DEPARTMENT OF MATHEMATICS COURSE CURRICULUM & MARKING SCHEME

B.Sc. VII & VIII Semester MATHEMATICS

(Based on Choice Based Credit System)

SESSION: 2024-25



ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg) NAAC Accredited Grade A⁺, College with CPE - Phase III (UGC), STAR COLLEGE (DBT) Phone: 0788-2212030

Website - www.govtsciencecollegedurg.ac.in, Email – autonomousdurg2013@gmail.com



DEPARTMENT OF MATHEMATICS

GOVT. V.Y. T. PG. AUTONOMOUS COLLEGE, DURG

SYLLABUS for B.Sc. Semester - VII

The syllabus with the paper combinations and Marking Scheme for the session 2024-2025.

Title	Paper Code	Title of the Paper	Theory	Credit
Core Course (DSC)		Advance Abstract Algebra I	100	4
Discipline Specific Elective (DSE)		Advance Real Analysis I	100	4
Discipline Specific Elective (DSE)		General Topology I	100	4
Discipline Specific Elective (DSE)		Complex Analysis I	100	4
Discipline Specific Elective (DSE)		Discrete Mathematics	100	4

The syllabus for B.Sc. Semester - VII is hereby approved by the members of Board of Studies for the session 2024-25.

In case any change or modification is prescribed by Central Board of Studies or Higher Education Dept., Govt. of Chhattisgarh with respect to content or distribution of marks for Undergraduate syllabi, it will be implemented accordingly.

Name & Signature:

Chairperson / H.O.D - Dr. Padmavati	Faculty members:
Subject Expert - Dr. Madhu Shrivastava Witt/6-07-14	Dr. M.A. Siddiqui – 📈
Subject Expert - Dr. Shabnam Khan	Dr. Rakesh Tiwari – TR/hu
Subject Expert - Dr. S. K. Bhatt Show 6725	Dr. (Smt.) Prachi Singh –
Representative Members 1. Dr. Anil Kashyap -	5
2. Shri A. K. Pandey -	
3. Dr. Mayur Puri Goswami	

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF MATHEMATICS COURSE CURRICULUM 2024-25

DSC

t A: In	troduction					
		Class: B.Sc. Semester	r – VII	Session:2024-2025		
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	and the state of the second state of the secon	Advanced Abstract Algebra				
		Discipline Specific	c Course	(DSC)		
Outco	ome (CLO)			y normal series a	and use of	
		series in JordenHolder Theorem.				
		 Understand field extension with 	h types	of extension as-	algebraic,	
			arabic ai		en, durene	
			nian maa	hules and susmal		
					es, nilbert	
				s and Jorden for	ms, Smith	
		normal form and rational canonic	cal form.			
Cred	lit Value	4 Credits 1 credit =15 H	ours - L	earning and Obser	rvation	
Tota	l Marks	Maximum Marks :100			the second se	
rt B: C						
	Total	no. of Teaching/ Learning Periods = 60 P	Periods (6	60 Hours)		
it		Topics (COURSE CONTENTS	S)		No. of Periods	
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I	Normal and Su	bnormal Series, Composition Series, Jordan	n-Holder	Theorem,	12	
I	Group Automo	rphism, Conjugacy Relation, Class Equation	n of Finit	e Group, Cauchy	12	
					12	
ш	Extension Fie	lds, Algebraic and Transcendental Ext	tensions,	Separable and	12	
	Inconsession Liv		,			
		ensions, Algebraically Closed Fields.	,			
	Specialized Fi	ds and Elements:				
v	Specialized Fields,				12	
	Specialized Fields, Fields.	elds and Elements: Finite Fields, Primitive Elements, Normal			12	
	Specialized Fi Perfect Fields, Fields. Galois Theory	elds and Elements: Finite Fields, Primitive Elements, Normal	l Extensio	ons and Splitting	12	
7	Specialized Fi Perfect Fields, Fields. Galois Theory Automorphism	elds and Elements: Finite Fields, Primitive Elements, Normal : of Extensions, Galois Extension, Fundamen	l Extensio	ons and Splitting		
,	Specialized Fi Perfect Fields, Fields. Galois Theory Automorphism Theory, Solution	elds and Elements: Finite Fields, Primitive Elements, Normal of Extensions, Galois Extension, Fundamen n of Polynomial Equations by Radicals, Inse	l Extensio	ons and Splitting	12	
,	Specialized Fi Perfect Fields, Fields. Galois Theory Automorphism Theory, Solution	elds and Elements: Finite Fields, Primitive Elements, Normal : of Extensions, Galois Extension, Fundamen	l Extensio	ons and Splitting		
,	Specialized Fi Perfect Fields, Fields. Galois Theory Automorphism Theory, Solution	elds and Elements: Finite Fields, Primitive Elements, Normal of Extensions, Galois Extension, Fundamen n of Polynomial Equations by Radicals, Inse gree 5 by Radicals.	I Extension ntal Theory solvability	ons and Splitting rem of Galois of the General		
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,	Specialized Fi Perfect Fields, Fields. Galois Theory Automorphism Theory, Solution	elds and Elements: Finite Fields, Primitive Elements, Normal of Extensions, Galois Extension, Fundamen n of Polynomial Equations by Radicals, Inse gree 5 by Radicals.	l Extensio	ons and Splitting rem of Galois of the General		
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,	Specialized Fi Perfect Fields, Fields. Galois Theory Automorphism Theory, Solution	elds and Elements: Finite Fields, Primitive Elements, Normal of Extensions, Galois Extension, Fundamen n of Polynomial Equations by Radicals, Inse gree 5 by Radicals.	I Extension ntal Theory solvability	ons and Splitting rem of Galois of the General		
	Cred Tota Tota	Total it Groups: I Normal and Su Solvable Group Group Automo Theorem and S Field Theory - II Extension Fie	Operatin Bachelor's in Clease: B.Sc. Semester Clourse (Certificate /Diploma / Class: B.Sc. Semester Course Code Advanced Abst Course Title Advanced Abst Course Type Discipline Specific Course Learning This Course will enable the students to 0 utcome (CLO) Very and solvability. Remember properties of group series in JordenHolder Theorem. Vunderstand field extension wit transcendental, separable, insep theory and solvability. Apply module, Noetherian, Artii basis theoremand Wedderzburn Analyze Linear transformation, understand Jord normal form and rational canonic transformation, understand Jord normal form and rational canonic Credit Value 4 Credits 1 credit =15 H Total Marks Maximum Marks :100 rt B: Content of the Course Total no. of Teaching/ Learning Periods = 60 I it Topics (COURSE CONTENT) It Normal and Subnormal Series, Composition Series, Jordar Solvable Groups, Nilpotent Groups. I Group Automorphism, Conjugacy Relation, Class Equation Theorem and Sylow Theorem. Field Theory - Extensions: Field Theory - Extensions:	Operatin Bachelor's in Science (Certificate /Diploma / Class: B.Sc. Semester - VII Degree Honors) Course Code Course Code Outcome (CLO) Outcome (CLO) This Course will enable the students to: Outcome (CLO) Remember properties of group especiall series in JordenHolder Theorem. Understand field extension with types transcendental, separable, inseparable ar theory and solvability. Apply module, Noetherian, Artinian mode basis theoremand Wedderzburn Artin the Analyze Linear transformation, canor transformation, understand Jorden block normal form and rational canonical form. Credit Value 4 Credits 1 credit =15 Hours - Li Total Marks Maximum Marks :100 N rt B: Content of the Course Topics (COURSE CONTENTS) Groups: Normal and Subnormal Series, Composition Series, Jordan-Holder 'Solvable Groups, Nilpotent Groups. I Normal and Subnormal Series, Composition Series, Jordan-Holder 'Solvable Groups, Nilpotent Groups. I Field Theory - Extensions:	opram. Bachelor's in crence (Certificate Diploma / Class: B.Sc. Semester - VII Session:2024-2025 Degree Honors) Course Code Advanced Abstract Algebra Course Title Advanced Abstract Algebra Course Type Discipline Specific Course (DSC) Course Title Advanced Abstract Algebra Course Type Discipline Specific Course (DSC) Remember properties of group especially normal series a series in JordenHolder Theorem. Outcome (CLO) • Remember properties of group especially normal series a series in JordenHolder Theorem. • Understand field extension with types of extension astranscendental, separable, inseparable and normal extensi theory and solvability. • Apply module, Noetherian, Artinian modules and example basis theoremand Wedderzburn Artin theorem. • Analyze Linear transformation, canonical form and transformation, understand Jorden blocks and Jorden for normal form and rational canonical form. Credit Value 4 Credits 1 credit =15 Hours - Learning and Obsee Total No. of Teaching/ Learning Periods = 60 Periods (60 Hours) It It Topics (COURSE CONTENTS) It Topics (COURSE CONTENTS) It Topics (COURSE CONTENTS) It Groups. Nilpotent Groups. It Normal and Subnormal Series, Composition Series, Jordan-Holder Theorem, Solvable Groups, Nilpotent Groups.	



Name & Signature of Members of	Board	of Studies
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Chairperson / H.O.D - Dr. Padmavati Part (717)	Faculty members:
Chairperson / H.O.D - Dr. Padmavati Port 2/175 Subject Expert - Dr. Madhu Shrivastava Wint /6-07-24 Subject Expert - Dr. Shahnam Khan	Dr. M.A. Siddiqui -
Subject Expert - Dr. Shabnam Khan	
Subject Expert - Dr. S. K. Bhatt Sahah 6.7.25	Dr. Rakesh Tiwari - TRui
Representative Members	Lan
1. Dr. Anil Kashyap -	La
2. Shri A K Pandey -	Dr. (Smt.) Prachi Singh -
3. Dr. Mayur Puri Goswami - REAU	

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Part C - Learning	Resource			
Reference:	Text Books, Reference	Books	s, Other Resourc	cs
Reference;				
press.	charya, S.K. Jain, S.R. Nagpaul : Ba n : Topics in Algebra, Wiley Easte			CambridgeUniversity
3. Quazi Zame	eeruddin and Surjeet Singh : Mod	ern Alı	zebra	
Online Resource:	s: (e- Resources/ e- Books/ e- I	earni	ng Portals)	
1. https://onlin	necourses.nptel.ac.in	2.	https://swayam.g	<u>gov.in</u>
3. https://epqp	.inflibnet.aci.in	4.	https://www.mo	oc.org
	ent and Evaluation			
Suggested Contin	nuous Evaluation Methods:			
Maximum Mark		100 Ma		
Semester End Ex	prehensive Evaluation (CCE):	20 Ma 80 Ma		
Internal	Internal Test – 20 Marks	00 IVI2	ITKS	Best of Test and
Assessment:	Assignment/ Seminar - one of 20) Mark	S	Assignment shall be
Continuous				considered against 20
Comprehensive Evaluation (CCE)				marks
Semester End	Pattern -FOUR Question A B	CDG	am anah unit O.	notion A and D and
Semester End Exam (SEE)	Pattern -FOUR Question A, B, C compulsory. Question C and D h	C, D fro ave inte	om each unit. Qu ernal choice.	estion A and B are
	Pattern -FOUR Question A, B, C compulsory. Question C and D h Question-A & B (Compulsory):	ave inte	ernal choice.	question (2 each)
	compulsory. Question C and D h	ave inte Very sh	ernal choice. 10rt answer type	
	compulsory. Question C and D h Question-A & B (Compulsory):	ave inte Very sh uestion	ernal choice. nort answer type 15	question (2 each)
Exam (SEE)	compulsory. Question C and D h Question-A & B (Compulsory): Question-C: Short answer type q Question-D: Long answer type q	ave inte Very sh uestion	ernal choice. nort answer type 15	question (2 each) 04 x 5 = 20 Marks
Exam (SEE)	compulsory. Question C and D h Question-A & B (Compulsory): Question-C: Short answer type q	ave inte Very sh uestion	ernal choice. nort answer type 15	question (2 each) 04 x 5 = 20 Marks 05 x 5 = 25 Marks 07 x 5 = 35 Marks
Exam (SEE) Name & Signature (compulsory. Question C and D h Question-A & B (Compulsory): Question-C: Short answer type q Question-D: Long answer type q of Members of Board of Studies:	ave into Very sh uestion uestion	ernal choice. hort answer type hs	question (2 each) 04 x 5 = 20 Marks 05 x 5 = 25 Marks 07 x 5 = 35 Marks
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Representative Members

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- 1. Dr. Anil Kashyap -
- 2. Shri A. K. Pandey -
- 3. Dr. Mayur Puri Goswami -

ARTINA

Dr. Rakesh Tiwari -Dr. (Smt.) Prachi Singh



			GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG				
		FOUR YEAR UNDERGRADUATE PROGRAM					
			DEPARTMENT OF MATHEMATICS				
			COURSE CURRICULUM 2024-25				
			COOKSE CONNECTION 2024 25	DSI			
				001			
		ntroduction					
Program: Bachelor's in science (Certificate			Class: B.Sc. Semester – VII Session:2024-2025				
		Diploma /					
		ree/Honors)					
1	Cou	rse Code					
2		rse Title	Advance Real Analysis I				
3		rse Type	Discipline Specific Elective (DSE)				
4		rse Learning	This Course will enable the students to:				
	Outcome (CLO)		 Remember sequences and series of functions and their convergence forconvergence. Analyze Function of several variables, derivatives in open subsets ofhigher order, partition of unity and Stock's Theorem. Understand Riemman and Stieltjes integral and its properties. 				
			Apply Idea of measures, measurable sets, Borel and Lebesgue mea	asures.			
5		dit Value	4 Credits 1 credit =15 Hours – Learning and Obser	rvation			
6 D		al Marks	Maximum Marks :100 Minimum Passing N	/larks:40			
Pa	rt B: (Content of the Co					
		101	al no. of Teaching/ Learning Periods = 60 Periods (60 Hours)	Nach			
Un	it		Topics (COURSE CONTENTS)	No. of Periods			
	I	Pointwise and U Weierstrass M-t	Series of Functions: Jniform Convergence, Cauchy Criterion for Uniform Convergence, est, Abel's and Dirichlet's Tests for Uniform Convergence.	13			
1	I	Power Series:					
1	1	of Terms of a Se	orem for Power Series, Abel's and Tauber's Theorems, Rearrangements eries, Riemann's Theorem.	11			
			everal Variables:	-			
11	1	Linear Transfor Derivatives.	mations, Derivatives in an Open Subset of R ⁿ , Chain Rule, Partial	10			
IV	V	Interchange of Theorem, Invers	and Higher Orders: the Order of Differentiation, Derivatives of Higher Orders, Taylor's e Function Theorem, Implicit Function Theorem.	14			
		Extremum Prob	blems and Differential Forms: ems with Constraints. Lagrange's Multiplier Method, Differentiation of				

Chairperson / H.O.D - Dr. Padmavati Put Ehrei Faculty members: EF6-07-24 Subject Expert - Dr. Madhu Shrivastava M Subject Expert - Dr. Shabnam Khan Dr. M.A. Siddiqui -67127 Subject Expert - Dr. S. K. Bhatt US **Representative Members** Dr. Rakesh Tiwari -1. Dr. Anil Kashyap -2. Shri A. K. Pandey -Dr. (Smt.) Prachi Singh Dr. Mayur Puri Goswami -3.



Part C - Learnin				
Reference:	Text Books, Re	ference Books,	Other Resources	
			N= N=C==== 111	I. Kaarlaacha
1. Principio 1976 In	of Mathematical Analysis	By Walter Ru	din McGraw-Hil	l, Kogakusha,
2 Real Ana	ternational student edition.	II - Dub Call		Varia 10/2
2. T.M.A.	lysis By H.L. Roydon Macmi	llan Pub.Co.li	ic.4th Edition, N	lew fork .1962.
	ostol, Mathematical Analysis			
	lambauer, Mathematical An			
	e, Real Analysis; an introdu			
6. G. de Ba	ra, Measure Theory and Int	egration, Wil	ey Eastern Limit	ted, 1981.
E. Hewitt	and K. Stromberg. Real and	Abstract Ana	lysis, Berlin, Sp	ringer, 1969.
	and V.P. Gupta, Lebesgue M			
	ublished, New Delhi, 1986 Rej			
10. I. P. Nata	nson, Theory of Functions o		ble. Vol. I, Frede	erick Ungar
Publishin	g Co., 1961.			0
Online Resources	(e- Resources/ e- Books/ e- Le	earning Portal	s)	
1. https://on	inecourses notel ac in	2	https://ewayam	nov in
	inecourses.nptel.ac.in		https://swayam.j	
3. https://epo	ip.inflibnet.aci.in		https://swayam.j	
3. https://epo Part D: Assessme	p.inflibnet.aci.in nt and Evaluation			
3. https://epo Part D: Assessme	nt and Evaluation uous Evaluation Methods:			
3. <u>https://cps</u> Part D: Assessme Suggested Contir Maximum Mark Continuous Com	nt and Evaluation nt and Evaluation uous Evaluation Methods: s: prehensive Evaluation (CCE):	4. 100 Marks		
3. https://cpa Part D: Assessme Suggested Contin Maximum Mark Continuous Com Semester End Ex	nt and Evaluation nt and Evaluation uous Evaluation Methods: s: prehensive Evaluation (CCE): am (SEE):	4. 100 Marks		
3. https://cpa Part D: Assessme Suggested Contin Maximum Mark Continuous Com Semester End Ex nternal	nt and Evaluation nt and Evaluation nous Evaluation Methods: s: prehensive Evaluation (CCE): am (SEE): Internal Test – 20 Marks	4. 100 Marks 20 Marks 80 Marks		oc.org Best of Test and Assignment
3. https://cpa Part D: Assessme Suggested Contin Maximum Mark Continuous Com Semester End Ex Internal ssessment:	nt and Evaluation nt and Evaluation uous Evaluation Methods: s: prehensive Evaluation (CCE): am (SEE):	4. 100 Marks 20 Marks 80 Marks		Best of Test and Assignme shall be considered against
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3. https://cpa Part D: Assessme Suggested Contin Maximum Mark Continuous Com Semester End Ex oternal ssessment: ontinuous omprehensive	nt and Evaluation nt and Evaluation nous Evaluation Methods: s: prehensive Evaluation (CCE): am (SEE): Internal Test – 20 Marks	4. 100 Marks 20 Marks 80 Marks		Best of Test and Assignme shall be considered against
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3. https://cpa Part D: Assessme Suggested Contin Maximum Mark Continuous Com Semester End Ex	nt and Evaluation nt and Evaluation Methods: s: prehensive Evaluation (CCE): am (SEE): Internal Test – 20 Marks Assignment/ Seminar – one o Pattern -FOUR Question A, 1 Question C and D have intern Question-A & B (Compulsory Question-C: Short answer type	4. 100 Marks 20 Marks 80 Marks of 20 Marks al choice. (): Very short a e questions	https://www.mod	Best of Test and Assignment shall be considered against 20 marks in A and B are compulsory. on (2 each) 04 x 5 = 20 Mark

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617/24 Chairperson / H.O.D - Dr. Padmavati Faculty members: 16-07-24 Subject Expert - Dr. Madhu Shrivastava MM Dr. M.A. Siddiqui -Subject Expert - Dr. Shabnam Khan 124 Subject Expert - Dr. S. K. Bhatt Dr. Rakesh Tiwari -**Representative Members** 1. Dr. Anil Kashyap -2. Shri A. K. Pandey -Dr. (Smt.) Prachi Singh EM 3. Dr. Mayur Puri Goswami -



GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF MATHEMATICS

COURSE CURRICULUM 2024-25

DSE Part A: Introduction Session:2024-2025 Program: Bachelor's in Class: B.Sc. Semester - VII science (Certificate /Diploma Degree/Honors) 1 Course Code 2 Course Title **Topology I** 3 Course Type Discipline Specific Elective (DSE) 4 Course Learning This Course will enable the students to: Outcome (CLO) Remember the concept of topology and algebraic topology. Apply the concept of separation axioms, connectedness, compactness and relatedtopics. Understand the product topology, metrization and embedding, paracompactness. Analyze Nets, Filters and ultra filters. Fundamental group and covering spaces. 5 Credit Value 4 Credits 1 credit =15 Hours - Learning and Observation 6 Total Marks Maximum Marks :100 Minimum Passing Marks:40 Part B: Content of the Course Total no. of Teaching/ Learning Periods = 60 Periods (60 Hours) No. of Unit **Topics (COURSE CONTENTS)** Periods Set Theory and Order: Countable and Uncountable Sets, Infinite Sets and the Axiom of Choice, Cardinal I 12 Numbers and Arithmetic, Schroeder-Bernstein Theorem, Cantor's Theorem and the Continuum Hypothesis, Zorn's Lemma, Well-Ordering Theorem. **Topological Spaces:** Definition and Examples of Topological Spaces, Closed Sets, Closure, Dense п 12 Subsets, Neighborhoods, Interior, Exterior, Boundary, Accumulation Points and Derived Sets. **Topological Structures:** Bases and Sub-bases, Subspaces and Relative Topology, Alternate Methods of ш Defining a Topology in Terms of Kuratowski Closure Operator and 12 Neighborhood Systems. Advanced Topological Concepts: Continuous Functions and Homeomorphism, First and Second Countable Spaces, IV 12 Lindelof's Theorems, Separable Spaces. **Topological Properties and Applications:** Separation Axioms - Their Characterizations and Basic Properties, Urysohn's v 12 Lemma, Tietze Extension Theorem, Compactness and Its Basic Properties. Name & Signature of Members of Board of Studies:

Chairperson / H.O.D - Dr. Padmavati Por Faculty members: Subject Expert - Dr. Madhu Shrivastava Subject Expert - Dr. Shabnam Khan Dr. M.A. Siddiqui -Subject Expert - Dr. S. K. Bhatt 67.24 Representative Members Dr. Rakesh Tiwari -1. Dr. Anil Kashyap -2. Shri A. K. Pandey -Dr. (Smt.) Prachi Singh -3. Dr. Mayur Puri Goswami -



Part C - Lear	ning Resource	
Reference:		
1. K. D. J	oshi, Introduction to General Topology, Wiley Eastern Ltd.,	1983.
2. J. Duga India Pa	indji, Topology, Allyn and Bacon, 1966 (reprinted in Ind 1. Ltd.).	ia by Prentice Hall of
3. George Compar	F.Simmons, Introduction to Topology and modern Analysis by, 1963.	s, McGraw-Hill Book
	ng and G Young, Topology, Addison-Wiley Reading, 196	
5. J.L. Kel	ey, General Topology, Van Nostrand, Reinhold Co., New res: (e- Resources/ e- Books/ e- Learning Portals)	York,1995.
1. https://o	nlinecourses.nptel.ac.in 2. https://swayan	i.gov.in
	qp.inflibnet.aci.in 4. https://www.m	ooc.org
Part D: Assess	nent and Evaluation	
Suggested Con	tinuous Evaluation Methods:	
Maximum Mar		
Continuous Co	mprehensive Evaluation (CCE): 20 Marks	
Semester End H		
ssessment:	Internal Test – 20 Marks	Best of Test and
Continuous	Assignment/ Seminar – one of 20 Marks	Assignment shall be
Comprehensive		considered against 20
valuation (CCE)		marks
Semester End Exam (SEE)	Pattern -FOUR Question A, B, C, D from each unit. Question C and D have internal choice.	lestion A and B are
	Question-A & B (Compulsory): Very short answer type	question (2 each)
	Question-C: Short answer type questions	04 x 5 = 20 Marks
	Question-D: Long answer type questions	05 x 5 = 25 Marks
		07 x 5 = 35 Marks
		Total = 80 Marks

Chairperson / H.O.D - Dr. Padmavati R. 612124	Faculty members:
Subject Expert - Dr. Madhu Shrivastava Mint 6-07-24	
Subject Expert - Dr. Shabnam Khan	Dr. M.A. Siddiqui –
Subject Expert - Dr. S. K. Bhatt Sam 6.70	Dr. Rakesh Tiwari - TALuu
Representative Members	
1. Dr. Anil Kashyap -	\circ
2. Shri A. K. Pandey -	Dr. (Smt.) Prachi Singh -
3. Dr. Mayur Puri Goswami -	154
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GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF MATHEMATICS **COURSE CURRICULUM 2024-25**

DSE

		roduction			G			
	-	Bachelor's in	Class: B.Sc. Semeste	er – VII	Session:2024-2025			
5		(Certificate oloma /						
		e/Honors)						
1		e Code						
2		e Title	Complex	Analysis	5 I			
3	Cours	е Туре	Discipline Specif		e (DSE)			
4		e Learning	This Course will enable the students to	:				
	Outco	me (CLO)			a of analyticity and	the Cauchs		
			• Remember the concept and cons					
			Riemman equations and result			; lunctions		
			including the fundamental theorem of algebra.					
			• Understand the application of t	the powe	er series, expansion	of analytic		
			functions.					
			 Apply Conformal mapping as 	nd bilin	ear transformation	and their		
			properties.					
			 Analyze the Cauchy residue theory 	orem to e	valuate integral and	sum series,		
			analyticcontinuation and its proj	perties, c	anonical products, L	little picard		
			theorem, Monteltheorem etc.					
5		lit Value		5 Hours –	Learning and Obser			
6	-	l Marks	Maximum Marks :100		Minimum Passing N	larks:40		
Pa	rt B: C	ontent of the C	urse Il no. of Teaching/ Learning Periods = 60	Periods	(60 Hours)			
		10			oo mours)	No. of		
Ur	nit		Topics (COURSE CONTEN	15)		Periods		
			gration and Basic Theorems:			12		
	I		egration, Cauchy-Goursat Theorem, Cauchy's Integral Formula,					
			r Derivatives, Morera's Theorem.					
			tions and Theorems:	T 1				
	П		uality and Liouville's Theorem, Taylor's			12		
		Functions.	tic Functions, Singularities and Classific	cation, N	leromorphic			
			pics in Complex Analysis:					
	ш			Theorem	of Algebra	12		
			Argument Principle, Rouche's Theorem, Fundamental Theorem of Algebra, 12 Maximum Modulus Principle, Schwarz Lemma, Inverse Function Theorem.					
			ry and Integrals:					
	IV		chy's Residue Theorem, Evaluation of In	ntegrals,	Branches of	12		
			Functions (Special Reference to arg z, lo					
			ions and Theorems:					
			ppings: Definitions and Examples, Bilin			5		
			Classifications, Special Bilinear Transfe					
	V	Examples (w	$= z^2, z = \sqrt{w}, w = e^z, w = tan^2\left(\frac{\pi}{4}z\right)$), Spaces	of Analytic	12		
			tions, Hurwitz's Theorem, Montel's Theorem, Riemann Mapping Theorem,					
		1		Maile	-	N N		
			S Con C	NVV-	241			
		(NO	Man. Sphe M	6-01	Zy Jaely	"AL		
		C Co			CULGIZ			
			rd Portage	14	/			
			611					



Chairperson / H.O.D - Dr. Padmavati QJ CIMY	Faculty members:
Subject Expert - Dr. Madhu Shrivastava Mut /6-07-24	Dr. M.A. Siddiqui - 📿
Subject Expert - Dr. Shabnam Khan	,
Subject Expert - Dr. S. K. Bhatt	Dr. Rakesh Tiwari -
Representative Members	test
1. Dr. Anil Kashyap -	Dr. (Smt.) Prachi Singh –
2. Shri A. K. Pandey -	
3. Dr. Mayur Puri Goswami - MDEMM	
	1



Part C - Learning Resource

Reference:

- 1. L.V. Ahlfors: Complex Analysis, McGraw Hill, 1979.
- 2. D. Sarason: Complex Function Theory, Hindustan Book Agency, Delhi, 1994.
- 3. H. K. Pathak, Complex Analysis and Applications, Springer, 2019.
- 4. H.A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford 1990.
- 5. Liang-shin Hahn & Bernard Epstein, Classical Complex Analysis, Jones and BartlettPublishers International, London, 1996.
- 6. S. Lang, Complex Analysis, Addison Wesley, 1977.
- 7. W.H.J. Fuchs, Topics in the Theory of Functions of one Complex Variable, D. Van Nostrand Co., 1967.
- 8. C.Caratheodory, Theory of Functions (2 Vols.) Chelsea Publishing Company, 1964.
- 9. Walter Rudin, Real and Complex Analysis, McGraw-Hill Book Co., 1966.
- 10. S.Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, 1997.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

https://onlinecourses.nptel.ac.in

2. https://swayam.gov.in

4. https://www.mooc.org

3. https://epop.inflibnet.aci.in

Part D: Assessme	ent and Evaluation		
Suggested Contin	nuous Evaluation Methods:		
Maximum Mark		00 Marks	
Continuous Com	prehensive Evaluation (CCE):	20 Marks	
Semester End Ex		80 Marks	
Internal	Internal Test – 20 Marks		Best of Test and
Assessment:	Assignment/ Seminar - one of 20	Marks	Assignment shall be
Continuous			considered against 20
Comprehensive			marks
Evaluation (CCE)			
Semester End Exam (SEE)	Pattern -FOUR Question A, B, C compulsory. Question C and D ha	, D from each unit. Que ve internal choice.	stion A and B are
	Question-A & B (Compulsory): V	ery short answer type q	uestion (2 each)
	Question-C: Short answer type qu		$04 \ge 5 = 20$ Marks
	Question-D: Long answer type que	estions	05 x 5 = 25 Marks
			$07 \times 5 = 35 \text{ Marks}$ Total = 80 Marks

Chairperson / H.O.D - Dr. Padmavati	Faculty members:
Subject Expert - Dr. Madhu Shrivastava Mut 6-07-24	Dr. M.A. Siddigui
Subject Expert - Dr. Shabnam Khan	Dr. M.A. Siddiqui –
Subject Expert - Dr. S. K. Bhatt Show 6.7.24	Dr. Rakesh Tiwari - TRA
Representative Members	Lors
1. Dr. Anil Kashyap -	la l
2. Shri A.K. Pandey -	Dr. (Smt.) Prachi Singh –
3. Dr. Mayur Puri Goswami -	



GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF MATHEMATICS

COURSE CURRICULUM 2024-25

TTA. IIII	oduction			D
Program: B ience (Certif	achelor's in icate /Diploma /Honors)	Class: B.Sc. Semester – VII	Session:2024-2025	
Course	Course Code			
	Course Title Discrete Mathematics			
	Ourse Type Discipline Specific Elective (DSE)			
4 Cours	e Learning	This Course will enable the students to:		
Outco	me (CLO)	1. The course aims at introducing the concepts	s of Lattices, sub L	attices a
		Homomorphisms between Lattices.		
		2. Understand the uses of Boolean algebra in daily	/ life.	
		 Understand the uses of grammar and languages Learn about the Finite state machines in differer 	in daily life.	
		5. Solve real-life problems using finite-state and T	it fields.	
	lit Value	4 Credits 1 credit =15 Hours –	Learning and Obse	rustion
	al Marks	Maximum Marks 100	Minimum Passing	
Part B: C	content of the C	Course		Marks:4
	Та	otal no. of Teaching/ Learning Periods = 60 Periods (60 Hours)	
Unit	Topics (COURSE CONTENTS) No.			No. o Period
I	Lattices:			12
	Boolean Alg	zebra:		
II Boolean Ale		ebra, Boolean Algebra as Lattice. Various Boolean Ide	ntition Pooloon	10
	Tunctions, I	ne Switching Algebra example, Sub-algebras.	nerres. Boolean	12
	Grammars, Languages:			
	Grammars,	Languages:	=	
III	Phrase-stru Language ge Grammars a	cture Grammars. Rewriting rules. Derivations. Senten enerated by a Grammar. Regular, Context-Free and Co and Languages.	tial forms. ntext Sensitive	12
	Phrase-stru Language ge Grammars a Regular se	cture Grammars. Rewriting rules. Derivations. Senten enerated by a Grammar. Regular, Context-Free and Co and Languages. ts:	ntext Sensitive	12
III IV	Phrase-stru Language ge Grammars a Regular se Regular exp Analysis. Po Reverse Po	cture Grammars. Rewriting rules. Derivations. Senten enerated by a Grammar. Regular, Context-Free and Co and Languages. ts: pressions and the Pumping Lemma. Kleen's theorem. N polish Notations. Conversion of Infix Expressions to Poli lish notations.	ntext Sensitive lotions of Syntax ish notation. The	12 12
	Phrase-stru Language ge Grammars a Regular se Regular exp Analysis. Po Reverse Po Finite stat	cture Grammars. Rewriting rules. Derivations. Senten enerated by a Grammar, Regular, Context-Free and Co and Languages. ts: pressions and the Pumping Lemma. Kleen's theorem. N polish Notations. Conversion of Infix Expressions to Poli	ntext Sensitive Notions of Syntax ish notation. The	

Chairperson / H.O.D - Dr. Padmavatige Wint 6-07-24	Faculty members:
Subject Expert - Dr. Madhu Shrivastava MMMC 6-07-24	ruculty members.
Subject Expert - Dr. Shabnam Khan O OA	Dr. M.A. Siddiqui –
Subject Expert - Dr. S. K. Bhatt Subject Expert - Dr. S. K. Bhatt	Di. M.A. Sidaiqui -
Representative Members	Dr. Rakesh Tiwari - The Mu
1. Dr. Anil Kashyap -	DI. Rakesh Hwart -
2. Shri A. K. Pandey -	Dr (Smt) Break Give Q
3. Dr. Mayur Puri Goswami -	Dr. (Smt.) Prachi Singh –

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art C - Learning R	ESQUICE .				
Reference:					
 Elements of D J.P. Tremblay 	iscrete Mathematics By C.L. Liu. & R. Manohar, Discrete Mathematical Structures w	ith Applications			
to Computer Science, McGraw-Hill Book Co., 1997.					
3. C.L Liu, Elements of Discrete Mathematics, McGraw-Hill Book Co.					
 N. Deo. Graph Theory with Application to Engineering and Computer Sciences. Prentice Hall of India. 					
5. J. L. Gersting, Mathematical Structures for Computer Science, (3 rd edition), Computer					
Science Press	g, Mainematical Structures for Computer Science, (5	cultury, company			
	s, New Tork. oschutz, Finite Mathematics (International) edition 1983)	McGraw-Hill			
	ny, New York.	,			
	iscrete Mathematics-A Unified Approach, McGraw-Hill I	Book Co.			
	(e- Resources/ e- Books/ e- Learning Portals)				
	(, , , , , , , , , , , , , , , , , , ,				
1 https://oplia.					
1. <u>nupst/online</u>	ecourses.nptel.ac.in 2. https://swayam.g	<u>ov.m</u>			
3. https://epap.	inflibnet.aci.in 4. https://www.moo	oc.org			
	nt and Evaluation				
	uous Evaluation Methods:				
Maximum Marks					
	prehensive Evaluation (CCE): 20 Marks				
Semester End Ex Internal	am (SEE): 80 Marks Internal Test – 20 Marks				
Assessment:	Assignment/ Seminar – one of 20 Marks	Best of Test and			
	Assignment Seminar – one of 20 Marks				
Continuous		Assignment shall be			
Comprehensive		considered against 20			
Comprehensive					
Comprehensive Evaluation (CCE)		considered against 20 marks			
Comprehensive Evaluation (CCE) Semester End	Pattern -FOUR Question A, B, C, D from each unit. Qu	considered against 20 marks			
Comprehensive Evaluation (CCE)		considered against 20 marks			
Comprehensive Evaluation (CCE) Semester End	Pattern -FOUR Question A, B, C, D from each unit. Qu compulsory. Question C and D have internal choice.	considered against 20 marks estion A and B are			
Comprehensive Evaluation (CCE) Semester End	Pattern -FOUR Question A, B, C, D from each unit. Qu	considered against 20 marks estion A and B are question (2 each)			
Comprehensive Evaluation (CCE) Semester End	Pattern -FOUR Question A, B, C, D from each unit. Qu compulsory. Question C and D have internal choice.	considered against 20 marks estion A and B are question (2 each)			
Comprehensive Evaluation (CCE) Semester End	Pattern -FOUR Question A, B, C, D from each unit. Qu compulsory. Question C and D have internal choice. Question-A & B (Compulsory): Very short answer type Question-C: Short answer type questions	considered against 20 marks estion A and B are question (2 each) 04 x 5 = 20 Mark			
Comprehensive Evaluation (CCE) Semester End	Pattern -FOUR Question A, B, C, D from each unit. Qu compulsory. Question C and D have internal choice. Question-A & B (Compulsory): Very short answer type	considered against 20 marks estion A and B are question (2 each) 04 x 5 = 20 Mark			
Comprehensive Evaluation (CCE) Semester End	Pattern -FOUR Question A, B, C, D from each unit. Qu compulsory. Question C and D have internal choice. Question-A & B (Compulsory): Very short answer type Question-C: Short answer type questions	considered against 20 marks estion A and B are			

Chairperson / H.O.D - Dr. Padmavati	Faculty members:
Subject Expert - Dr. Madhu Shrivastava Wint=6-07-24	Dr. M.A. Siddiqui – 😥
Subject Expert - Dr. Shabham Khan	
Subject Expert - Dr. S. K. Bhatt	Dr. Rakesh Tiwari - TRM
Representative Members	basic
1. Dr. Anil Kashyap -	2
2. Shri A. K. Pandey -	Dr. (Smt.) Prachi Singh –
3. Dr. Mayur Puri Goswami -	21

DEPARTMENT OF MATHEMATICS GOVT. V.Y. T. PG. AUTONOMOUS COLLEGE, DURG

			Marks Allotted		Credi
Title	Paper No.	Title of the Paper	Theory	Practical / Project	
Core Course (DSC)	BMT101	Advance Abstract Algebra II	100		4
Discipline Specific Elective (DSE)		Advance Real Analysis II	100		4
Discipline Specific Elective (DSE)		General Topology II	100		4
Discipline Specific Elective (DSE)		Complex Analysis II	100		4
Discipline Specific Elective (DSE)		Graph Theory	100		4
Research Project/ Dissertation				100	12
The syllabus for B Studies for the sessio In case any change or	n 2024-25. ⁻ modificatio tisgarh with	ter - VIII is hereby approved b n is prescribed by Central Board respect to content or distributio ordingly.	l of Studies	or Higher E	ducatio

Chairperson / H.O.D - Dr. Padmavati Faculty members: Subject Expert - Dr. Madhu Shrivastava Mint=/6-07-44Dr. M.A. Siddiqui Ok Subject Expert - Dr. S. K. Bhatt Stan 6.7.24 Dr. Rakesh Tiwari - TRe Representative Members 1. Dr. Anil Kashyap -2. Shri A. K. Pandey -3. Dr. Mayur Puri Goswami -

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF MATHEMATICS **COURSE CURRICULUM 2024-25**

DSC

Par	t A: Int	roduction				
Pro	gram: I	Bachelor's in	Class: B.Sc. Semester – VIII Sessi	ion:2024-2025		
S	science (Certificate					
		oloma /				
		e/Honors)				
1		e Code	Advanced Abstract Algebra II			
2	Cours				_	
4		e Type	Discipline Specific Course (DSC) This Course will enable the students to:			
-	 Recall group properties, focusing on normal series and their role in the Jorda Hölder Theorem. Understand field extensions including algebraic, transcendental, separab 					
			 inseparable, and normal extensions. Apply Galois theory to solve equations by radic equation evaluation. 			
			 Analyze linear transformations, including can transformations, Jordan blocks, and Jordan forms. Study modules, Noetherian and Artinian modules with 			
			• Study modules, Noetherian and Artiman modules with theorem, and Wedderburn-Artin theorem.	iai examples, imbert bas		
5	Cred	it Value	4 Credits 1 credit =15 Hours – Learn	ning and Observation		
6		l Marks				
Part B: Content of the Course						
Total no. of Teaching/ Learning Periods = 60 Periods (60 Hours)						
Un	iit		Topics (COURSE CONTENTS) No. of Periods			
	Modules: I Cyclic modules, Simple modules, Semi-simple modules, Schur's Lemma, Free 12 modules.					
	Rings: II Noetherian and Artinian modules, Hilbert basis theorem, Wedderburn-Artin 12 theorem, Uniform modules, Primary modules.					
	Linear Transformations:IIIAlgebra of linear transformations, Singular and non-singular transformations,12Characteristic roots, Matrices and linear transformations.					
	IV Canonical Forms: IV Similarity of linear transformations, Invariant subspaces, Reduction to triangular forms, Nilpotent transformations, Index of Nilpotency.					
	V Advanced Forms: Invariants of a nilpotent transformation, The primary decomposition theorem, Jordan V blocks and Jordan forms, Smith normal form over a principal ideal domain and rank, Fundamental structure theorem for finitely generated modules over a Principal ideal domain and its applications to finitely generated abelian groups.					

6-07-24 6-07-24 Mile 6-07-24 M617 617124 MADEN



Chairperson / H.O.D - Dr. Padmavati Por Grin	Faculty members:
Chairperson / H.O.D - Dr. Padmavati Partition Subject Expert - Dr. Madhu Shrivastava Whit/6-07-24	Dr. M.A. Siddiqui –
Subject Expert - Dr. Shabnam Khan	
Subject Expert - Dr. S. K. Bhatt	Dr. Rakesh Tiwari - U-Ru
Representative Members	Ent
1. Dr. Anil Kashyap -	Dr. (Smt.) Prachi Singh –
2. Shri A. K. Pandey -	
 Shri A. K. Pandey - Dr. Mayur Puri Goswami - 	



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Part C - Learni	ng Resource		Other Desources		
	Text Books, Re	eference Bool	s, Other Resources		
Reference: 1. P.B. Bhat press.	tacharya, S.K. Jain, S.R. Nagp	aul : Basic A	bstract Algebra, Ca	umbridgeUniversity	
2. I.N.Herst 3. QuaziZar	ein : Topics in Algebra, Wiley neeruddin and Surjeet Singl 'es: (e- Resources/ e- Book	i : Modern Al	gebra		
	linccourses.nptel.ac.in		https://swayam.gov	<u>, in</u>	
3. https://cpc	p.inflibnet.aci.in	4.	https://www.mooc.e	org	
Part D: Assessn	ient and Evaluation				
Suggested Cont Maximum Mari	inuous Evaluation Methods:	100 Ma			
Semester End E		80 Ma			
Internal	Internal Test – 20 Marks			Best of Test and	
Assessment: Assignment/ Seminar – one of 20 Ma Continuous Comprehensive		of 20 Marks		Assignment shall be considered against 20 marks	
Evaluation (CCE)					
Semester End Exam (SEE)	Semester End Pattern - FOUR Question A, B, C, D from each unit. Question A and B are compulsor			ion A and B are compulsory.	
	Question-A & B (Compulsory): Very short answer type question (2 each)				
	Question-C: Short answer type questions $04 \times 5 = 20$ Marks				
				05 x 5 = 25 Marks	
	Question-D: Long answer ty	pe questions			
				$07 \times 5 = 35 \text{ Marks}$	
				Total $= 80$ Marks	

Chairperson / II.O.D - Dr. Padmavati P-	Faculty members:
Subject Expert - Dr. Madhu Shrivastava Wint 6-07-24	Dr. M. A. Siddigui M
Subject Expert - Dr. Shabnam Khan	Dr. M.A. Siddiqui –
Subject Expert - Dr. Shabnam Khan Subject Expert - Dr. S. K. Bhatt Sph Out 6 アレン	Dr. Rakesh Tiwari - TRMu
Representative Members	100 min
1, Dr. Anil Kashyap -	0
2. Shri A. K. Pandey -	Dr. (Smt.) Prachi Singh –
3. Dr. Mayur Puri Goswami - Rosale	

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GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF MATHEMATICS COURSE CURRICULUM 2024-25

Part A: Introduction				Comment	er – VIII	Session:2024-	2025
Program: Bachelor's in		Class: B.Sc.	Semeste				
science (Certificate							
/Diploma /							
	and the second se	(Honors)					
1	Course	the second		Advance Rea	al Analysi	is II	
2	Course	and have the part of the second of the second of the second s		Discipline Specif	ic Elective	e (DSE)	
3	Course	: Learning	This Course wi				and
-4		me (CLO)	Recall s	l enable the students to: equences and series of fur	nctions, fo	ocusing on their conve	rgence and
	Outeo	ine (CLO)		1000			
			 Analyze 	functions of several varia	bles, inclu	iding derivatives in op	jen subsets,
				I desired partition (of unity a	nd Slokes Theorem.	
			 Underst 	and the Riemann and Stie	Itjes integ	rais, emphasizing the	, propos
			and app	ications. the concepts of measure	as measu	urable sets Borel mea	asures, and
			 Explore 	the concepts of measure e measures, highlighting the	heir signif	icance in analysis.	
			Lebesgu	e measures, nightighting ti 1 credit =15	5 Hours -	Learning and Obser	vation
5		it Value	4 Credits Maximum Mar			Minimum Passing M	larks:40
6		Marks	0.11.115.0				
Pa	art B: C	ontent of the C	tal no. of Teachir	g/ Learning Periods = 60	Periods	(60 Hours)	Nort
		10	ourse otal no. of Teaching/ Learning Periods = 60 Periods (60 Hours) Topics (COURSE CONTENTS)			No. of Periods	
U	nit			COURSE CONTE	(10)		1 crious
		Riemann-Stieltjes Integral:					
	I	Definition and	inition and existence of Riemann-Stieltjes Integral, Properties of the integral,				12
		Integration and differentiation, The fundamental theorem of calculus, Integration of					
		Vector-valued functions.					
		Lebesgue Measure and Integration: Lebesgue outer measure. Measurable sets. Regularity, Measurable functions. Borel and				12	
	П	Lebesgue measurability.					
		1	hooma				
	Ш	Non-measurable sets, Integration of non-negative functions, The general integral,				12	
		Integration of series, Measures and outer measures.					
		C.			the star	angura Mangura	12
	IV	Extension of a	a measure, Unique	ness of extension, Complet	tion of a fi	leasure, weasure	12
		spaces. Integr	ation with respect	to a measure.			
		Advanced Di	fferentiation and	of bounded variation 1 ebe	esone diffe	erentiation theorem.	
		The four derivatives, Functions of bounded variation, Lebesgue differentiation theorem, Differentiation and integration. The LpLp-spaces, Convex functions, Jensen's inequality,					12
	V	Holder and Minkowski inequalities, Completeness of LpLp, Convergence in measure,					
		Almost unifor	Almost uniform convergence.				
Almost uniform convergence. Name & Signature of Members of Board of Studjes: Chairperson / H.O.D - Dr. Padmavati & GOTY Subject Expert - Dr. Madhu Shrivastava Subject Expert - Dr. Shabnam Khan Dr. M.A. Siddiqui							
Nam	e & Sig	on / H.O.D -	Dr. Padmavati	612124	Faculty	members:	
Cn	airpers	pert - Dr. Mac	lhu Shrivastava	mint 16-07-24		11	
Subject Expert - Dr. Sha			bnam Khan_ 🦯		Dr. M.A	A. Siddiqui – 发	
Subject Expert - Dr. S. K			C. Bhatt 🛛 🗶 🕻	2674	1		1.
Sut	orecent	ative Membe	rs O		Dr. Rak	esh Tiwari = T	hu
Re	present	Anil Kashyap	-	`			1
	r Dr	A. K. Pandey		ria l	Dr. (Sn	nt.) Prachi Singh – 💃	1X
 Shri A. K. Pandey - Dr. Mayur Puri Goswami - Chengan - 				M' M'		- 0	
	3. Dr.	ind year a second	lund	610/100			
				61011			



D. C. I						
Part C - Learning l	Resource	C Deaks (ther Resources			
Reference:		eference Books, (
 Internatio Real Analy T. M. Apos Gabriel Kla G. J. White G. de Barr E. Hewitt a P. K. Jain a Limited Pu I. P. Natan Publishing 	of Mathematical Analysis nal student edition. rsis By H.L. Roydon Macm tol, Mathematical Analysi ambauer, Mathematical An , Real Analysis; an introdu ra, Measure Theory and In and K. Stromberg. Real and and V.P. Gupta, Lebesgue ablished, New Delhi, 1986 Re son, Theory of Functions g Co., 1961. (e- Resources/ e- Books/ e- I	illan Pub.Co.Ind s, Narosa Publi nalysis, Marcel action, Addison tegration, Wile d Abstract Anal Measure and I eprint 2000). of a Real Varial	:.4th Edition, New shing House, New Dekkar,Inc. New -Wesley Publishi y Eastern Limite ysis, Berlin, Spri ntegration, New ole. Vol. I, Freder	w York .1962. w Delhi,1985. York,1975. ng Co.,Inc.,1968. d, 1981. nger, 1969. Age Internation		
Omme Resources.	(C- Resources, C- Little					
1. <u>https://onlinecourses.nptel.ac.in</u> 2. <u>https://swayam.gov.in</u>						
3. https://epq	3. <u>https://epqp.inflibnet.aci.in</u> 4. <u>https://www.mooc.org</u>					
Maximum Marks	uous Evaluation Methods: : orchensive Evaluation (CCF om (SEE): Internal Test – 20 Marks	80 Marks		Best of Test and shall be considered	Assignment	
Assessment: Continuous Comprehensive Evaluation (CCE)	Assignment/ Seminar – one			20 marks		
Evaluation (CCE)Semester End Exam (SEE)Pattern -FOUR Question A, B, C, D from each unit. Question A and B are compulsor Question C and D have internal choice.					oulsory.	
Question-A & B (Compulsory): Very short answer type question (2 each) 04 x			on (2 each) 04 x 5	5 = 20 Mark		
	Question-C: Short answer t			05 x 3	5 = 25 Mark	
	Question-D: Long answer t	ype questions			5 = 35 Mark = 80 Mark	

Name & Signature of Members of Board of Studies:

)

Chairperson / H.O.D - Dr. Padmavatifo CHI24	Faculty members:
Chairperson / H.O.D - Dr. Padmavati P Enry Subject Expert - Dr. Madhu Shrivastava Wi 76-07-24	Dr. M.A. Siddiqui – 🎢
Subject Expert - Dr. Shabnam Khan	K_
Subject Expert - Dr. S. K. Bhatt	Dr. Rakesh Tiwari - TDRun
Representative Members	
 Dr. Anil Kashyap - Shri A. K. Pandey - 	Dr. (Smt.) Prachi Singh –
 Shri A. K. Pandey Dr. Mayur Puri Goswami - MOSWA 	
(rite	



GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF MATHEMATICS

COURSE CURRICULUM 2024-25

DSE Part A: Introduction Program: Bachelor's in Session:2024-2025 Semester - VIII Class: B.Sc. science (Certificate /Diploma / Degree/Honors) 1 Course Code 2 Course Title **Topology II** 3 Course Type Discipline Specific Elective (DSE) Course Learning 4 This Course will enable the students to: Recall the concepts of topology and algebraic topology, focusing on Outcome (CLO) fundamental principles and applications. Apply separation axioms, connectedness, compactness, and related topics in topological spaces. Understand the product topology, embedding theorems, metrization theorems, and paracompactness. Analyze advanced topics including nets, filters, ultrafilters, fundamental groups, covering spaces, and their related theorems in algebraic topology. 5 Credit Value 4 Credits 1 credit =15 Hours - Learning and Observation 6 **Total Marks** Maximum Marks :100 Minimum Passing Marks:40 Part B: Content of the Course Total no. of Teaching/ Learning Periods = 60 Periods (60 Hours) No. of Unit **Topics (COURSE CONTENTS)** Periods **Product Topology:** Product spaces, Projection maps, Tychonoff product topology in terms of standard sub-I 12 base and its characterizations, Connectedness and product spaces, Compactness and product spaces (Tychonoff's theorem), Countability and product spaces. **Embedding and Metrization:** Embedding and metrization, Embedding lemma and Tychonoff embedding, The Urysohn п 12 metrization theorem, Local finiteness. Nets: Ш Directed Set, Nets, Topology and convergence of nets, Hausdorffness and nets, 12 Compactness and nets, Finite Intersection Property. Filters: Filters and their convergence, Canonical way of converting nets to filters and vice-versa, IV 12 Ultrafilters and compactness. Advanced Topological Theorems: V Paracompactness, The Nagata-Smirnov metrization theorem, The Smirnov metrization 12 theorem.

Chairperson / H.O.D - Dr. Padmavati Faculty members: Subject Expert - Dr. Madhu Shrivastava M Subject Expert - Dr. Shabnam Khan Dr. M.A. Siddiqui -Subject Expert - Dr. S. K. Bhatt **Representative Members** Dr. Rakesh Tiwari 1. Dr. Anil Kashyap -2. Shri A. K. Pandey -Dr. (Smt.) Prachi Singh 3. Dr. Mayur Puri Goswami -



Part C - Learning	Resource					
Reference:						
1. K. D. Joshi	Introduction to General To	pology, Wiley	Eastern Ltd., 19	983.		
2. J. Dugundj	2. J. Dugundji, Topology, Allyn and Bacon, 1966 (reprinted in India by Prentice Hall of					
3. George F.S	India Pvt. Ltd.). 3. George F.Simmons, Introduction to Topology and modern Analysis, McGraw-Hill Book					
Company,			D 11 10(1			
J.Hocking :	and G Young, Topology, A	ddison-Wiley	Reading, 1961.			
5. J.L. Kelley.	, General Topology, Van No	strand, Reinho	old Co., New YO	ork,1995.		
Online Resources	: (e- Resources/ e- Books/ e	e- Learning P	ortais)			
1 https://opfi	necourses.nptel.ac.in	2.	https://swayam.g	ov.in		
1. 100023.2/VIIII	involution and involution in					
https://epq	p.inflibnet.aci.in	4.	https://www.moo	oc.org		
Part D- Assessm	ent and Evaluation					
the second data with the second se	nuous Evaluation Methods	s:				
Maximum Mark		100 Ma	rks			
Continuous Con	prehensive Evaluation (C	CE): 20 Ma	irks			
Semester End E	xam (SEE):	80 Ma	rks			
Internal	Internal Test - 20 Marks			Best of Test and		
Assessment:	Assignment/ Seminar - on	e of 20 Marks		Assignment shall be		
Continuous				considered against 20		
Comprehensive				marks		
Evaluation (CCE)						
Semester End	Pattern -FOUR Question			estion A and B are		
Exam (SEE)	compulsory. Question C ar	nd D have inte	mal choice.			
Question-A & B (Compulsory): Very short answer type question (2 each)						
	Question-A & B (Compuls	sory): very sno	in answer type c			
				04 x 5 = 20 Marks		
	Question-A & B (Compuls Question-C: Short answer			04 x 5 = 20 Marks		
	Question-C: Short answer	type questions				
		type questions		04 x 5 = 20 Marks 05 x 5 = 25 Marks		
	Question-C: Short answer	type questions		04 x 5 = 20 Marks		

Name & Signature of Members of Board of Studies:

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Chairperson / H.O.D - Dr. Padmavati P-517124	Faculty members:
Subject Expert - Dr. Madhu Shrivastava With 6-07-24	Dr. M.A. Siddiqui – 🖉
Subject Expert - Dr. Shabnam Khan	
Subject Expert - Dr. S. K. Bhatt XAL GIV	Dr. Rakesh Tiwari – TRau
Representative Members	
 Dr. Anil Kashyap - Shri A. K. Pandey - 	Dr. (Smt.) Prachi Singh –
3. Dr. Mayur Puri Goswami -	

GOVT, V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF MATHEMATICS

COURSE CURRICULUM 2024-25

DSE

Part	A: Int	troduction				1000
Program: Bachelor's in science (Certificate /Diploma / Degree/Honors)			Class: B.Sc.	Semester – VIII	Session:2024-2025	
1 Course Code						
2		c Title		Complex Analysis	II	
3	-	se Type		Discipline Specific Elective		
4		Course Learning This Course will enable the students to:				
Outcome (CLO)		ome (CLO)	 Recall the concept of analyticity, focusing on the Cauchy-Riemann equations and their consequences, including results on harmonic and entire functions and the fundamental theorem of algebra. 			
			analytic f	nd the application of power series, unctions. conformal mapping, bilinear transfo		
			• Analyze of complex a		ormations, and then p	nopernes m
Apply the Cauchy re			analytic of	Cauchy residue theorem to evaluate continuation and its properties, a		
5	Cre	dit Value	4 Credits	1 credit =15 Hours -	Learning and Obser	vation
6		al Marks	Maximum Mark		Minimum Passing M	
Part B: Content of the Course						
				Learning Periods = 60 Periods	(60 Hours)	
Unit				(COURSE CONTENTS)		No. of Periods
		equation, Run	ion and its properties, Riemann Zeta function, Riemann's functional ge's theorem, Mittag-Leffler's theorem.			12
II analytic		analytic contir	tinuation, Uniqueness of direct analytic continuation, Uniqueness of nuation along a curve, Power series method of analytic continuation, ection principle.			12
ш		Monodromy th Harnack's inec	theorem and its consequences, Harmonic functions on a disk, equality and theorem.			12
Dirichlet Prot		Dirichlet Prob	lem, Green's function, Canonical products, Jensen's formula, n formula, Hadamard's three circles theorem.			12
V Order of an ent Hadamard's fac theorem, The L and the Great P		tire function, Exponent of Convergence, Borel's theorem, actorization theorem, The range of an analytic function, Bloch's Little Picard theorem, Schottky's theorem, Montel Caratheodory Picard theorem, Univalent functions, Bieberbach's conjecture y) and the "1/4-theorem".			12	

Chairperson / H.O.D - Dr. Padmavati	Faculty members:
Subject Expert - Dr. Madhu Shrivastava	
Subject Expert - Dr. Shabnam Khap	
	Dr. M.A. Siddiqui –
Subject Expert - Dr. S. K. Bhatt	2
Representative Members	Dr. Rakesh Tiwari - 1
1. Dr. Anil Kashyap -	Logus
2 Chri A V Banday	Dr. (Smt) Prodice in 10
	Dr. (Smt.) Prachi Singh –
3. Dr. Mayur Puri Goswami -	40



Part C - Learning Resource

Reference:

- 1. L.V. Ahlfors: Complex Analysis, McGraw Hill, 1979.
- 2. D. Sarason: Complex Function Theory, Hindustan Book Agency, Delhi, 1994.
- 3. H. K. Pathak, Complex Analysis and Applications, Springer, 2019.
- 4. H.A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford 1990.
- 5. Liang-shin Hahn & Bernard Epstein, Classical Complex Analysis, Jones and BartlettPublishers International, London, 1996.
- 6. S. Lang, Complex Analysis, Addison Wesley, 1977.
- 7. W.H.J. Fuchs, Topics in the Theory of Functions of one Complex Variable, D. Van Nostrand Co., 1967.
- 8. C.Caratheodory, Theory of Functions (2 Vols.) Chelsea Publishing Company, 1964.
- 9. Walter Rudin, Real and Complex Analysis, McGraw-Hill Book Co., 1966.
- 10. S.Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, 1997.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

- 2. https://swayam.gov.in 1. https://onlinecourses.nptel.ac.in
- 4. https://www.mooc.org 3. https://epgp.inflibnet.aci.in

Part D: Assessment and Evaluation **Suggested Continuous Evaluation Methods:** Maximum Marks: 100 Marks **Continuous Comprehensive Evaluation (CCE):** 20 Marks Semester End Exam (SEE): 80 Marks Best of Test and Internal Internal Test - 20 Marks Assessment: Assignment/ Seminar - one of 20 Marks Assignment shall be Continuous considered against 20 Comprehensive marks Evaluation (CCE) Semester End Pattern -FOUR Question A, B, C, D from each unit. Question A and B are Exam (SEE) compulsory. Question C and D have internal choice. Question-A & B (Compulsory): Very short answer type question (2 each) $04 \ge 5 = 20 \text{ Marks}$ Question-C: Short answer type questions $05 \ge 5 = 25$ Marks Question-D: Long answer type questions 07 x 5 = 35 MarksTotal = 80 Marks

Chairperson / H.O.D - Dr. Padmavati	Faculty members:
Subject Expert - Dr. Madhu Shrivastava Mute/6-07-24	D-MA Sidding A
Subject Expert - Dr. Shabnam Khan	Dr. M.A. Siddiqui – 🔨
Subject Expert - Dr. S. K. Bhatt	
Representative Members	Dr. Rakesh Tiwari – John
1. Dr. Anil Kashyap -	
2. Shri A. K. Pandey -	Dr. (Smt.) Prachi Singh –
2. Shri A. K. Pandey - 3. Dr. Mayur Puri Goswami -	Dr. (Sint.) Pracin Singn –



GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF MATHEMATICS **COURSE CURRICULUM 2024-25**

Par	t A: In	troduction		DS			
Pro	gram: cience /Dip Degree	Bachelor's in (Certificate bloma / e/Honors)	Class: B.Sc. Semester – VIII Session:2024-20	25			
1		e Code					
2		se Title	Graph Theory				
4		Durse Type Discipline Specific Elective (DSE)					
4	Course Learning Outcome (CLO)This Course will enable the students to:• Appreciate the definition and basics of graphs along with ty examples.			pes and thei			
			 Understand the definition of a tree and learn its app fundamental circuits. 	olications t			
			 Know the applications of graph theory to network flows. 				
	1		• Understand the notion of planarity of a graph.				
			• Relate the graph theory to the real-world problems.				
5	Cree	dit Value	4 Credits 1 credit =15 Hours – Learning and Ob	servation			
6	_	Total Marks Maximum Marks :100 Minimum Passing					
Pa	rt B: (Content of the	Course				
		Total	no. of Teaching/ Learning Periods = 60 Periods (60 Hours)				
Unit			Topics (COURSE CONTENTS)				
	I	Definition and graphs, disconr graph isomorph	s and Graph Isomorphisms examples of a graph, subgraph, walks, paths, and circuits. Connected ected graphs, and components of a graph. Euler and Hamiltonian graphs, isms. Adjacency matrix and incidence matrix of a graph. Directed graphs ntary properties.	12			
Planar GraphsIIPlanar graph, E		Planar Graphs Planar graph, E	uler theorem for a planar graph. Various representations of a planar planar graph. Detection of planarity, Kuratowski's theorem.				
I	II	Weighted Gra	bhs and Algorithms , travelling salesman problem, shortest path. Dijkstra's algorithm.	12			
IV Cut-set of a graph a		Cut-Sets and C Cut-set of a gra	h and its properties. Fundamental circuits and cut-sets. Cut-vertices, l separability. Network flows.				
V Definition and p trees. Spanning		Trees and Spar	ining Troop				

Chairperson / H.O.D - Dr. Padmavati Faculty members: I=16-07-24 Subject Expert - Dr. Madhu Shrivastava Mith Subject Expert - Dr. Shabnam Khan Dr. M.A. Siddiqui -6721 Subject Expert - Dr. S. K. Bhatt **Representative Members** Dr. Rakesh Tiwari – (1. Dr. Anil Kashyap -2. Shri A. K. Pandey -Dr. (Smt.) Prachi Singh -3. Dr. Mayur Puri Goswami б

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Part C - Learning Resource

Reference:

- 1. Elements of Discrete Mathematics By C.L. Liu.
- 2. J.P. Tremblay & R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill Book Co., 1997.
- 3. C.L Liu, Elements of Discrete Mathematics, McGraw-Hill Book Co.
- 4. N. Deo. Graph Theory with Application to Engineering and Computer Sciences. Prentice Hall of India.
- 5. J. L. Gersting, Mathematical Structures for Computer Science, (3rd edition), Computer Science Press, New York.
- Seymour Lepschutz, Finite Mathematics (International) edition 1983), McGraw-Hill Book Company, New York.
- 7. S.Wiitala, Discrete Mathematics-A Unified Approach, McGraw-Hill Book Co.

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Online Resources: (e- Resources/ e- Books/ e- Learning Portals)
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- 1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in
- https://epqp.inflibnet.aci.in 4. https://www.mooc.org

Part D: Assessment and Evaluation Suggested Continuous Evaluation Methods: Maximum Marks: 100 Marks Continuous Comprehensive Evaluation (CCE): 20 Marks Semester End Exam (SEE): 80 Marks Internal Internal Test - 20 Marks Best of Test and Assessment: Assignment/ Seminar - one of 20 Marks Assignment shall be Continuous considered against 20 Comprehensive marks Evaluation (CCE) Pattern -FOUR Question A, B, C, D from each unit. Question A and B are Semester End Exam (SEE) compulsory. Question C and D have internal choice. Question-A & B (Compulsory): Very short answer type question (2 each) $04 \ge 5 = 20 \text{ Marks}$ Question-C: Short answer type questions $05 \ge 5 = 25$ Marks Question-D: Long answer type questions $07 \ge 5 = 35$ Marks Total = 80 Marks

Chairperson / H.O.D - Dr. Padmavati	Faculty members:	
Subject Expert - Dr. Madhu Shrivastava Mint= (6-07-24	Dr. M.A. Siddiqui –	
Subject Expert - Dr. Shabnam Khan		
Subject Expert - Dr. S. K. Bhatt Govar 6 7124	Dr. Rakesh Tiwari – TBAU	
Representative Members		
1. Dr. Anil Kashyap -	Dr. (Smt.) Break Singh	
2. Shri A. K. Pandey -	Dr. (Smt.) Prachi Singh –	
3. Dr. Mayur Puri Goswami -		

