edition). Brooks/Cole. Cengage. 8. Monty J. Strauss, Gerald L. Bradley & Karl J. Smith (2011). Calculus (3rd edition). Pearson Education. Dorling Kindersley (India) Pvt. Ltd. Eresources: https://onlinecourses.nptel.ac.in https://swayam.gov.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 Conducted by course teacher) Test /Quiz — 20+20 Marks Assignment/Seminar- 10 Marks Conducted by course teacher) Two Section-A&B 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	Reference Boo	ks Recommen	ded-	Pothishala Pvt. Ltd.		
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Pearson Education. Dorling Kindersley (India) Pvt. Ltd. https://onlinecourses.nptel.ac.in https://epqp.inflibnet.aci.in https://www.mooc.org Part D: Assessment and Evaluation Suggested Continuous Evaluation Methods: Maximum Marks: Continuous Internal Assessment (CIA): End Semester Examination (ESE): Conducted by course teacher) Test /Quiz - 20+20 Marks Conducted by course teacher) Two Section-A&B 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	7. James S	tewart (2012)	Multivariable Colombia (711 1111)	_		
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Continuous Internal Assessment (CIA): End Semester Examination (ESE): Continuous Internal Assessment (CIA) Conducted by course teacher) End Semester Examination Examination (ESE): Test /Quiz - 20+20 Marks Assignment/Seminar- 10 Marks Assignment/Seminar- 10 Marks be considered against 30 marks Examination (ESE) Two Section-A&B 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	Part D: Assessment and Evaluation					
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Assignment/Seminar- 10 Marks Conducted by course teacher) End Semester Examination (ESE) Two Section-A&B 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	Continuous Internal		7 0 171241			
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2. Bescriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks	Examination	Section-A: (21.Objective- 10x1=10 marks 02 Sh	Out out		
	(ESE)	Section-B: I	Descriptive answer type question 1	answer type question-5x4=20marks		
Name and signature of convener & members of CDOS			The answer type question, 1 of	ut of 2 from each unit- 10x4= 40 Marks		
	Name and s	signature of co	INVENER & members of CDOS			

Name and signature of convener & members of CBOS
Do. S. Dashputnu)

Dr. P. k. Sahu)

Name and signature of convener & members of CBOS
Dr. P. k. Sahu)

Dr. S. Khur

Dr. S. Khur

Dr. S. Khur

FOUR YEAR UNDER GRADUATE PROGRAM(2024-28)

DEPARTMENT OF MATHEMATICS COURSE CURRICULUM

Part A	: Introduction			
Program	m: Bachelor in Science ificate/Diploma/Degree/Honors)	Semester - II	_	Session:2024-2025
2	Course Code Course Title			MASC-02
3	Course Type	Algebra		
1 D ::		Knowledge of he	Discipline Specific Course (DSC) Knowledge of basic algebra, determinants and matrices.	
5	Course Learning Outcome (CLO)	 Learn about th Understand Se Learn about th 	enable the e Matrix alg t theory, Fu e 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	. 100	Observation
		Tridiks	. 100	Minimum Passing Marks:40

Part B:	Content of the Course	
Total no	of teaching – learning period =60 Periods (60 Hours)	
UNIT	Tonics	Tay 05 1
I	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 inverse.	
п	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
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

			15	
Part C - Learning Resource				
Text Books, Reference Books, Other Resources				
Text Books Recommended-	The state of the s			
1. RamjiLal (2017). Algebra I	etic Springer			
2. Nathan Jacobson (2009). Bo	asic Algebra I (2 nd edition). Dover F	Publications		
3. John B. Fraleigh (2007). A First Course in Abstract Algebra (7th edition). Pearson				
Reference Books Recommended-	-			
4. Michael Artin (2014). Algei	ebra (2 nd edition). Pearson.			
5. Stephen H. Friedberg, Arno	old J.Insel& Lawrence E. Spence (20	003). <i>Linear Algebra</i> (4 th edit	tion)	
Prentice-Hall of India Pvt. Lt	t	11.800.00 (1.00.00		
6. Joseph A. Gallian (2017). C	Contemporary Abstract Algebra (9th	edition). Cengage.		
7. Kenneth Hoffman & Ray K	Lunze (2015). Linear Algebra (2nd ed	lition). Prentice-Hall.		
8. I. N. Herstein (2006). <i>Topic</i>	lia.			
E-resources: https://onlinecourse	es.nptel.ac.in			
https://epqp.inflibne				
https://swayam.gov.				
https://www.mooc.o				
Part D: Assessment and Evaluation				
Suggested Continuous Evaluation Methods:				
Maximum Marks:	100 Mar	ks		
Continuous Internal Assessment		S		
End Semester Examination (ES	SE): 70 Marks	3		
	Test /Quiz – 20+20 Marks	Better marks out of two te	st/quiz +	
Assessment (CIA)	Assignment/Seminar- 10 Marks	obtained marks in Assignm	ent shall	
(Conducted by course teacher)		be considered against 30 m		
End Semester Two Section-				
Examination Section-A: Q:	1.Objective- 10x1=10 marks Q2. Sh	ort answer type question-5x	4=20marks	
(ESE) Section-B: De	escriptive answer type question, 1 or	ut of 2 from each unit- 10x4	= 40 Marks	

Name and signature of convener & members of CBOS-

(Dr. S. R. K. Sahu)

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